Water into Wine in California: Economic Perspectives

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Sometimes we forget the basics

1. California has wonderful water advantages
   • Mountains with massive snowfall to aid in water storage
   • Big flat valleys near the snow with little bothersome rain during long dry warm growing seasons
   • Rivers here and there to help move water around
   • Huge underground aquifers for storage
   • A system of replenishing the aquifers using massive irrigation systems that bring melted snow from mountains that recharge losses that accumulate during dry years

2. Of course, there are a few problems too. And several of the advantages are under stress from too much reliance and changing natural conditions. Public policies are evolving in response to new conditions and new demands.
Most annual rainfall variability in US

NOTE: Dots represent the coefficient of variation of total annual precipitation at weather stations for 1951-2008. Larger values have more year-to-year variability.
Water and People in California

Average annual runoff (land area)
- 66% (20%)
- 24% (20%)
- 9% (20%)
- 1% (10%)
- 0.1% (30%)

Population Distribution
- 80% Population (2.5% of Area)
- 10% Population (2.5% of Area)
- 5% Population (5% of Area)
- 5% Population (90% of Area)

Main Highways
Some Key Water Facts are Just Geography

Water in California mostly flows to ocean relatively unimpeded and we do this on purpose for environmental purposes and geography (and season)

• A large share of California water is in the Northwest where it flows to the Pacific unseen. That is a wonderful use of water, but, even if it were not, transport costs would be prohibitive to use for people and farms are.
• Most farm water must be moved cheaply or not at all.
• Plants need lots of water. Animals (including people) eat plants and enjoy having them around.
• In fact, much urban and industrial water is poured on the ground for vegetation or used for processing of plant products, such as wine. *We will get to these numbers soon.
Most of California depends on an engineered statewide network for its water.
Moving Water from North to South

- Water supply and demand in California means cheaply moving water from mountains and snowpack in the Northeast to people (and crops) in the southcentral and southwest.
- Gravity helps, but the Delta stands between the supply of water and the demand for water.
- Environmental issues including species habitat are fundamental.
- Much of the law and regulation being applied statewide really derives from the North/South Central Valley conundrum.
- Some coastal water issues are specifically local, but many are “spillover” from the big statewide fights.
Understanding Farm Water is Partly Just Arithmetic

- Farm water is and must be cheap by any normal standard.
- Where and when is crucial for water as for other good. Water in the Sacramento Valley cannot water crops in Napa or Kern County.
- In normal times in normal places the price is between $0.0001 per gallon and $0.001. That is between 0.01 pennies and 0.1 pennies per gallon. ($33 to $326/acre-foot)
- Even in the drought, expensive water is $0.3 pennies/gallon. By contrast cheap oil is $1/gallon
- Other than Napa grapes and perhaps berries, farm water must be cheap or it cannot be used for most farming.
- Water is so cheap we pour it on the ground and let it run out under the Golden Gate Bridge.
Cropland Idled, Before and During Drought
Three Economic Points About California Agriculture and Water in a Drought

1. Agriculture is important. Farming is 1 to 2% of gross state product, and 3 to 4% counting allied industries and ripple effects. Much bigger share 10% or more in Central Valley regions with the biggest drought impacts.

2. Food (and wine) price effects from drought are small:
   a. Smaller direct impact where California specialties are grown
   b. Farms keep water on high revenue per acre-foot vegetables and perennials
   c. Biggest impacts on field crops such as alfalfa and cotton and crops that are also grown elsewhere

3. Overall California farm labor impacts are small as a share (related to points 1. and 2.), but are severe on many rural people who are already vulnerable.
Water and Markets

• Trade around the national and the world is a vital tool to mitigate local supply shocks such as variability in access to water.

• Connected places suffer fewer negative consequences and help smooth losses elsewhere (trade acts like storage or savings). Trade provides market diversification.

• For example, California food prices did not rise much in the drought because connected to the national and global markets both for exports and imports.

• Nonetheless, we here proposals to use government to restrict exports that have a water footprint. Or to restrict water use on crops for which exports are important.

• In fact markets deal with these issues directly with no government regulations or export bans needed.

• Let’s turn to winegrapes and wine.
The more recent literature considers the supply and demand sides of water costs in wine production, focusing on irrigation in the vineyard.

The current standard technology requires a ratio of water to wine of more like three hundred to one rather than simply one to one as in the anecdotal evidence referenced in the illustration.

