

California Farm Equipment Magazine

DECEMBER 2025 Volume 44 • Number 12

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18 Public invited for up-close look at future of citrus ag tech. University of California Agriculture and Natural Resources' innovation arm, UC ANR Innovate, in partnership with Farmhand Ventures, has selected six agricultural technology companies for VINE Connect, a statewide commercialization program that helps proven ag tech companies bring their technologies to market through direct engagement with California growers.



22 UC Dry Bean Field Day gives updates on new-variety research. Rows of tightly packed olive trees stretch across California's Central Valley. These super-high-density orchards, where trees are planted close together for faster, mechanized harvesting, can grow strong with less fertilizer than expected, according to new research from the University of California, Davis.



30 Study Shows Very Dense Olive Orchards Thrive on Less Fertilizer. Researchers Also Find Compost Helps Trees Absorb More Nitrogen. Rows of tightly-packed olive trees like these shown here produced the same yields and high-quality oil even when using 25-50% less nitrogen than recommended amounts for traditional orchards.

**On The Cover
Wishing A
Merry Christmas
and
Happy New Year!**

A Microbial Blueprint for Climate-Smart Cows

Gut Genes May Hold Key to Lowering Methane



Matthias Hess, with the UC Davis Department of Animal Science, and researchers at UC Berkeley, have identified which microbes in a cow's gut could help reduce methane. It brings them a step closer to engineering gut microbes to create more climate-friendly cows. (Gregory Urquiaga / UC Davis)

by Amy Quinton

Each year, a single cow can belch about 200 pounds of methane. The powerful greenhouse gas is 27 times more potent at trapping heat in the atmosphere than carbon dioxide. For decades, scientists and farmers have tried to find ways to reduce methane without stunting the animal's growth or productivity.

Recent research at University of California, Davis, has shown that feeding cows red seaweed can dramatically cut the amount of methane that is produced and released into the environment. Until now, however, scientists did not fully understand how red seaweed changes the interactions among the thousands of microbes in the cow's gut, or rumen.

A new collaborative study by researchers at UC Davis, the University of California, Berkeley, and the Innovative Genomics Institute, or IGI, sheds light on that process and reveals which microbes in the cow's gut might help reduce methane. The new insights bring the multidisciplinary team, composed of microbiologists, animal and computer scientists, closer to engineering the gut microbes of cows to produce less methane, offering a long-term solution that would not depend on seaweed feed additives. The study was published in *Microbiome*.

Seaweed transforms the cow gut

Scientists have previously shown that red seaweed of the genus *Asparagopsis* blocked a key enzyme found in methane-producing microbes in the cow's gut. In the current study, researchers discovered that seaweed turned certain microbial genes on and off, a sign that these genes play a key role in how red seaweed helps cut methane from cows. As these genes switched on and off in the cow's gut, hydrogen briefly built up. The team also identified a rumen bacterium

that belongs to the genus *Duodenibacillus* that can use some of the hydrogen.

"That's important because too much hydrogen can lead to acidosis in the rumen, which can harm the animal," said project leader and corresponding author Matthias Hess, a microbiologist and professor in the UC Davis Department of Animal Science and an IGI investigator. "Instead, this organism uses the hydrogen and converts it to succinate, a compound the animal can eventually use to make protein."

Hess said the findings could open the door to engineering communities of hydrogen-hungry microbes that might outcompete methane-producing microbes.

"Hydrogen is a key energy source in the rumen, specifically for methane-producing microbes," said principal investigator Spencer Diamond, with the IGI. "This study helps us better understand how other microbes that naturally occur in the rumen can divert this hydrogen away from methanogens and

towards bacteria that may make animals more efficient."

Scientists extracted fluid from the rumens of eight cows: four that were fed a regular diet and four that were also given a seaweed additive for 14 days. Cows that ate the seaweed cut their methane emissions by 60%, increased their hydrogen production by 367% and increased their feed efficiency by up to 74%.

Researchers were also able to reconstruct the genome of *Duodenibacillus*, a bacterium that has not yet been isolated in a lab. By looking at the bacterium's complete genetic code, they could understand its role in hydrogen consumption, how it may compete with other hydrogen-utilizing microorganisms, and how it functions in the cow's rumen more globally. Efforts are now underway to try and isolate this specific *Duodenibacillus* species for further study.

Other authors of the study include Ermias Kebreab, Pedro Romero and Breanna Roque of UC Davis; Pengfan Zhang of the Innovative Genomics Institute at UC Berkeley; and Nicole Shapiro and Emiley Eloie-Fadros of the U.S. Department of Energy Joint Genome Institute. Authors Matthias Hess and Ermias Kebreab are also principal investigators at the IGI.

This work was supported in part by Lyda Hill Philanthropies, Acton Family Giving, the Valhalla Foundation, Hastings/Quillin Fund - an advised fund of the Silicon Valley Community Foundation, the CH Foundation, Laura and Gary Lauder and Family, the Sea Grape Foundation, the Emerson Collective, Mike Schroepfer and Erin Hoffman Family Fund - an advised fund of Silicon Valley Community Foundation, and the Anne Wojcicki Foundation through The Audacious Project at the Innovative Genomics Institute. The work was also supported by the Shurl and Kay Curci Foundation and by the Office of Science of the U.S. Department of Energy.

