Limited Water Options For Tough Times

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Water Management:

• How crops respond to water
  • Water Management/Losses

• Water Use of crops
  • Timing

• Cropping Systems Management
  • Tillage
  • Water Management
Crop Response to Water:

Crop yields have a linear response to ET
Not to Irrigation

Irrigation helps increase ET but
losses of water occur
Leaching
Runoff
Yield vs Water Relationship

Max ET/Yield

ET

Irrigation

Inefficiencies

Yield

Water (ET or Irrigation)
Management Strategies

Research from Colorado, Nebraska and Kansas

Reduce water applied during vegetative growth stage

Reduce water applied with little or no yield loss under normal conditions
North Platte
Silt Loam

Grain Yield (Bu/Acre)

Year

1997 1998 1999 2000

BMP
Late Initiation
Allocation
Dryland

Irrigation (inches)

Year

1997 1998 1999 2000

BMP
Late Initiation
Allocation
Dryland
Irrigated Yield by Position

Grain Yield (bu/acre)

Field Location

Dryland  6 inch  10 inch  Late  Full
Fort Collins
Clay Loam (pivot)

Grain Yield (Bu/Acre)

Irrigation (inches)

Year

2005

0

50

100

150

200

BMP

Allocation

Year

2005

0

2

4

6

8

10

12

14

BMP

Allocation
Fort Collins
Clay Loam (pivot)
2005 Precipitation
Irrigated Oil Sunflower Yields

Grain Yield (lbs/acre)

Year

Dryland  R6-R7  R4-R5  R1-R3  R1-R5  Full Water


Avg  2004Avg
Management Strategies

- Reduce Evaporation Losses
The Economic Question?

• What do you want?
  • Maximum Yield?
  • Maximum Return?
Management Strategies

• Reduce irrigated acreage
  – Irrigate a portion of land
  – Remainder in dryland production
    • produce at a level of profitable returns
• Reduce irrigation to entire field
• Rotate with lower crop water use crops
  – irrigate all crops with varying amounts
  – Sunflowers, corn, soybean, winter wheat, dry beans, sugar beets
Water Management

When limited on water quantity

Save water for critical time periods

Reproductive growth stage

Most crops can withstand some stress during the vegetative growth stage
# Limited Allocation

**Greeley, CO**

<table>
<thead>
<tr>
<th>Crop Type</th>
<th>Effective Precip.</th>
<th>Irrigation Efficiency</th>
<th>ET Irrigation</th>
<th>Net Irrigation</th>
<th>Gross Irrigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>24.7 In.</td>
<td></td>
<td>17.4 In.</td>
<td>19.3 In.</td>
<td></td>
</tr>
<tr>
<td>Winter Wheat</td>
<td>16.4 In.</td>
<td></td>
<td>9.0 In.</td>
<td>10.0 In.</td>
<td></td>
</tr>
<tr>
<td>Dry Beans</td>
<td>18.4 In.</td>
<td></td>
<td>11.0 In.</td>
<td>12.2 In.</td>
<td></td>
</tr>
</tbody>
</table>

Effective Precip.: 7.4 inches

Irrigation Efficiency: 90%
Limited Allocation

• Choices to be made:

• 11.4 Inch Allocation

• Grow 59% of corn acres – full water
  • normal yields on less acres

• Grow 100% of corn acres – 59% of water
  • normal acres with reduced yield (70+% of max)

• Grow 15% of acres to corn and 85% to wheat
  • normal yields on both with all acres
Limited Allocation

- Harvest wheat as forage
  - Reduce ET by approximately 5 inches
  - Reduce net irrigation by 4 inches
  - Reduce gross irrigation by 4.5 inches

- Pivot Irrigation
  - Grow corn on 42% of acres and forage on 58%
  - Grow corn on 66% of acres and forage on 17%
    and dry beans on 17%
Limited Allocation

• Furrow Irrigation
  • Not as many options

• Allocation of 13.9 inches

• Full irrigation of corn on 39% of acres

• Limit water applications to all acres

• Choose other grain crops or forages with one or two crops.
Limited Allocation

• Furrow Irrigation
  • Management Options

• Pack furrows
  • Improve advance time

• Alternate row irrigation
  • Improve efficiency

• Do not allow adequate soak at the end of furrows
  • Full to limited water applications
Limited Allocation

• Management Options
  • Treat acres like dryland with additional moisture that you control

• Reduce input costs
  • Reduce populations
  • Less or no tillage
  • Adjust fertilizer to yield potential
  • Proper choice of varieties

• Control weeds
  • They steal water from the crop
ISSUES

• Crop Insurance
  • Currently no option for limited irrigation.

• Water allocations
  • With limited irrigation, irrigation efficiencies usually improve.

• Must withstand crops looking less vigorous.

• More research down the road.