Effective Irrigation Practices
To Improve Short Term and Long Term Water Management

Regardless of the method of irrigation used certain guidelines should be considered routinely as applicable to any method of irrigation:

1. Occasionally conduct irrigation system evaluations, such as those provided by “mobile labs” or similar services, to provide feedback on distribution uniformity (DU) and irrigation scheduling decisions.

2. Seek the assistance of farm advisors, irrigation consultants, Natural Resources Conservation Service, or other resources to help identify water management improvement opportunities and to assist in the adoption of economically advantageous practices.

3. Know your soil. Keep a map available with the soil description, including important physical characteristics of soil such as texture, soil depth, water holding capacity, soil salinity, and intake rate.

4. Monitor soil profile salinity throughout the field to assure that a root-zone salt balance is being maintained.

5. Hire, train, and retain irrigators skilled in effectively managing water and the irrigation equipment.

Practices Specific to Common Irrigation Methods:

<u>**Sloping Furrow**</u>

1. Practices to Optimize Uniformity of Water Application
   a. Make adjustments to encourage water to advance to the end of the field in ¼ to ½ the irrigation set time by:
      1. Using high initial onflow rates to each furrow
      2. Shorten furrows lengths
      3. Laser grading for uniform slope (remove high and low spots)
      4. Pull “torpedoes” or other methods to smooth furrow surfaces after cultivation.

   b. Respond to soil texture (water intake rate) variations in the field by:
      1. Using surge irrigation
      2. Consider changing to sprinkler or other pressure irrigation methods

2. Practices to Efficiently Control Tail water
   a. Reduce onflow rate after water has advanced to the end of the field.
   b. Capture runoff in a properly planned and designed tail water recovery system
   c. Re-use captured runoff in an efficient manner

   d. Take advantage of tail water reduction features available with surge irrigation

3. Practices to Respond to High Intake Rate Soils
   a. Use surge irrigation
   b. Switch to portable sprinklers during high intake rate periods
   c. Irrigate less frequently (considering crop water stress tolerance)
   d. Irrigate every other or “alternate” furrow

4. Practices to Optimize Water Application Timing and Amount Decisions
   a. Develop a water budget irrigation scheduling strategy which considers each of the following:
      1. Allowable or desirable crop water stress
      2. Available water holding capacity within the effective rooting depth of crop
      3. Water availability and/or delivery constraints
      4. Very small water applications (1”-2”) result in poorer uniformities
      5. The ability of rainfall to meet part of the seasonal crop water requirement (effective rainfall)
      6. Timing of farm cultural practices such as cultivations, fertilizer applications, harvest, etc.

   b. To help decide when to irrigate, track crop water needs directly by monitoring soil profile moisture (e.g., by sample and feel method or moisture-sensing devices) and/or plant stress techniques (e.g., with leaf water potential or infrared devices). In addition, climate-based crop water use techniques such as the California Irrigation Management Information System (CIMIS) should be utilized to account for soil variability and to simplify monitoring

   c. Use a soil moisture (deep wetting front) probe as a tool to help decide when to shut off the water.

   d. Install and utilize water flow meter/measuring devices or methods to monitor the flow rate so that the volume applied to each irrigation set can be calculated.

5. Record irrigation dates and amounts applied to each field. Then, regularly compare soil-based and/or CIMIS-type crop water use data with actual water application records to serve as a check on irrigation scheduling decisions.

6. Advocate and support flexible (frequency, rate, and duration) water deliveries from water suppliers.

7. If irrigation set time required to "sub the beds" result in excessive deep percolation from the bottom of the furrows, consider:
   a. Probing the beds to check for actual adequacy of wetting (it is usually not necessary to completely "blacken" the top of the beds).
   b. Re-configuring future beds (making them lower and/or narrower) to reduce subbing time.
   c. Change irrigation methods to sprinkler or micro to better provide near-surface moisture.

Sloping Border

1. Practices to Optimize Uniformity of Water Application
   a. Encourage equal water "standing time" throughout each border length by matching the water advance rates (water covering the surface) with recession rates (water leaving the surface) by:
      1. Establishing (tracking) the water recession rate
      2. Producing the desired advance rate by:
         - Increasing or decreasing the onflow rate to each border
         - Adjusting border spacings
         - Laser grading for a uniform slope
         - Laser grading for minimum cross slope and desired irrigation slope

2. Practices to Efficiently Control Tail water
   a. Shut the water off before it has advanced to the end of the field
   b. Capture runoff in a properly planned and designed tail water recovery system
   c. Re-use captured runoff in an efficient manner