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2 UPCOMING AUCTIONS

Saturday December 6th 9:00 AM

Inspection Friday, December 5th 9:00 AM to 4:00 PM

Location: 6200 Price Way, Bakersfield, CA

Expecting 50 + Vehicles Including: 2016 International Diesel Dura Star, Swimming Pool Plastering Truck, 6 Speed Trans., 2021 GMC Diesel, 4 x 4 4 Door, 132,000 Miles, 2018 Ford F-150 Ext. Cab, Chevy 3500 1 Ton, 2017 Ford F-250 4 Door, 217,000 Miles, (5) 2017/2018 Dodge Vans, various conditions, 2018 Ford F150's, 2014 Ford F350 C & C, 2015 F-150 W/Service Body, 2006 Wrecked Dodge Charger, 2002 Dodge 3500 1 Ton Gas Flat Bed W/54000 Miles, 4x4, Nice, & Many More.

John Deere 5093EN W/Cab, Serial # 571189, 5101 Serial # 7700780 Sold As Is, John Deere 770 W/Front Loader, 4853 Hours, S/N 2619 Nice, (3) John Deere Gator's (3) New 3 Wheel Electric Flat Beds, (3) New 2 Passenger 3 Wheel Riders, (6) New Electric 4&6 Seater Golf Carts. Harlo HP6500 Rough Terrain Forklift 4 x 4, S/N 91372, Toro 716 Riding Power Mower W/Folding Mowers, nice, Trail King 2 Axle Tandem Axle, Tilt Bed, Pintle Hitch, (2) 5' x 10' Box Trailers, Jacobsen Tilt Bed 2 Axle W/Winch, (2) 40' New Containers. 20' x 30' All Steel Carports, 11' x 19' Single Steel, (3) 2' x 12' Livestock Metal Seds, (2) 12' x 20' Car Ports, Iron Fencing, Welders, Skid Steer Attachments, Lincoln 256 Mig Welders, Rikon 14" Bandsaws, South Bend Lathe, Bridgeport Mill, Rim Clamp Tire Changer, Shop Tables, Sunmaster Motor Testers, Used Golf Carts, , Honda 700 Pioneer, (3) MQ Light Towers, Honda Passport & Spree Motor Bikes, (13) Honda Recon's, good, (30) + 4 Wheelers, Some for Parts. Kiernan Estate W/1927 IHC Flat Bed Truck, (3) 54/55 Ford Ranchero Pickup Bodies, 50+ Juke-boxes, 100,000 Records to Choose From, Old Radios, Coca Cola Machines, Old Motorcycles & Much More



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Inspection Friday, December 12th 9:00 AM to 2:00 PM

Location: 1355 West Main Street, SANTA MARIA, CA 93454

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California Dairy Needs Assessment

Rúbia Branco-Lopes, Jennifer Heguy, Betsy Karle, Randi Black and Daniela Bruno - UC ANR

The California dairy industry continues to evolve, with fewer dairies, larger herds, and new challenges from



Fig. 1. Map of counties in Northern California (NCA), northern San Joaquin Valley (NSJV), and greater Southern

education) were kept for comparison with 2017, with a few new ones added to reflect emerging challenges for California dairies.

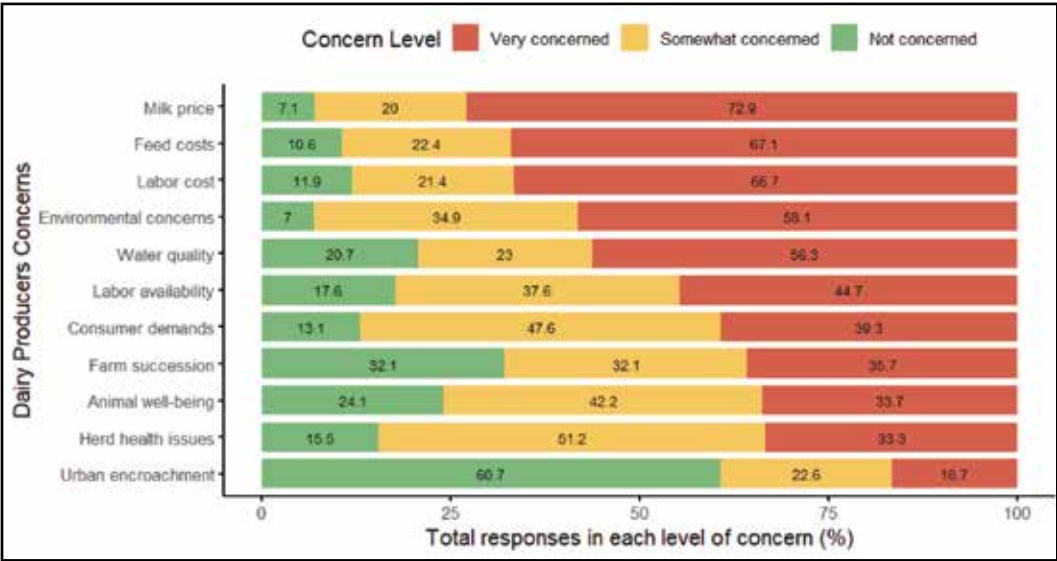
A total of 87 producers participated in the survey, representing an 8.1% response rate. Herd sizes ranged from 50 to 7,000 cows, with an average of 1,663 cows. Most respondents operated conventional dairies (82%), while 16% were organic and remaining did not inform the production system. Producers from across the state were represented (Fig.1), with 19% from Northern California, 36% from the Northern San Joaquin Valley, and 45% from Greater Southern California.

Concerns. The top five dairy producers concerns were milk price, feed costs or availability of feeds, labor cost, environmental concerns or regulations, and water quality or availability (Fig. 2). Compared to 2017, feed costs or availability of feeds moved up as a top concern in the recent survey. Producers across regions expressed similar levels of concern for most issues, except for urban encroachment. Producers

in Northern California were more concerned about urban expansion (60%) compared to those in the Northern San Joaquin Valley (44%) and Greater Southern California (39%).

