

# An Equilibrium Overview of Western Water Risk to Agriculture

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**Agriculture is an integral component of Equilibrium's investment strategies, and we are keenly aware of the opportunities and risks associated with one of the sector's most critical inputs, water.** The western US is particularly vulnerable to water scarcity as heatwaves and reduced snowpack exacerbate continued extreme drought. The 2021 declaration of a first-ever water shortage for the Colorado River—triggered by record low levels at Lake Mead—impacts water supplies in seven states, including California. Unprecedented strain on that state's water supply system is threatening agricultural production in the country's largest food-producing regions; at the same time, increased demand for water is driving the implementation of stricter groundwater management policies across jurisdictions.

## GROUNDWATER MANAGEMENT AND MARKETS

Under California's Sustainable Groundwater Management Act (SGMA), the state's 127 high- and medium-priority groundwater basins were required to adopt Groundwater Sustainability Plans (GSPs) by 2022 and have until 2042 to attain sustainability. Farmers and communities alike are assessing shrinking groundwater sources and looking for ways to recharge aquifers, not only to meet SGMA regulations but to simply ensure future supply. With the implementation of pumping caps, less water will be available to farms during peak irrigation periods and worst-case scenarios estimate up to 10,000 users could be affected by cutoffs.<sup>1</sup> While unquestionably a necessary policy tool to address scarcity, SGMA will affect agricultural land values, rewarding cropland with secure, dependable and multi-source water. Overall, **SGMA will result in a reduction in California's farmland.**

Outside of California, western states' groundwater management policies vary but in all situations of increasing scarcity, agricultural users will be impacted. In Arizona's Pinal County, reductions triggered by the Colorado River shortages have reduced water supply by nearly 20 percent. As a result, farmers are selling their land to solar developers, leaving fields empty, and experimenting with drought-resistant plants.<sup>2</sup> **Dairies and farms are more likely to face restrictions than municipal users,** the result being shorter supply and increased food prices across the US.<sup>3</sup>



Types, quantities, and reliability of water supplies vary significantly across the western states, and it is important to note that **some areas still have abundant sources.** Supply considerations include:

- Surface water supplies
- Local cropping patterns
- Private surface water rights
- Groundwater conditions
- Regulatory compliance
- Water marketing opportunities

Agricultural water and irrigation districts, ditch companies, and private growers are all key players in water markets. Historically, surface water has been the only type traded, mainly by water districts; however, new groundwater allocation markets are emerging in response to local groundwater management policies. Specific transfer rules vary but generally, these new markets could create opportunities for landowners to sell water or buy additional supply. **Incentivizing water trading and banking should allow users to better allocate water across space and time.**

<sup>1</sup>"As California restricts water use for farmers, low supply levels add to drought's harsh reality", PBS

<sup>2</sup>"Arizona farmers are getting slammed by water cuts in the West", CNBC

<sup>3</sup>Culp & Kelly, LLP



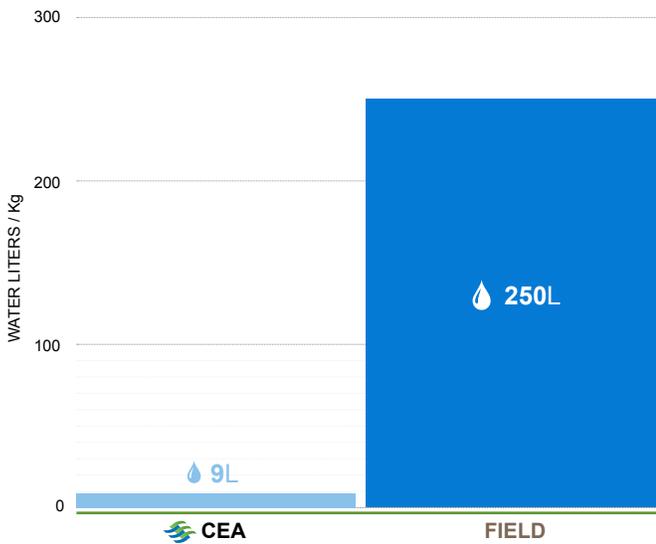
## IMPLICATIONS FOR CONTROLLED ENVIRONMENT AGRICULTURE (CEA)

In parts of the western US, severe water scarcity has wreaked havoc on traditional field farming. Farmers have tried to adapt by transferring scarce irrigation water to crops with a higher expected net revenue per drop of water while leaving some fields unplanted. Access to capital will be critical in the implementation of risk-mitigating technologies (including CEA) and the ability to remain competitive. **Water, or lack thereof, is the single biggest factor accelerating the growth of CEA. Compared to traditional field production, CEA uses far less water relative to yield.**<sup>4</sup> For example, one cycle of lettuce grown in the field uses 3-4 acre-feet of water, whereas, in a controlled environment, eleven cycles per year can be produced with as little as 2-3 acre-feet.<sup>5</sup> In a high tech greenhouse, water accounts for less than 2 percent of operating expenses, depending on crop; in the case of field production, this range jumps to 5-15 percent with farms at the lower end generally relying on highly subsidized sources that may be at risk.<sup>6</sup> From a water perspective, we believe CEA is both operationally and economically more resilient than conventional farming.