There is evidence that lower priced wine uses more water not less.
Revenue per Acre-foot by Crop in the San Joaquin Valley

- **Almonds**
  - $1,500

- **Winegrapes**
  - $2,500

- **Processing Tomatoes**
  - $1,500
### Grape Irrigation Water per Gallon of Wine

<table>
<thead>
<tr>
<th>Area</th>
<th>Acres (‘000)</th>
<th>Acre-feet per Acre</th>
<th>Acre-Feet (‘000)</th>
<th>Tons of Grapes per Acre</th>
<th>Gallons Water/Ton (‘000)</th>
<th>Gallons Water/Gallon of Wine*</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Coast</td>
<td>132</td>
<td>0.7</td>
<td>93</td>
<td>4.4</td>
<td>52.5</td>
<td>309</td>
</tr>
<tr>
<td>Central Coast</td>
<td>91</td>
<td>1.4</td>
<td>27</td>
<td>5.7</td>
<td>80.1</td>
<td>471</td>
</tr>
<tr>
<td>Delta</td>
<td>86</td>
<td>1.35</td>
<td>116</td>
<td>10.6</td>
<td>41.3</td>
<td>243</td>
</tr>
<tr>
<td>S.J. Valley</td>
<td>129</td>
<td>2.4</td>
<td>307</td>
<td>14.6</td>
<td>53.2</td>
<td>313</td>
</tr>
<tr>
<td><strong>Total California</strong></td>
<td><strong>459</strong></td>
<td><strong>1.45</strong></td>
<td><strong>667</strong></td>
<td><strong>8.75</strong></td>
<td><strong>54.1</strong></td>
<td><strong>318</strong></td>
</tr>
</tbody>
</table>

*approximately 170 gallons of wine per ton of grapes.*
## Estimated California Winery Water Use

<table>
<thead>
<tr>
<th>California Wineries</th>
<th>Percent share of production</th>
<th>Gallons produced (millions)</th>
<th>Gallons Used for Production (millions)</th>
<th>Acre-feet of Water Used (thousand)</th>
<th>Gallons of water per gallon of wine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big wineries</td>
<td>85</td>
<td>563</td>
<td>1,690</td>
<td>5.2</td>
<td>3</td>
</tr>
<tr>
<td>Mid-sized wineries</td>
<td>10</td>
<td>66</td>
<td>398</td>
<td>1.2</td>
<td>6</td>
</tr>
<tr>
<td>Others</td>
<td>5</td>
<td>33</td>
<td>663</td>
<td>2.0</td>
<td>20</td>
</tr>
<tr>
<td>Total/Ave.</td>
<td>100</td>
<td>663</td>
<td>2,751</td>
<td>8.4</td>
<td>4.15</td>
</tr>
</tbody>
</table>
Average Gallons of Water per Gallon of Wine

![Bar graph showing average gallons of water per gallon of wine. The graph compares irrigation water, winery water, and total water usage.]
Water and Markets

• Water is becoming more scarce for farming in California. Some of this is climate, some population and some regulation.

• Markets are continuing to evolve to let water move more flexibly. One reflection of this is higher prices.

• Consider responses if the price of water for winegrapes doubles from $200 per acre-foot to $400 per acre-foot.

• This could happen with higher delivery costs of surface water, higher pumping costs of groundwater, better opportunities to sell water, or higher regulatory costs.

• Explore impacts on the wine industry, in two representative regions.
### Basis for the Calculations

<table>
<thead>
<tr>
<th>Simplified rough estimates</th>
<th>San Joaquin Valley</th>
<th>Sonoma/Napa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grape price ($/ton)</td>
<td>400</td>
<td>4000</td>
</tr>
<tr>
<td>Water usage (acre-foot/acre)</td>
<td>2.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Grape yield (ton/acre)</td>
<td>14.6</td>
<td>4</td>
</tr>
<tr>
<td>Wine from grapes (gal/ton)</td>
<td>175</td>
<td>160</td>
</tr>
<tr>
<td>Water use in processing wine (gal/gal)</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Wholesale price for wine ($/cases)</td>
<td>20</td>
<td>250</td>
</tr>
<tr>
<td>Demand Elasticity Short run/Long run</td>
<td>-0.5/-3.0</td>
<td>-0.5/-1.0</td>
</tr>
</tbody>
</table>
Impacts of Doubling the Cost of Water from $200 to $400/AF on Grape costs, Wine Costs and Wine Quantity
Beware of Water Nonsense: Information so misused or it is dangerous

- Agriculture and food are particularly prone to claims about facts and relationships that do not hold water.
- One major concern is that the California drought will lead consumers and policymakers to make ill-informed choices.
- Water is crucial, yet if prices and markets are allowed to adjust the grape market transmits water costs into wine costs.
- Last year a Canadian journalists proposed to help California agriculture by not buying California wine, produce or fruit!
- But, this misses the key points of geography, arithmetic and economics.
- Two powerful forces move water: gravity and economics and California needs both to deal with water issues.
Thank you, Dan Sumner
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