Research priorities. In 2024, the top research priorities identified by producers were environmental regulation, milk quality, reproduction, water use efficiency, and herd health. Four of these topics had already been among the top five in 2017 (herd health, environmental regulation, reproduction, and milk quality). Water use efficiency was first asked in 2024. Although overall priorities have remained consistent over time, regional differences were observed. Producers in Greater Southern California placed higher importance on alternative forages, while Northern California producers prioritized extreme weather and organic or pasture-based management. Heat stress and herd health ranked higher in the Northern San Joaquin Valley and Greater Southern California, whereas milk quality received less emphasis in the south.

Educational priorities. Producers' educational priorities closely aligned with their research priorities. The five high priority educational topics were milk quality, environmental regulation, reproduction, water use efficiency, and herd health issues. As with research, four of these had been top priorities in 2017, with water use efficiency being newly added in the most recent survey. Producers in Northern California gave greater emphasis to extreme weather and organic or pasture-based systems, while those in the Northern San Joaquin Valley and Greater Southern Cali-



fornia identified heat stress as a key educational need

Fig. 2. Level of concern among California dairy producers by topic

Acknowledgment. Thank you to all producers who responded to the survey. Your input will guide the direction of UC Cooperative Extension dairy programs.

California Farm Equipment

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Associate Publisher Mona L. Neyer

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CONTACTS

Editorial Office

California Farm Equipment
P.O. Box 1128, Visalia, CA 93279
Telephone (559) 627-2182. Website at:
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Students recognized in California Farm Bureau Collegiate Discussion Meet

Becca Hamman, an agriculture education student at California State University, Chico, was named the winner of the California Young Farmers & Ranchers Collegiate Discussion Meet, held Nov. 15 at Modesto Junior College. Hamman earned \$2,500 and will represent California in the national competition during the American Farm Bureau Federation's Young Farmers & Ranchers Leadership Conference set for March 13-16 in Portland.

Competing were 36 YF&R members from seven colleges. Competitors were from Cal Poly, San Luis Obispo; California State University, Chico; California State University, Fresno; Merced College; Modesto Junior College; Santa Rosa Junior College; and University of California, Davis. They advanced to the final competition from earlier rounds in which they were challenged to demonstrate their abilities in exchanging ideas and offering detailed opinions on issues of importance to agriculture and Farm Bureau.

The discussion featured multiple rounds and analyzed the impacts of urban sprawl on farmland, how digital engagement can improve communication with policymakers, ways to help members better understand Farm Bureau benefits, and strategies for farmers and ranchers to effectively advance environmental stewardship.

Joseph Aguiar of Cal Poly, San Luis Obispo, was the first runner-up and winner of \$1,000. Finalists, and winners of \$500 each, were Kaylen Jaime of Cal Poly, San Luis Obispo, and Ariana Covarrubias of Santa Rosa Junior College.

The overall high-scoring team, and winner of \$500, was Cal Poly, San Luis Obispo.

This competition is supported by donor contributions. Jim and Normita Spinetta, farmers in El Dorado County, invested \$200,000 in a fund established by the California Farm Bureau to advance the organization's Young Farmers & Ranchers Discussion Meet contest.

California Farm Bureau works to protect family farms and ranches as part of a nationwide network representing more than 5 million Farm Bureau members. Learn more at www.cfbf.com.

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California Farm Equipment Magazine Earns Spot Among Top 15 Farm Equipment Publications

California Farm Equipment Magazine has been recognized by Feedspot as one of the Top 15 Farm Equipment Magazines worldwide, a distinction that underscores the publication's longstanding role as a trusted source of agricultural information. This honor places the Visalia-based magazine alongside some of the most respected agricultural publications across the globe, highlighting its editorial quality, industry influence, and commitment to serving farmers and equipment professionals.

Founded decades ago, California Farm Equipment Magazine has built its reputation by consistently delivering practical, evidence-based content tailored to the needs of the Western agricultural community. From in-depth coverage of the latest machinery and technology innovations to insights on industry trends shaping the future of farming, the magazine has become a reliable resource for growers, dealers, and agricultural professionals who depend on timely and accurate information.

Feedspot, a leading online content curator, compiles its rankings based on several factors, including editorial excellence, readership engagement, and overall contribution to the industry. The recognition is not only a testament to the magazine's editorial standards but also to its ability to adapt to the evolving needs of modern agriculture. By blending traditional reporting with digital accessibility, California Farm Equipment Magazine ensures that its audience remains informed in an era of rapid technological change.

"We are honored to be included among some of the most respected agricultural publications in the world," said the California Farm Equipment Magazine team. "This recognition is a testament to our dedication to supporting the agricultural

community with high-quality, practical information."

The acknowledgment also provides new opportunities for visibility. As part of the Feedspot listing, California Farm Equipment Magazine can share links and social media profiles, expanding its reach among readers and industry partners. This increased exposure strengthens the magazine's ability to connect with a broader audience while reinforcing its role as a hub for agricultural knowledge.

For the farming community, the recognition serves as validation of the magazine's mission: to provide trusted insights that help professionals make informed decisions. Whether it's evaluating new equipment, understanding regulatory changes, or exploring sustainable practices, California Farm Equipment Magazine continues to deliver content that is both practical and forward-looking.

The magazine's editorial team credits its loyal readership and advertisers for making this achievement possible. Their support has enabled the publication to maintain high standards while expanding coverage to reflect the diverse challenges and opportunities facing agriculture today. From small family farms to large-scale operations, the magazine's readership reflects the breadth of the industry it serves.

California Farm Equipment Magazine extends its gratitude to Feedspot Founder Anuj Agarwal and his team for this recognition, and to its readers for their continued trust. As agriculture continues to evolve with new technologies and global demands, the magazine remains committed to being a reliable voice for farmers and equipment professionals across California and beyond.