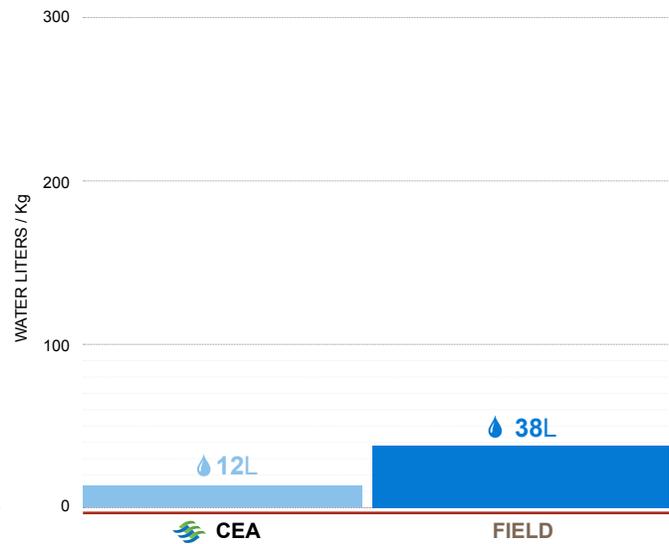


## GREENHOUSES USE UP TO 90% LESS WATER THAN TRADITIONAL FIELD FARMING

### LETTUCES



### TOMATOES



<sup>4</sup> Comparison of Land, Water, and Energy Requirements of Lettuce Grown Using Hydroponic vs. Conventional Agriculture Methods", International Journal of Environmental Research and Public Health

<sup>5</sup> Equilibrium proprietary research

<sup>6</sup> Equilibrium proprietary research, University of Nevada, and UC Davis



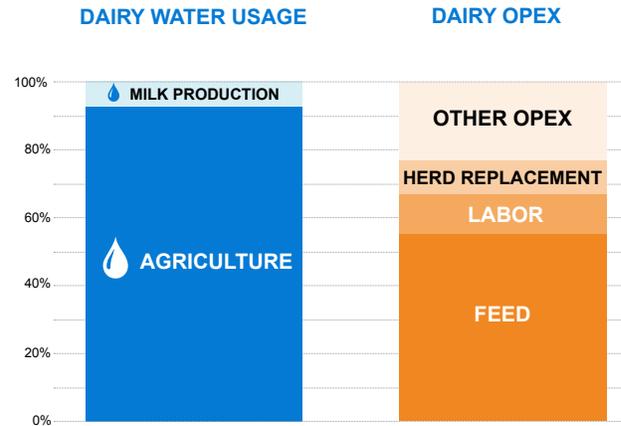
## IMPLICATIONS FOR DAIRY FARMS AS VIABLE RNG FEEDSTOCK

For dairies, water supply risks can be divided into direct risk to dairy operations and the risk to supply chain inputs. **Milk production itself utilizes minimal water compared to agricultural requirements for growing feed for the cows.** In some locations, the latter represents a serious near-term risk as curtailed irrigation means production of lower-value crops, such as forage and hay, is constrained. Decreased pasture forage can necessitate the culling of mature cows and shipping of more feeder cattle out of state.

Given that water risk is focused on feed, and feed costs equal approximately 50 percent of dairy operating expenses, the question becomes whether dairy farms can remain profitable by importing their feed. Per WestWater Research, the average dairy grows 40 percent of their own forage; however, this figure can range to all or none grown onsite. An analysis of onsite production vs. feed prices shows that it is possible to turn a profit by growing 25 percent of feed onsite (and in some cases, even less) if feed costs do not exceed \$400 per ton. At \$500 per ton, profitability can be reached with 50 percent of feed produced onsite.<sup>7</sup>

In 2022, previously stable California feed prices jumped more than 50 percent, to \$420 - \$450 per ton, in part because of consecutive dry years and the pending implementation of SGMA groundwater pumping charges. This increase is putting pressure on returns; however, upward trends in milk prices have boosted

revenue and have allowed most dairies to remain profitable. We do not expect water-related risk to drive a wholesale exodus of the industry as scarcity is highly localized, opportunities to optimize and reduce feedstock costs exist, and barriers to relocation are high. Hard assets would need to be recouped, co-op membership is restrictive, and farmers would have difficulty monetizing any water rights due to varied restrictions placed on water transfers in localized irrigation districts and Groundwater Sustainability Agencies. Even if the latter was possible, the market value of water would not justify the costs of moving a farm's assets. As such, Equilibrium believes that **dairies with the foresight and capital to invest in mitigating water risk will remain viable operations.**



## INVESTMENT IMPLICATIONS

Water risk is a focus for any investor looking at agriculture-related assets in the western US and necessitates careful diligence. Optimistically, water supply decline is a multi-decade event, which the most sophisticated farmers can still adapt to, if willing to move quickly. **This will create opportunities for both of Equilibrium's investment strategies,** in CEA and in water reuse and logistics infrastructure, such as water recharge, storage, and desalination. WestWater estimates that investments in wastewater treatment technologies at dairies have the potential to decrease the forage crop production required to maintain historic cow capacity by 50 percent.

**Ensuring long-term water security is a critical part of due diligence on all Equilibrium's agriculture-related assets.**

We recognize the need for highly localized analysis at the individual property level, accurate assessments of actual and

projected water use, buffers in the event these change, and the monitoring of stakeholder activities. The complexity of water regulation, markets, and players further complicates the scaling of investment strategies across geographies, as do political and emotional human connections to this fundamental resource. A less-than-thorough analysis of water risk could leave investors with few options to increase supply. Even with a sophisticated understanding of water markets, additional extractions, transfers, and allocations can be difficult to secure and, if available, can be costly. Equilibrium will continue to leverage its expertise to mitigate exposure to water risk - securing banked water reserves, proactively purchasing additional acre-feet, installing water-saving equipment, and working collaboratively with water districts.

<sup>7</sup> WestWater Research LLC