The Future of Irrigated Agriculture: Where’s the Water?

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Sustaining California Agriculture

Conclusions

• There is great potential for improving the efficiency of water use in California agriculture.
• Many farmers are already doing these things, but much more can be done.
• There are obstacles to improving efficiency, but the largest is old thinking.
• These can be overcome. But will they?
Sustaining California Agriculture
The Potential for Improving Efficiency

- **Efficient Irrigation Technology** – shifting from flood irrigation to sprinkler and drip systems;

- **Improved Irrigation Scheduling** – using local climate and soil information to schedule irrigation; and

- **Regulated Deficit Irrigation** – applying RDI to almonds, pistachios, wine grapes, raisins.
Other Savings Estimates

• Pacific Institute: 4.5 to 6 million acre-feet.


• Quantification Settlement Agreement: 150,000 – 270,000 acre-feet of conservation annually in the Colorado River area only (2010-2021)
Sustaining California Agriculture
Examples of Innovators

[Map showing locations of Sierra Orchards and Panoche Water District]
Challenges to Capturing Savings

- **Inadequate Data** – lack of actual water use measurement and monitoring, water balances

- **Economic/Financial Barriers** – significant initial investment sometimes required; confusing subsidies.

- **Inflexible Infrastructure** – inflexible delivery systems (right place, right quality, right time); few on-demand water systems.
Challenges to Capturing Savings (more)

- **Old Thinking** – 3 prevalent myths:
  - 1) We’ve done all we can do.
  - 2) Only “consumptive” water savings are important because all excess water is captured and used.
  - 3) We accurately understand water use and flows in California.
1) More Can Be Done
2) “Non-Consumptive” Savings are Critical

- Drainage
- Water quality
- Avoided infrastructure costs
- Potential for energy savings
- Ecosystem/streamflow restoration
It’s Not Just the Delta Smelt

- Ecosystem impacts: NOAA and NMFS conclude that CVP/SWP Operations are threatening:
  - Endangered winter-run Chinook salmon
  - Threatened spring-run Chinook salmon
  - Threatened steelhead
  - Threatened green sturgeon
  - Southern Resident killer whales

- Socio-economic impacts: closure of commercial fisheries
3) Lack of Water Measurement

- No direct measurement of agricultural water use.
- No direct measurement of groundwater use.
- No direct measurement of evaporative losses.
- No direct measurement of groundwater recharge or return flows.

- So? No way to do an accurate water budget.
Milly et al. 2008 (Science, Vol 319); color added when 8/12 models agree on direction of change, for IPCC A1B.
Changes in Hydrology

Decreasng California Snowpack

<table>
<thead>
<tr>
<th>Historical Average (1961–1990)</th>
<th>2070–2099</th>
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<tbody>
<tr>
<td>100% remaining</td>
<td>Lower Warming Range Drier Climate</td>
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<tr>
<td>40% remaining</td>
<td>20% remaining</td>
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April 1 snow water equivalent (Inches)

Source: Cayan et al. 2006
Paradigm Shift Needed

• Old Thinking: inefficient/over-irrigation doesn’t matter
  – Consequences: poor water quality, drainage problems, ecosystem destruction, need for large infrastructure, ongoing competition for water.

• New Thinking: smart and efficient irrigation can help maintain a healthy agricultural sector and environment
  – Consequences: reduced drainage problems, higher productivity per unit water, enhanced in-stream flows, more flexible infrastructure.
Moving Forward

• Comprehensive monitoring of water use.
• Financial incentives for improving efficiency.
• Enforcement of reasonable and beneficial use laws.
• Ecosystem restoration.
• Strategic “conjunctive use.”
• Include agriculture in statewide water conservation targets.
• Increased education and technical assistance: UC Extension, NRCS, RCDs
Full report available online at www.pacinst.org

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Groundwater Mining

Rising Salinity

- A 2009 study from UC Davis, “The Economic Impacts of Central Valley Salinity,” reported that if salinity increases at the current rate until 2030, the direct annual costs will range from $1 billion to $1.5 billion, with income impacts to the Central Valley between $1.2 billion and $2.2 billion (Howitt et al. 2009)
All excess water is captured and used?

• According to the California Department of Water Resources, an estimated 250,000 acres of land had a water table within 5 feet of the ground surface and were classified as a “present problem area” in 2002. An additional 1.0 million acres of land had a water table 5 and 20 feet below the ground surface and were classified as “potential problem areas” (DWR 2007).