Looking Ahead: Innovation and Community

The recognition also comes at a pivotal time for agriculture. Farmers are navigating challenges such as climate variability, rising input costs, and the need for more sustainable practices. Equipment manufacturers are responding with innovations in precision technology, automation, and energy efficiency. California Farm Equipment Magazine has positioned itself as a bridge between these advancements and the professionals who rely on them, offering clear explanations and practical applications that help readers stay ahead of the curve.

Beyond technology, the magazine emphasizes the human side of farming — the resilience of growers, the importance of community, and the shared commitment to feeding the world. By spotlighting local stories alongside global trends, the publication ensures that its readers see themselves reflected in the broader narrative of agriculture. This balance of technical expertise and community focus is one of the reasons the magazine continues to resonate with its audience.

As it celebrates this recognition, California Farm Equipment Magazine reaffirms its mission: to inform, inspire, and support the agricultural community. With decades of experience and a forward-looking vision, the magazine is poised to continue shaping conversations about farm equipment and agricultural innovation for years to come.

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Farmers Urged to “Prepare with Propane” for Cold-Weather Reliability

Propane Delivers Heat, Power, and Peace of Mind When Winter Strains the Grid

As extreme cold events become more frequent and strain aging electrical grids, farmers and agricultural operations are turning to propane as a reliable, on-farm energy solution. Propane's ability to operate independently of the grid makes it especially well-suited for winter use, from heating barns and greenhouses to powering backup generators.

“Winter is when reliability matters most,” said Mike Newland, director of agriculture business development for the Propane Education & Research Council (PERC). “Propane is stored on-site and ready when farmers need it, ensuring essential equipment and facilities stay powered— even in the face of widespread outages or fuel supply disruptions. Propane is the reliable energy partner farmers can count on all season long.”

Severe winter weather is a major driver of U.S. power outages, and the risks are mounting. According to a 2025 Department of Energy Report, blackout risks could grow 100-fold by 2030.

To prepare agriculture operations for the winter season,

propane tanks can be filled ahead of storms, protecting against supply shortages and transportation delays. When planning for the winter season, PERC recommends producers:

1. Top off propane tanks early, especially before major storms hit.
2. Inspect burners, lines, and regulators now to avoid winter breakdowns.
3. Convert existing generators or engines to bi-fuel or full propane, where feasible.
4. Maintain an emergency buffer stock — 20 to 30 percent extra capacity is a recommended margin.
5. Work with a propane supplier familiar with rural and agricultural service to ensure prompt winter delivery.

With winter approaching, early planning is the best protection. By securing fuel supplies now and ensuring equipment is ready, farmers can avoid costly downtime and safeguard their livelihoods. For additional guidance, visit www.Propane.com/Agriculture or contact your local propane supplier to develop a customized winter-readiness plan.

Creamy and Crunchy Desserts with Classic Pumpkin Flavor

FAMILY FEATURES

If there's one food item that brings everyone together more than most during the holidays, it's warm, delicious desserts. From classics like pumpkin pies and cookies to extravagant dishes like souffles, loved ones can savor the flavor of sweet treats at the dessert table all season long.

This much-loved version of Pumpkin Pie is a delicious take on a traditional dessert that's perfect for any time of year. Even if you've never baked a pie, this easy rendition makes it a cinch to share with your nearest and dearest.

It's made with Green Giant 100% Pure Pumpkin, which is more than just a seasonal product. You can enjoy it as a go-to for smooth, pure pumpkin in baked goods, chilis, savory dishes, or morning smoothies as a wholesome boost full of earthy pumpkin flavor.

Or you can celebrate its deliciousness in these coffee house-style Brown Butter Pumpkin Spice Cookies. Featuring a rich, buttery flavor, these pumpkin cookies are rolled in cinnamon sugar, bake up soft and boast a sweet, crunchier exterior that's perfect for those who love pumpkin spice. Find more inspiration for holiday baking and beyond by visiting greengiantvegetables.com.

Pumpkin Pie

Prep time: 15 minutes
Cook time: 50-55 minutes
Servings: 8

- 1 pie crust (store-bought or homemade), at room temperature
- 3 large eggs
- 1/2 cup granulated sugar
- 1/3 cup light brown sugar
- 1 can (15 ounces) Green Giant 100% Pure Pumpkin
- 3/4 cup heavy whipping cream
- 1 teaspoon vanilla extract
- 1 teaspoon ground cinnamon
- 1/2 teaspoon ground ginger
- 1/4 teaspoon ground nutmeg
- 1/2 teaspoon salt

Roll out dough to 2 inches larger than pie dish. Gently press dough into dish until it lines bottom and sides. Trim dough to within 1/2 inch of dish edge. Fold edges underneath themselves, creating thick 1/4-inch border. Crimp edges with fingers. Refrigerate. Preheat oven to 375 F.

In large bowl, whisk eggs and sugars until smooth. Add pumpkin, cream, vanilla, cinnamon, ginger, nutmeg and salt. Stir until well blended. Slowly pour filling into pie shell. Cover edges with thin strips of aluminum foil. Bake 25 minutes. Remove foil. Bake 25-30 minutes, or until toothpick inserted near center comes out clean. Cool on wire rack.



Pumpkin Pie

In large mixing bowl, whisk flour, baking soda, salt and pumpkin pie spice. Set aside.

In separate medium mixing bowl, stir browned butter and brown sugar. Whisk in pumpkin and vanilla extract followed by eggs and egg yolks.

Gradually mix wet ingredients into dry until evenly mixed. Refrigerate dough 30 minutes.

