California Agricultural Water Stewardship Initiative

Drought-Proofing Your Farm Checklist

EcoFarm Conference, 1/22/2010

Michael Cahn, Irrigation and water resources advisor UC Cooperative Extension, Monterey County

General strategies

- ✔ Fallow least productive fields if water supply is not sufficient for the optimizing production on all fields
- ✔ Optimize soil fertility to maximize production from available water
- ✔ Use reduced/conservation tillage to improve soil structure and to reduce pre-season water needed to facilitate tillage operations

Use winter precipitation and irrigation run-off

- ✔ Capture storm run-off in ponds/reservoirs
- ✔ Plant fall/winter cover crops to minimize storm run-off from fields
- ✔ Vegetate permanent ditches to slow storm run-off and maximize ground water recharge
- ✔ Furrow dike to slow storm run-off from fields
- ✔ Capture irrigation tail water in basin and reuse for irrigations (food safety)

Reduce evaporation/transpiration losses

- ✔ Irrigate during the evening, morning or night to minimize evaporative losses
- ✔ Control weeds
- ✔ Use plastic mulches and organic residue (cover crop residue) mulches
- ✔ Convert to irrigation systems that wet less soil surface (furrow to drip, or sprinkler to micro-sprinkler)
- ✔ Increase interval between sprinkler irrigations to reduce evaporative losses
- ✔ Use short season and early season cultivars
- ✔ Incorporate or kill cover crops between rows of permanent crops (trees and vines) before the cropping season
- ✔ Time incorporation or killing of winter cover crops to conserve soil moisture for subsequent crop
- ✔ Avoid the use of anti-transpiriants

Improve infiltration and water holding capacity of soil

- ✔ Incorporate organic amendments to increase water holding capacity and macropore structure
- ✔ Apply gypsum to minimize crusting of soil surface
- ✔ Rotate with cereal crops (rye, barley, wheat) and/or deep rooted agronomic crops (corn, safflower, sunflower)
- ✔ Correct drainage problems (install tile drainage, break impeding layers)

Optimize irrigation system design and operation

General practices

- ✔ Evaluate distribution uniformity of irrigation system
- ✔ Audit operation and maintenance of irrigation system
- ✔ Consult with an irrigation system designer
- ✔ Check that irrigation system is operating at recommended pressure
- ✔ Invest in more efficient irrigation system (eg. change from sprinkler to micro-sprinklers in orchard)
- ✔ Train irrigators and irrigation foremen on maintenance and operation
- ✔ Grade field to improve the uniformity of slope
- ✔ Minimize or eliminate irrigation run-off
- ✔ Fix leaks in main and sub main lines

Practices specific to micro-irrigation

- ✔ Install pressure gauges or Schrader valves for monitoring pressure at water source, filter, submain connections, and lateral lines (drip hoses, drip tape).
- ✔ Use pressure regulators at main-submain connections
- ✔ Conduct regular maintenance to prevent clogging of emitters
- ✔ Use the appropriate filter for water source and drip system
- ✔ Repair leaks
- ✔ Replace worn tape/ drip emitters/ micro-sprinklers
- ✔ Limit elevation change along rows to less than 15 feet
- ✔ Consider using pressure compensating tape/drip emitters/micro-sprinklers
- ✔ Make sure main and submain line diameters are appropriate for flow rates

Practices specific to sprinkler irrigation

- ✔ Use appropriate nozzle size for spacing of sprinkler heads
- ✔ Check that the same sprinkler heads and nozzle sizes are used through out the field
- ✔ Irrigate at low wind speeds (< 10 mph)
- ✔ Space lateral lines and sprinkler heads to optimize distribution uniformity
- ✔ Replace worn nozzles
- ✔ Replace worn gaskets
- ✔ Replace sprinkler heads that leak or do not turn
- ✔ Consider replacing impact sprinkler heads with rotator heads

Practices specific to furrow irrigation

- ✔ Surge or pulse irrigate
- ✔ Use torpedo to smooth furrows
- ✔ Shorten length of furrow runs
- ✔ Irrigate alternate furrows
- ✔ Start with high application (intake) rates
- ✔ Improve uniformity of slope
- ✔ Cut-off water when flow reaches tail end of field
- ✔ Re-circulate tail water to head of field

Improve irrigation scheduling

Practices that can reduce water use

- ✔ Apply appropriate amount of water for pre-plant and early season irrigations
- ✔ Apply appropriate amount of water for germination and transplant establishment
- ✔ Apply appropriate amount of water for salinity management
- ✔ Record volume of water applied (flow meter)
- ✔ Use a timer to automatically shut off pump
- ✔ Consider using regulated deficit irrigation for tree and vine crops

Information to improve irrigation scheduling

- ✔ Know crop water needs (daily evapotranspiration requirement)
- ✔ Know the application rate of irrigation system (inches per hour, gallons per hour)
- ✔ Know the rooting depth of the crop
- ✔ Identify soil type and texture
- ✔ Know water holding capacity of soil
- ✔ Test salinity of irrigation water and soil
- ✔ Understand water stress effects on crop growth, yield and product quality
- ✔ Monitor soil moisture
- ✔ Use tools for monitoring plant water stress (pressure bomb)
- ✔ Use CIMIS or other weather stations for determining daily crop evapotranspiration requirements
- ✔ Use irrigation scheduling software or spreadsheets to aid irrigation decisions