FACILITATING WATER MARKETS

TO INDUCE IMPROVEMENTS IN THE PRODUCTIVITY OF WATER USE IN CALIFORNIA AGRICULTURE

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California agriculture has made impressive improvements in water conservation in recent years. Yet, there remains a large potential for meeting currently unmet water demands in drier years in all water sectors—urban, agricultural and environmental;--by further increasing the productivity of water use in agriculture. University of California researchers have found that the least productive 20% of the water used in California agriculture generates less than 5% of its revenue.[1] This is because there is great variability in the productivity of agricultural water use, and that variability is directly related to the cost of water to growers. In a typical year that cost may range from a low of $6.50 to over $200 per acre feet among Central Valley farmers using surface water.

Actually, California growers are about as efficient in their water use as is cost justified. The cost of water to the least productive 25% is simply too low to make investment in water conservation technology or practices worthwhile. One remedy would be to increase their cost of water by removing subsidies, increasing the costs of discretionary blocks of water (tiered pricing), or imposing a water usage fee. All of these may be warranted, but all are fraught with political and practical difficulties.

If we cannot readily, increase the cost of water in agriculture, the better option is to increase its value. This can be done by providing market incentives to save water and transfer it to higher economic uses. These tools are likely to be much more efficacious than further planning mandates. We can restate the proposition as follows: the least productive fraction of California agriculture is under-invested in the technologies and practices that could substantially reduce water use without requiring fallowing.

[1] Natural Heritage Institute, "Agricultural Water Conservation and Water Use Efficiency, Findings and Conclusions of the Challenge Grant Program: Collaborative Field Demonstrations of the Efficacy and Practicality of Financial Incentives for Agricultural Water Conservation", December 2000 p.

To understand what kinds of investments we need to stimulate in what kinds of techniques and practices, it is helpful to conduct a "fate analysis" of water as it moves through agriculture. All water devoted to agriculture goes either UP, DOWN, IN or OUT:

- UP: Much of agricultural water is lost in conveyance and on-farm applications due to evaporation to the atmosphere. Reservoirs, open ditches, flood irrigation and sprinklers are the sources. If these physical losses could be reduced, a very large fraction of irrigation water could be salvaged, in some cases approaching 40%.

- DOWN: Deep percolation of water below the root zone of the crops may or may not represent a physical loss. Reducing percolation to inaccessible or degraded aquifers, to saline groundwater, or to the sea, does indeed produce a true saving. But irrigation water that goes to replenish usable aquifers or streamflows will subsequently be reused by groundwater or surface users, respectively. This does not mean, however, that incidental recharge through over-application of irrigation water is a good idea. Recharging aquifers is a good way to store water during years of relative abundance, but it makes no sense to recharge aquifers during dry years when every drop is needed on the surface. It is much better to adopt water application techniques and practices that will reduce deep percolation in all years, and then purposefully use surplus surface water to recharge groundwater banks when additional inter-annual storage is needed.

- IN: Water is incorporated into crop biomass through evapo-transpiration. In theory, the productivity of water can be increased by shifting from low-value to high value crops. But that is hard to induce and harder to mandate because cropping decisions are driven largely by commodity marketing arrangements and competitive factors (including, increasingly, foreign competition).

- OUT: Tail water and irrigation return flows can be recovered and reused in the same or adjacent fields or discharged back to the surface stream for subsequent reuse. This water is not lost to beneficial use and is not an appropriate target for water conservation efforts.

Thus, the only real physical losses, the salvaging of which will translate into augment water supply, are evaporation and deep percolation. So this is the water to target through market incentives. The least productive growers and water districts under-invested in canal lining and, particularly, in precision water application techniques that put just the right amount of water into the ground in just the right place at just the right time, and much less into the atmosphere. The reason is not lack of information. To the contrary, California growers are among the most informed and sophisticated agricultural entrepreneurs in the world.