Form dough into four separate logs 2-3 inches in diameter and about 7 inches long. Wrap each cookie dough log with plastic wrap. Freeze dough 30 minutes, or until ready to bake.

For rolling: Preheat oven to 350 F and line large baking sheet with parchment paper. Stir sugars and cinnamon on large plate. Unwrap desired amount of dough (throw slightly at room temperature if dough is completely frozen) and roll each log in sugar mixture. Slice into 1/2-inch slices. Place on baking sheet 3 inches apart.

Bake 14-15 minutes. Repeat with remaining cookie dough. Cool cookies at room temperature on baking sheet 10 minutes before transferring to cooling rack and cooling 10 minutes.

Brown Butter Pumpkin Spice Cookies

Prep time: 30 minutes
Cook time: 70 minutes
Yield: 48-50 cookies

- 1 cup unsalted butter
- 5 cups all-purpose flour
- 2 teaspoons baking soda
- 1 teaspoon salt
- 1 tablespoon pumpkin pie spice
- 2 cups brown sugar
- 1 can (15 ounces) Green Giant 100% Pure Pumpkin
- 1 tablespoon vanilla extract
- 2 large eggs
- 2 egg yolks

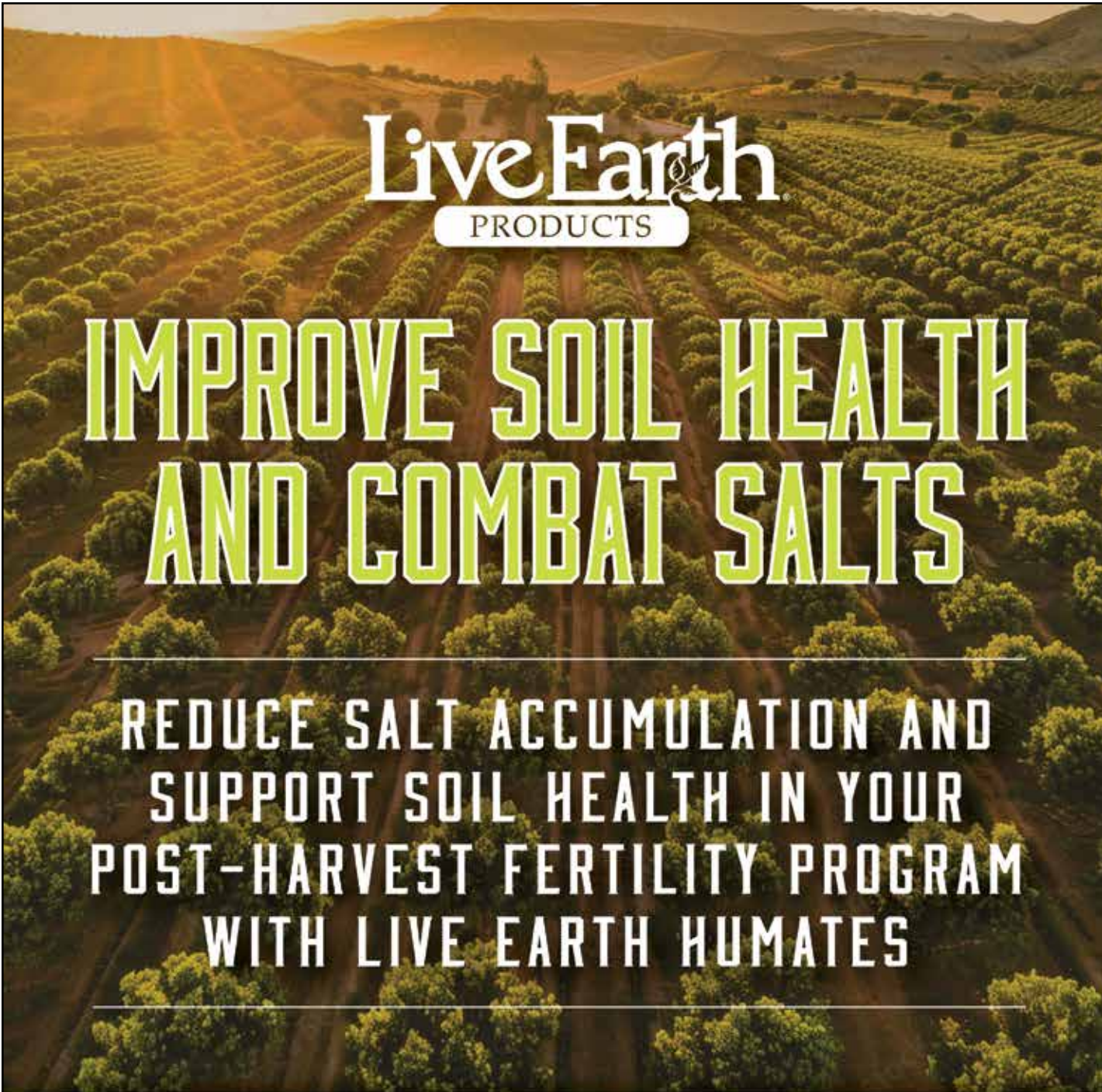
For Rolling:

- 2 tablespoons cane sugar
- 1 tablespoon brown sugar
- 1 teaspoon cinnamon

In small sauce pan over medium heat, melt butter. Stir regularly until butter turns deep golden brown, 8-10 minutes. Pour browned butter into heat-safe bowl or measuring cup and refrigerate until cooled, but not solid, about 15 minutes.