3. Practices to Optimize Water Application Timing and Amount Decisions
   a. Develop a water budget irrigation scheduling strategy which considers each of the following:
      1. The amount of water which the border will "take" (infiltrate) uniformly
      2. Available or desirable crop water stress
      3. Water availability and/or delivery constraints
      4. The ability of rainfall to meet part of the seasonal crop water requirement (effective rainfall)
      5. Timing of farm cultural practices such as cultivations, fertilizer applications, harvest, etc.

   b. To help decide when to irrigate, track crop water needs directly by monitoring soil profile moisture (e.g., by sample and feel method or moisture-sensing devices) and/or plant stress techniques (e.g., with leaf water potential or infrared devices). In addition, climate-based crop water use techniques such as the California Irrigation Management Information System (CIMIS) should be utilized to account for soil variability and to simplify monitoring.

c. Use a soil moisture (deep wetting front) probe as a tool to check the adequacy of irrigation.
d. Install and utilize water flow meter/measuring devices or methods to monitor the flow rate so that the volume applied to each irrigation set can be calculated.
e. Record irrigation dates and amounts applied to each field. Then, regularly compare soil-based and/or CIMIS-type crop water use data with actual water application records to serve as a check on irrigation scheduling decisions.
f. Advocate and support flexible (frequency, rate and duration) water deliveries form water suppliers.

Hand-Move Sprinklers

1. Practices to Optimize Uniform Water Application
   a. Have new systems designed by a competent irrigation designer. A good design will provide:
      1. Adequate mainline and lateral sizes and appropriate system layout considering topography, to minimize pressure variations.
      2. Proper sprinkler head spacing and lateral move distances to provide adequate overlap.
      3. An application rate that is less than the intake rate of the soil.
      4. Adequate use of pressure regulators.
      5. The use of pressure controls or nozzle size selection to achieve uniform application on hilly terrain.
      6. Consideration for windy conditions.
      7. A well-chosen filtration/sand separation system.
      8. Proper operating pressure.
      9. Proper riser heights to avoid spray interference by crops.

   b. Set up and operate the system as designed in regard to:
      1. Operating presssure
      2. Lateral move distances
      3. Lateral sizes and lengths
      4. Number of lateral operated each set
      5. Proper placement of laterals

   c. Perform regular inspection and maintenance, addressing:
      1. Filter operation
      2. Gasket leakage
      3. Nozzle wear and plugging (do not mix nozzle sizes during replacement)
      4. Sprinkler head operation
      5. Pipe damage

   d. Use alternate sets (offset laterals one half of a move distance every other irrigation).

   e. Avoid irrigating during windy periods when practical.

2. Practices to Minimize Evaporation Losses
   a. Avoid irrigating during windy periods when practical.
   b. Maintain sprinkler head pressures below the "misting point".
   c. Avoid water applications of one inch or less.

3. Practices to Optimize Water Application Timing and Amount Decisions
   a. Develop a water budget irrigation scheduling strategy which considers each of the following:
      1. Allowable or desirable crop water stress.
      2. Available water-holding capacity within effective rooting depth of crop.
      3. Water availability and/or delivery constraints.
      4. The ability of rainfall to meet part of the seasonal crop water requirement (effective rainfall).
      5. Timing of farm cultural practices such as cultivations, fertilizer applications, harvest, etc.

   b. To help decide when to irrigate, track crop water needs directly by monitoring soil profile moisture (e.g. , by sample and feel method or moisture-sensing devices) and/or plant stress techniques (e.g., with leaf water potential or infrared devices). In addition, climate-based crop water use techniques such as the California Irrigation Management Information System (CIMIS) should be utilized to account for soil variability and to simplify monitoring.
   c. Use a soil moisture (deep wetting front) probe as a tool to check the adequacy of irrigation.
   d. Install and utilize water flow meter/measuring devices or methods to gauge the volume of water applied to each irrigation set.
   e. Record irrigation dates and amounts applied to each field. Then, regularly compare soil-based and/or CIMIS-type crop water use data with actual water application records to serve as a check on irrigation scheduling decisions.
   f. Advocate and support flexible (frequency, rate and duration) water deliveries form water suppliers.

<u>Solid-Set Sprinklers</u>

1. Practices to Optimize Uniform Water Application
   a. Have new systems designed by a competent irrigation designer. A good design will provide:
      1. Adequate mainline and lateral sizes and appropriate system layout considering topography, to minimize pressure variations.
      2. Proper sprinkler head spacing and lateral move distances to provide adequate overlap.
      3. An application rate that is less than the intake rate of the soil.