The reason is simply that these investments are not financially worthwhile at present. But, why not? Regional water markets are becoming rather common within and among agricultural water districts in the Central Valley. If a farmer wants to sell, she can often find a willing buyer. A lot of water does move in this manner (by some estimates, over 800,000 acre feet in a typical year if purchases by the environmental Water Account are counting).

Current water markets are not inducing an appropriate level of investment in techniques to reduce physical losses for three reasons, all of which can be rectified by the state and federal governments:

1) Almost all of this water moves on the "spot market", that is, on a year by year basis. Stated another way, farmers are selling part of the water to which they are entitled, not part of their entitlements. The reasons are complicated: CVP and SWP farmers do not actually own the underlying water rights, and neither do their districts. Therefore, transfers require process-intensive and time-consuming approvals, usually at multiple levels. In some cases, State Board orders to amend water right orders are necessary. Often, CEQA and NEPA compliance may be required. In sum, the transaction costs are daunting.
2) Conveyance is not owned by the buyers or sellers but by their water districts and the State Water Project and Central Valley Project. While it may be possible in theory to arrange for deliveries of saved water, the terms and transactions are often not conducive.

3) Water demands vary greatly year to year and so does the market value of transfers. Sellers want to sell in years of abundance; buyers want to buy in years of scarcity. There is not at present a way to store wet year sales for dry year use. The consequence is that there is no assurance of water marketing opportunities year to year. But investment in water conservation technologies and practices take years to pay off. Generally, farmers finance them through bank loans. Banks want to see a reliable revenue stream.

There are interventions that the state and federal governments could make to remedy all of these obstacles. For instance, DWR could stabilize water markets by entering to long term contracts to buy water from low-productivity state, federal, or non-project agricultural water and irrigation districts in specified water year types, when spot market transactions do not materialize, at guaranteed prices and quantities. The purchased water (likely wetter year water) could be stored in a network of groundwater banks, strategically located around the Central Valley. There is no shortage of dewatered aquifers, physically suitable for groundwater banking, situated south of the delta. With an isolated delta conveyance facility of appropriate capacity, Sacramento Valley surplus water could also be stored in this

fashion. Under-utilized surface storage capacity available to some water supply agencies (e.g., Metropolitan Water District of Southern California) might also be rented on a space available basis. This stored water could then be recovered and re-integrated into the interconnected Central Valley water delivery system to serve as a supplemental supply in dry and critically dry years on a full cost recovery basis. Some of this stored water should be devoted to environmental flow restoration, as a public benefit, without public cost.

Water and irrigation districts could generate water to supply these contracts with DWR by offering to buy back water from their growers in a reverse auction. Those growers who offer up sufficient enough water to fill the sales contracts with DWR at the lowest prices would receive that payment. Any member's decision to release water back to his district would be wholly voluntary. To assure that in-district needs would be met before water leaves the district, the buy-back program could include a "right of first refusal" exercisable by any district member at the bid price plus a pro-rata share of the costs incurred by the district in administering the program. And, the DWR and USBR would allow their excess conveyance capacity to be utilized to facilitate these transactions.

The transfer approval process could be greatly streamlined through rule changes that could satisfy NEPA and CEQA through programmatic EISs and EIRs. Future transactions within the scope of the new rules could then be approved routinely and pro forma.

In advance of more detailed analysis and modeling, it is hard to estimate how much water could become available to buffer current dry year shortfalls through these interventions. If the 25% of low-productivity agricultural water could be mobilized in this manner, it would amount to the largest new water supply opportunity on the horizon, without the necessity of constructing new dams. Transactions would be entirely among willing participants. Groundwater levels would rise in depleted aquifers. Environmental flows would be improved. And the entire program would be self-financing. These seem sufficient rewards to warrant more detailed analysis. A legislative mandate stimulated by a report of the Little Hoover Commission may be just what is needed.

NHI thanks the Little Hoover Commission for the opportunity to present these views. Questions or requests for further information should be directed to:

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