Brown Butter Pumpkin Spice Cookies



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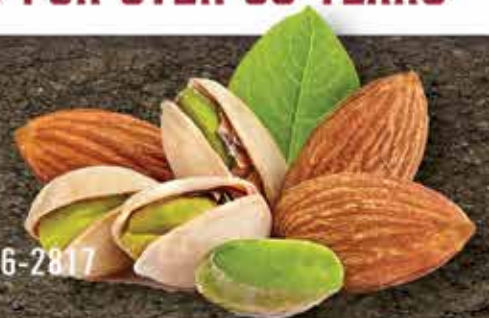
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Secretary Rollins Leads Historic USDA Trade Mission to Mexico

U.S. Secretary of Agriculture Brooke L. Rollins recently led the largest agribusiness trade mission in the history of the Department of Agriculture, underscoring the growing importance of U.S.–Mexico agricultural ties.

The three-day mission in Mexico City brought together 41 U.S. businesses, 33 cooperators and advocacy groups, six state departments of agriculture, and more than 150 participants. Collectively, they conducted over 500 business-to-business meetings, strengthening opportunities for American farmers and ranchers to expand their reach into Mexico's dynamic market.

Secretary Rollins emphasized that the mission was not only about trade but also about tackling shared challenges. A key focus was the ongoing fight against New World Screwworm (NWS), a parasitic pest that threatens livestock and agricultural productivity in both countries. Rollins met with Mexican President Claudia Sheinbaum at the Presidential Palace to discuss joint efforts to eradicate NWS and to reaffirm commitments under the 1944 Water Treaty. "This week was an incredible opportunity to connect buyers and sellers, push for American exports into Mexico's ethanol market, and advance our joint review of the United States-Mexico-Canada Agreement," Rollins said.

The delegation also visited Mexico's National Service of Agro-Alimentary Health, Safety, and Quality (SENASICA) headquarters, where bilateral teams are coordinating NWS containment strategies. Under Secretary for Marketing and Regulatory Programs Dudley Hoskins traveled to Chiapas to review enforcement practices, while Under Secretary for Trade and Foreign Agricultural Affairs Luke Lindberg joined Rol-

lins in touring major importers of U.S. goods.

Stops included a Walmart Super Center in Mexico City and Grupo Bimbo's bakery facilities. Grupo Bimbo, one of the world's largest baking companies, imported nearly \$400 million in U.S. ingredients in 2024, ranging from wheat and dairy to eggs, potatoes, and nuts. These visits highlighted the scale of American agricultural products already integrated into Mexico's food supply chain and demonstrated how trade missions directly support everyday consumer needs.

State leaders also played a prominent role. Directors from Idaho, Nebraska, and Washington joined officials from California, Tennessee, and Wisconsin to represent regional agricultural interests. Their participation underscored the mission's broad scope, connecting local producers to international buyers and ensuring that smaller farming communities also benefit from global trade opportunities.

Mexico remains the top market for U.S. agricultural exports. In 2024, shipments totaled \$30.2 billion, with consumer-oriented goods such as meat, dairy, processed foods, fruits, and beverages accounting for nearly half that value. Bulk commodities—including corn, soybeans, wheat, rice, and pulses—made up another third, valued at \$10 billion.

By combining trade promotion with pest eradication and treaty enforcement, the mission demonstrated USDA's multifaceted approach to advancing American agriculture abroad. For U.S. farmers and ranchers, Mexico continues to be both a vital partner and a critical market, and this historic mission reinforced the shared commitment to growth, cooperation, and resilience.

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Public invited for up-close look at future of citrus ag tech

By Hanif R Houston,

University of California Agriculture and Natural Resources' innovation arm, UC ANR Innovate, in partnership with Farmhand Ventures, has selected six agricultural technology companies for VINE Connect, a statewide commercialization program that helps proven ag tech companies bring their technologies to market through direct engagement with California growers.

The companies will demonstrate their technologies at a VINE Connect Field Day on Friday, Dec. 5, 2025, at the UC ANR Lindcove Research and Extension Center in Exeter, Tulare County. Attendees can see the technology in action and engage directly with founders, researchers and growers.

The event is free and open to the public. Space is limited; register to reserve your badge.

This cohort focuses specifically on citrus and tree fruit, including some of California's most valuable and most vulnerable commodities. California's citrus growers are contending with rising input costs, tightening water regulations, persistent labor shortages, and mounting pest and disease threats.

While innovative technologies exist to address these issues, many stall before reaching practical, farm-scale use. VINE Connect closes that gap, supporting companies ready to demonstrate measurable impact under real California conditions.

"California growers need solutions that work now, and work under real constraints – that's what VINE Connect is here to deliver," said Gabe Youtsey, UC ANR's chief innovation officer and head of UC ANR Innovate, which operates The VINE platform.

The cohort includes:

Ag-Bee LLC — Spray drone application services and sales, providing FAA-certified precision pesticide application for specialty crops, particularly beneficial for irregular plots and steep terrain where traditional application methods are challenging



Image courtesy of Ag-Bee

CropX — Comprehensive farm management system featuring patented spiral-design soil sensors and ET (evapotranspiration) monitoring, transforming complex data into actionable irrigation recommendations that have proven to reduce water usage by 30% while improving yields

Person holds a tablet with a view of a farm management

system featuring patented spiral-design soil sensors and ET monitoring



Image courtesy of CropX

Evolve Genomix — Rapid, field-use molecular diagnostic test kits for plant pathogen detection, delivering DNA-based results in under an hour compared to traditional 2-3 week laboratory turnarounds, with an automated version launching in 12-18 months

Researcher uses a dropper to put a drop on a leaf sitting in a petri dish



Image courtesy of Evolve Genomix

HotSpot AG — Tailored irrigation and fertigation automation systems designed specifically for permanent crops, offering remote monitoring and control capabilities that save time, money and resources while operating during off-peak energy hours