4. Adequate use of pressure regulators.
5. The use of pressure controls or nozzle size selection to achieve uniform application on hilly terrain.
6. Consideration for windy conditions.
7. A well-chosen filtration/sand separation system.
8. Proper operating pressure.
9. Proper riser heights to avoid spray interference by crops.

b. Operate the system according to the design parameters.
1. Operate at the design pressure.
2. Number of blocks operated each set

c. Perform regular inspection and maintenance, addressing:
1. Filter operation
2. Nozzle wear and plugging (do not mix nozzle sizes during replacement)
3. Sprinkler head operation
4. System damage

d. Avoid irrigating during windy periods when practical.

2. Practices to Minimize Evaporation Losses
a. Avoid irrigating during windy periods when practical.
b. Maintain sprinkler hear pressures below the “misting point”.
c. Avoid water applications of one inch or less.

3. Practices to Optimize Water Application Timing and Amount Decisions
a. Develop a water budget irrigation scheduling strategy which considers each of the following:
1 Allowable or desirable crop water stress.
2. Available water-holding capacity within effective rooting depth of crop.
3. Water availability and/or delivery constraints.
4. The ability of rainfall to meet part of the seasonal crop water requirement (effective rainfall)
5. Timing of farm cultural practices such as cultivations, fertilizer applications, harvest, etc.

b. To help decide when to irrigate, track crop water needs directly by monitoring soil profile moisture (e.g. by sample and feel method or with moisture-sensing devices) and/or plant stress techniques (e.g. with leaf water potential or infrared devices). In addition, climate-based crop water use techniques such as CIMIS should be utilized to account for soil variability and to simplify monitoring.

c. Use a soil moisture (deep wetting front) probe as a tool to check the adequacy of irrigation.

d. Install and utilize water flow meter/measuring devices or methods to gauge the volume of water applied to each irrigation set.
e. Record irrigation dates and amounts applied to each field. Then, regularly compare soil-based and/or CIMIS-type crop water use data with actual water application records to serve as a check on irrigation scheduling decisions.
f. Advocate and support flexible (frequency, rate and duration) water deliveries from suppliers.

Micro Irrigation (micro sprinkler, surface and sub-surface drip)

1. Practices to Optimize Uniform Water Application
   a. Have new systems designed by a competent irrigation designer. A good design will provide:
      1. Adequate submain pipeline and tubing sizes, and appropriate system layout considering topography, to minimize pressure variations.
      2. Application rates which do not cause runoff.
      3. Adequate use of pressure regulators an manifold and lateral inlets to minimize pressure variations.
      4. The use of pressure-compensation emitters on hilly terrain.
      5. A well-chosen filtration/sand separation system as recommended by the emitter/tubing/spray head manufacturer.
      6. Automatic filter backflush.
      7. Proper operating pressure.
      8. An automatic chemigation system to inject fertilizer, chlorine, acid and other agents to prevent emitter/tubing plugging.
      9. Adequate wetted area.

   b. Operate the system at design pressure.
   c. Perform regular inspection and maintenance such as:
      1. Filter operation inspection
      2. Check for emitter/tubing/spray head plugging (do not mix spray heads or emitters of varying rated discharge rates during replacement).
      3. Regularly flush submains, manifolds, and tubing.
      4. Inspect for damage caused by animals, cultural practices, or other factors.
      5. Monitor operating pressure on submains and manifolds.

2. Practices to Optimize Water Application Timing and Amount Decisions
   a. Develop a water budget irrigation scheduling strategy which considers each of the following:
      1. Allowable or desirable crop water stress.
      2. Available water-holding capacity within effective rooting depth of crop.
      3. Water availability and/or delivery constraints.
      4. The ability of rainfall to meet part of the seasonal crop water requirement (effective rainfall)
      5. The discharge rate of the emitter/spray head/tubing

b. To help decide when to irrigate, track crop water needs directly by monitoring soil profile moisture (e.g. by sample and feel method or with moisture-sensing devices) and/or plant stress techniques (e.g. with leaf water potential or infrared devices). In addition, climate-based crop water use techniques such as CIMIS should be utilized to account for soil variability and to simplify monitoring.
c. Use a soil moisture (deep wetting front) probe as a tool to check the adequacy of irrigation.
d. Install and utilize water flow meter/measuring devices or methods to gauge the volume of water applied to each irrigation set.
e. Record irrigation dates and amounts applied to each field. Then, regularly compare soil-based and/or CIMIS-type crop water use data with actual water application records to serve as a check on irrigation scheduling decisions.
f. Advocate and support flexible (frequency, rate and duration) water deliveries from suppliers.