Irrigation Water Management
Options for Alfalfa

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Thanks to co-authors: Drs. Dan Putnam, Khaled Bali, & Daniele Zaccaria
We will talk about:

- Surface (border) Irrigation
- Sprinkler Irrigation
- Subsurface Drip Irrigation (SDI)

What can be done to improve the Irrigation Water Management of each?
Improving Irrigation Water Management

- Common to all irrigation systems
  - How much water is being applied.
  - How much water should be applied.
Improving Irrigation Water Management

• Common to all irrigation systems
  • How much water is being applied.
    • Pipeline systems – use a flow meter.
    • Propeller flow meter.
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      - Propeller flow meter.
      - Doppler flow meter.
Improving Irrigation Water Management

• Common to all irrigation systems
  • How much water is being applied.
    • Pipeline systems – use a flow meter.
      • Propeller flow meter.
      • Doppler flow meter.
      • Electromagnetic flow meter.
Improving Irrigation Water Management

• Common to all irrigation systems
  • How much water is being applied.
    • Pipeline systems – use a flow meter.
    • Open channel systems.
      • Difficult to do well.
Improving Irrigation Water Management

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      - Weirs & flumes.
Improving Irrigation Water Management

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    • Weirs & flumes.
  • Irrigation district info.
Improving Irrigation Water Management

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  - How much water is being applied.
    - Pipeline systems – use a flow meter.
  - Open channel systems.
    - Difficult to do well.
    - Weirs & flumes.
    - Irrigation district info.
  - Find a pipeline & measure.
Improving Irrigation Water Management

- Common to all irrigation systems
  - How much water is being applied.
  - How much water should be applied.
    - Alfalfa water use (evapotranspiration-ET) info. widely available. See Proceedings.
Improving Irrigation Water Management

• Common to all irrigation systems
  • How much water is being applied.
  • How much water should be applied.
    • Alfalfa water use (evapotranspiration-ET) info. widely available. See proceedings.
  • Soil moisture monitoring.
    • Need to know HOW MUCH.
Improving Irrigation Water Management

• Border Check Systems
  • Compare applied water to amount required.
    • If excess water is being applied, going to tailwater or deep percolation.
Improving Irrigation Water Management

• Border Check Systems
  • Reducing tailwater runoff:
    • May be as simple as getting a better handle on set times.
    • Change sets before water reaches the end of the field.
Improving Irrigation Water Management

- Border Check Systems
  - Reducing tailwater runoff:
    - May be as simple as getting a better handle on set times.
    - Change sets before water reaches the end of the field.
    - Work being done on automation.
Improving Irrigation Water Management

- Border Check Systems
  - Reducing tailwater runoff:
  - Reusing tailwater runoff:
    - Collect and reuse on same field or another field.
Improving Irrigation Water Management

- Border Check Systems
  - Reducing tailwater runoff:
  - Reusing tailwater runoff:
    - Collect and reuse on same field or another field.
    - Allowing water to simply be reused by another downstream user may be efficient but has water quality issues.
Improving Irrigation Water Management

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  - Compare applied water to amount required.
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Improving Irrigation Water Management

- Border Check Systems
  - Reducing deep percolation losses.
    - Too much water is being applied. Why?
Improving Irrigation Water Management

- **Border Check Systems**
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    - Set time is most often determined by the time it takes for water to reach the end of the field, NOT by how long it takes to refill the root zone.
Improving Irrigation Water Management

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    - Non-uniformity of border irrigation often leads to deep percolation.
Improving Irrigation Water Management

• Border Check Systems
  • Reducing deep percolation losses.
    • Too much water is being applied. Why?
    • Set time is most often determined by the time it takes for water to reach the end of the field, NOT by how long it takes to refill the root zone.
    • Non-uniformity of border irrigation often leads to deep percolation.
    • All of this is often tied to fields which are too long.
Improving Irrigation Water Management

• Border Check Systems
  • Reducing deep percolation losses. What can be done?
Improving Irrigation Water Management

- Border Check Systems
  - Reducing deep percolation losses.

What can be done?
- Get water down the field faster.
- Increase the field slope.
Improving Irrigation Water Management

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    - Increase the flow rate to the check.
Improving Irrigation Water Management

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    • Decrease the field length.
      The most effective of all measures.
Improving Irrigation Water Management

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Improving Irrigation Water Management

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      **Shorter fields are more expensive and harder to farm.**
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      Shorter fields are more expensive and harder to farm.

If can’t improve the border check system, switch irrigation systems?
Improving Irrigation Water Management

- Sprinkler Irrigation Systems
Improving Irrigation Water Management

- Sprinkler Irrigation Systems
  - Know the sprinkler application rate (in/hr), don’t guess.
Improving Irrigation Water Management

• Sprinkler Irrigation Systems
  • **Know** the sprinkler application rate (in/hr), don’t guess.
  • Set times should be determined by how much you want to apply, not by what is convenient.
    • Remember, you may not be applying enough water.
Improving Irrigation Water Management

- **Sprinkler Irrigation Systems**
  - **Know** the sprinkler application rate (in/hr), don’t guess.
  - **Set times should be determined by how much you want to apply, not by what is convenient.**
    - Remember, you may not be applying enough water.
    - Soil moisture monitoring may be a big help here.
Improving Irrigation Water Management

- Sprinkler Irrigation Systems
  - *Know the sprinkler application rate (in/hr), don’t guess.*
  - *Set times should be determined by how much you want to apply, not by what is convenient.*
  - *Maintenance can be the key.*
Improving Irrigation Water Management

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- **Maintenance can be the key.**
  - Sprinklers operating well.
Improving Irrigation Water Management

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  • Sprinklers operating well.
  • Have sprinklers or orifices changed?
Improving Irrigation Water Management

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  - *Set times should be determined by how much you want to apply, not by what is convenient.*
- **Maintenance can be the key.**
  - Sprinklers operating well.
  - Have sprinklers or orifices changed?
  - Has pressure changed?
Improving Irrigation Water Management

• Sprinkler Irrigation Systems
  • Know the sprinkler application rate (in/hr), don’t guess.
  • Set times should be determined by how much you want to apply, not by what is convenient.
  • Maintenance can be the key.
  • Tell the wind to stop blowing.
Improving Irrigation Water Management

- Subsurface Drip Irrigation
Improving Irrigation Water Management

- Subsurface Drip Irrigation
  - What is the application rate?
Improving Irrigation Water Management

- **Subsurface Drip Irrigation**
  - What is the application rate?
    - Can’t evaluate drip tape so use a flow meter and manufacturer information.

### Flow Rates

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<td>lph</td>
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Improving Irrigation Water Management

- **Subsurface Drip Irrigation**
  - What is the application rate?
    - Can’t evaluate drip tape so use a flow meter and manufacturer information.
  - If well designed and well maintained, should be very uniform and very efficient (need good management).
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• **Big issues:**
  - Cost
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Improving Irrigation Water Management

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  • What is the application rate?
    • Can’t evaluate drip tape so use a flow meter and manufacturer information.
  
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• **Big issues:**
  
  • Cost
  
  • Clogging
  
  • Rodents.

    You’ll learn to hate gophers.
Questions???

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For Powerpoint presentation, go to:
http://ucanr.edu/schwankl
Border Strip Irrigation
Border Strip Irrigation
Border Strip Irrigation

If correct flow rate, check width, and field length are used, can be efficient.
Sprinkler Irrigation

- Can be efficient if done properly.
- Equipment & energy costs are an issue.
Subsurface Drip Irrigation (SDI)

- Not widely used, but more and more interest in it.
- Challenges are cost and keeping it working well.