Irrigation and fertigation automation system installed in an orchard



Image courtesy of HotSpot AG

See Six Companies page 20

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Six Companies

continued from page 18

Kingman Ag — Autonomous tractor retrofit solutions that transform conventional tractors from any manufacturer into driverless workhorses, reducing fuel consumption by 25-50% and labor costs while maintaining operational flexibility



Retrofitted autonomous tractor in a field
Photo courtesy of Kingman Ag

OnTarget Spray Systems — Electrostatic spraying technology that has focused solely on agricultural applications for decades, reducing water usage by 80% and diesel consumption by 50% while achieving superior coverage through their patented Wraparound Technology™



Electrostatic spraying technology deployed in a grove
Photo courtesy of OnTarget Spray Systems

"Every one of these companies addresses a pain point that keeps growers up at night," said Hannah Johnson, industry

lead at UC ANR Innovate. "They were selected not for their pitch decks, but for their ability to deliver measurable results in actual field conditions."

Unlike traditional accelerators focused on investor pitches and rapid scaling, VINE Connect emphasizes grower partnerships and field-tested solutions. The intensive program guides startups through working sessions on effective farmer engagement, trial design, and collaboration with commodity boards and research institutions.

The program addresses what UC ANR identifies as the "innovation gap" – the space between technologies that work in theory and those that perform under the intense pressures facing California agriculture, including climate volatility, water limitations, labor shortages and rising compliance costs.

"Ag tech adoption is about trust," said Connie Bowen, founder of Farmhand Ventures. "We built this program to help companies earn that trust by being prepared, curious and ready to implement farmer feedback early."

The VINE Connect is a part of a comprehensive platform run by UC ANR's Office of Innovation and Farmhand Ventures. Created to meet the growing need for practical, industry-driven innovation in California's agrifood sector, The VINE prioritizes a "market pull" approach, ensuring that technology development is guided by actual needs from the field rather than assumptions.

The platform offers two pathways: VINE Build, which transforms early-stage prototypes into fundable startups with up to \$50,000 in equity-based investment, and VINE Connect, designed for companies with commercially available solutions ready to scale.

Selected VINE Connect participants gain access to guided business development courses, field trials, competitive grant funding opportunities, and showcase events connecting them with potential customers and partners.

The Dec. 5 Field Day coincides with Lindcove REC's annual Fruit Display & Tasting event, where industry members are invited to experience more than 100 varieties of citrus (the public day is Dec. 6).

Register for the Dec. 5 field day at <https://LindcoveConnect.eventbrite.com>.

Grower-Led Mapping Project Redefines California's Vineyard Footprint

The California Association of Winegrape Growers (CAWG), in partnership with regional grower and vintner associations, has released the results of the 2025 California Winegrape Vineyard Mapping Project, providing the most accurate, field verified accounting of California's vineyard acreage to date.

The analysis identified 477,475 acres of standing winegrape vineyards as of August 2025, and 38,134 acres removed between October 2024 and August 2025. Conducted by Land IQ, a Sacramento-based agricultural and environmental science firm, the project

delivers a comprehensive spatial mapping of vineyard blocks statewide, along with data summaries detailing standing and removed acreage by county, crush district, and American Viticultural Area (AVA). The mapping system uses advanced remote sensing, artificial intelligence, and on-the ground field verification to achieve vineyard-level precision.

"This mapping gives us a new level of spatial accuracy, showing what's actually planted and where," said Natalie Collins, CAWG president. "It provides a shared, credible foundation for regional benchmarking, market planning, and informed policy – giving us a reliable baseline to understand change, promote transparency, and plan responsibly for the future."

Project results will be available to CAWG members and partner-association members via secure login in two formats:

- Statewide report (PDF): Standing and removed acreage by county, crush district, and AVA.
- Interactive mapping tool: A web application to explore vineyard plantings statewide.
- Data Access: The statewide report, interactive mapping tool, and industry FAQ are available at: <https://cawg.org/grower-resources/vineyard-mapping/>



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UC Dry Bean Field Day gives updates on new-variety research



Michelle Leinfelder-Miles is the county director in San Joaquin County for UC Cooperative Extension. Photo by Trina Kleist, UC Davis

By Trina Kleist

Researchers across California are developing new varieties of dry beans and testing them in a hunt for larger seed size, higher yield, tolerance to drought and heat, and resistance to disease and pests.

The aim of the work is to benefit growers and handlers, said Michelle Leinfelder-Miles, of University of California Agricultural and Natural Resources. She is the UC Cooperative Extension Delta crops resource management advisor serving San Joaquin, Sacramento, Yolo, Solano and Contra Costa counties.

Varieties demonstrated during the field day included garbanzos, black-eyed peas, common beans and tepary beans, a legume native to the hot, dry American Southwest.

Researchers discussed what they're doing to develop resources for breeding, and they showed how they're using technology such as drones and ground-based robots to learn more about what plants need to thrive.

Farmers interested in field-testing new varieties are welcomed. Anyone interested can contact Leinfelder-Miles or their local UC Cooperative Extension office.

In 2024, American farmers produced nearly 1.8 million tons of dry beans on more than 1.5 million acres, valued at about \$1 billion, according to the United States Department of Agriculture. Funding for the research discussed during the field day comes from a variety of sources, including the California Dry Bean Advisory Board.

Garbanzos: Higher yield, bigger seeds

Researchers have been making carefully selected crosses among garbanzos, also called chickpeas, to develop varieties that yield more and produce bigger seeds, said Antonia Palkovic, a specialist with the department. Advanced breed-

ing lines are still called by their numbers – such as the high-performing 110 – and a few of them seem to be in a sweet spot for both yield in pounds-per-acre and the weight of 100 seeds, which is a fast way to approximate seed size.

Scientists also are drawing on previous research to pull in traits from garbanzos that are strong for drought tolerance and disease resistance. Scientists also want “plants that will emerge uniformly early in the season and grow vigorously to compete against weeds,” said Christine Diepenbrock, an associate professor in the department who now leads the dry bean breeding program. In addition, they are planting trial plots in various areas in the Central Valley in collaboration with UC ANR.

A type of garbanzo called kabuli is of special interest, Diepenbrock said. Kabuli has large, thin-skinned, tan-white seeds with a mild, nutty flavor. It's commonly used in Middle Eastern and Indian cuisines.

In addition, Diepenbrock and team are continuing the breeding program's work on drought tolerance in coordination with Varma Penmetsa, an associate professional researcher in the department who also

has been involved in cross-pollinating garbanzos.

Regarding disease resistance, Diepenbrock added, “the dry climate in California does help with there being less disease pressure.”

Contact the researchers: Antonia Palkovic at alpalkovic@ucdavis.edu and Christine Diepenbrock at chdiepenbrock@ucdavis.edu. Their research in this area is funded by the California Dry Bean Advisory Board.

Black-eyed peas: Speeding up selection

UC Davis also is collaborating on research into black-eyed peas, also called cowpeas and blackeyes. The blackeye breeding program is led by Bao-Lam Huynh, an assistant professor in the Department of Nematology at UC Riverside, who described his team's advances during the event.

Huynh collaborates with the UC Davis team on research that informs breeding. That includes the GEMINI project to develop an advanced breeding toolkit, which Diepenbrock co-leads. (Scientists also are using GEMINI to work on common and tepary beans.) Other collaborators include Sassoum Lo and colleagues at UC Davis who are working to increase blackeye seed size.

By identifying regions of the legume's genome that control size, scientists can help breeders speed up the selection process. Lo and team had identified two regions during her doctoral research at UC Riverside. Nine improved lines were developed based on combinations of those regions, Lo reported at the event. Lo is now an assistant project scientist in Diepenbrock's lab.

Coming up: Scientists are studying the nutritional quality of black-eyed peas produced by these lines and hundreds more, plus measuring how well they perform in the field, Lo said.



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4: 2025 13th ANNUAL WIN EXPO Trade Show & Conference. The trade show features nearly 300 exhibitors presenting the latest products and services available along with a robust educational conference focusing on four distinct tracks, Production & Winemaking, Sales & Marketing, Strategy & Leadership, and Vineyard & Growers. The event is hosted at the Sonoma County Fairgrounds in Santa Rosa, CA.

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Study Shows Very Dense Olive Orchards Thrive on Less Fertilizer

Researchers Also Find Compost Helps Trees Absorb More Nitrogen



Study finds that olive trees produced the same yields and high-quality oil even when using 25-50% less nitrogen than recommended rates for traditional orchards. Photo by: Savannah Haas, UC Davis

by Tiffany Dobbyn

Rows of tightly-packed olive trees like these shown here produced the same yields and high-quality oil even when using 25-50% less nitrogen than recommended amounts for traditional orchards. (Savannah Haas/UC Davis)

Study finds that olive trees produced the same yields and high-quality oil even when using 25-50% less nitrogen than recommended amounts for traditional orchards. (Savannah Haas/UC Davis)

Rows of tightly packed olive trees stretch across California's Central Valley. These super-high-density orchards, where trees are planted close together for faster, mechanized harvesting, can grow strong with less fertilizer than expected, according to new research from the University of California, Davis.

The study, published in the journal *Agronomy for Sustainable Development*, tested how different levels of nitrogen fertilizer and compost affected tree growth, yield and olive oil quality. The two-year field experiment, conducted with local growers in Woodland and near Stockton, found that olive trees produced the same yields and high-quality oil even when using 25% to 50% less nitrogen fertilizer than recommended amounts for traditional orchards.

Andrew Curtright, lead author of the study and post-doctoral scholar with the Department of Land, Air and

Water Resources, said this key finding suggests olive growers can use less fertilizer without compromising productivity.

"We have a lot of opportunities in California to grow olives sustainably," Curtright said. "With our healthy soils and appropriate nutrient management, we can get a good olive crop with high-quality olive oil without having to worry about applying so much nitrogen."

Compost and soil health

Compost also played a helpful role. Adding compost made from yard trimmings and food scraps helped trees absorb more nitrogen from fertilizer in the first year. Curtright said it brings other long-term advantages like boosting soil structure and reducing runoff, which could make it a useful tool for keeping nitrogen in the soil longer and reducing waste.

"We found that compost actually improved the nutrition of the olive trees and reduced greenhouse gas emissions," Curtright said. "So, wins all around."

Researchers used a special tracing method to track fertilizer nitrogen inside the trees. They found that about one-third of the nitrogen in the leaves, fruit and stems didn't come from fertilizer. It came from the soil and from nutrients the trees had stored from previous years.

"We found that the vast majority of the nitrogen that the olive tree needed actually came from the soil," Curtright explained. "We want to dig into that and try and figure out why and what are the dynamics that allow the soil to provide that nitrogen. We also need to think about how we replenish it and build it back up."

Curtright hopes to pursue those questions, as well as examine various cultivars to see which olive varieties would be best suited for super-high-density orchards, in the next phase of research.

The research team also included Savannah Haas from UC Davis and Xia Zhu-Barker, who was an associate researcher at UC Davis during the project and is currently with the University of Wisconsin-Madison. The project was supported by a grant from the California Department of Food and Agriculture Specialty Crop Block Grant program, which receives funds from the U.S. Department of Agriculture.

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