How Much Water Do Pecans Need?

Lenny Wells, UGA Horticulture
WHEN GROWING PECANS: IF YOU HAVE TO CHOOSE BETWEEN WATER AND FERTILIZER.......... 

CHOOSE WATER!
Pecans and Water

- Pecans have a very efficient water transport system
- Developed ability to avoid stomatal closure under high temps with adequate water
- Pecans are very inefficient users of water
- Require large amounts of water to support optimal growth and fruit production
Pecan Water Use

• Pecans extract most of their water from the upper 32 inches of the soil profile
• Need 60” of water per year
  – In the SE, rainfall can account for 50-67% of needs
• Pecan trees can use as much as 350 gal/day
• Greatest demand is during August/September
• Pecan Irrigation systems are designed to be supplemental to rainfall
• At 12 trees per acre, Drip/Microjet system capacity should be **3600-4200** gallons/acre/day
Pecan Irrigation Systems

• Solid Set
  – Expensive
  – Poor water use efficiency
  – Water large area quickly

• Sprinklers often in every other middle
• Pump capacity should be at least 75 gpm/A
Drip Irrigation

- Lateral lines normally 6-8 ft from tree
- Most emitters used are 2 gph
- 8-16 emitters per tree
Pecan Irrigation Systems

- **Microjet**
  - Same benefits as drip
  - Larger wetted area
  - Best system for establishment of young trees

16 gph 16 gph
• Trees can translocate water from roots in moist soil to those in dry soil
• The pecan tree’s water needs can be supplied by wetting only a portion of the root zone
• A single line can be as good as or better than a line on each side with the same number of emitters

<table>
<thead>
<tr>
<th></th>
<th>Yield</th>
<th>% Increase</th>
<th>$ Value of Increase (@$1.34/lb)</th>
<th>% Kernel</th>
<th>Nuts/lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Irrigation</td>
<td>803a</td>
<td>0</td>
<td>0</td>
<td>41.8a</td>
<td>65</td>
</tr>
<tr>
<td>1-sided</td>
<td>2044b</td>
<td>64</td>
<td>$1662.94</td>
<td>48.7b</td>
<td>54.5</td>
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<td>Irrigation</td>
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<td>2-sided</td>
<td>2045b</td>
<td>64.5</td>
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<td>50.3b</td>
<td>58</td>
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<td></td>
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</table>

Worley, 1982
Costs of Drip Irrigation

- System Parts and Installation: $800 per acre
- Well & Pump: 4” + 5 hp = $6800
  6”+30 hp = $34,000
- Operation Cost: $40-$60 per acre
## Value of Fertilizer

<table>
<thead>
<tr>
<th>Fertilizer Rate (lbs/acre)</th>
<th>Yield/Acre (lbs)</th>
<th>% Increase</th>
<th>Value of Increase (@$1.34/lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1696</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>400 lbs biennially</td>
<td>1837</td>
<td>8.3</td>
<td>188.94</td>
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<tr>
<td>400 lbs annually</td>
<td>2211</td>
<td>30</td>
<td>690.10</td>
</tr>
<tr>
<td>800 lbs annually</td>
<td>1577</td>
<td>-7.0</td>
<td>-159.46</td>
</tr>
</tbody>
</table>

‘Stuart’ Worley, 1974
## Value of Irrigation

<table>
<thead>
<tr>
<th>Water Application (Gal/Day/Acre)</th>
<th>Yield/Acre (lbs)</th>
<th>% Increase</th>
<th>Value of Increase (@ $1.34/lb)</th>
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<tbody>
<tr>
<td>0</td>
<td>1034</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1200</td>
<td>1374</td>
<td>32</td>
<td>455.60</td>
</tr>
<tr>
<td>3600</td>
<td>1761</td>
<td>70</td>
<td>974.18</td>
</tr>
</tbody>
</table>

‘Stuart’

Daniel, J.W. 1982
Return on New Irrigation System
Example: 25 acre orchard

• Cost of new irrigation system: $26,800

• Value of increase in production:
  $974.18/acre X 25 = $24,354.50

• 26800-24354.50=$2445.50 left to recover in year 2

• At increase of only $455.60/acre, the cost of the system can be recovered in 3 years

Assumes $1.34/lb.
Return on New Irrigation System
Example: 100 acre orchard

- Cost of new irrigation system: $54,000
- Value of increase in production:
  $974.18/acre X 100 = $97,418.00
- $97,418 - $54,000 = +$43,418
  - Difference in 1200 gal capacity vs 3600 gal capacity = $51,858

- At increase of only $455.60/acre, the cost of the system can be recovered in 2 years
  Assumes $1.34/lb.
Other Advantages of Irrigation

- Increased Nut Size/Quality, Nut Retention
- Minimizes Shuck Decline/Sticktights
- Enhances shuck split
- Reduces Severity of alternate bearing
- Ability to inject fertilizer and systemic insecticides
# Pecan Irrigation Schedule

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<th>Drip (%cycle) (hrs/day)</th>
<th>Sprinkler (inches/A/wk)</th>
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<tr>
<td>April</td>
<td>60</td>
<td>7.2</td>
</tr>
<tr>
<td>May</td>
<td>70</td>
<td>8.4</td>
</tr>
<tr>
<td>June</td>
<td>80</td>
<td>9.6</td>
</tr>
<tr>
<td>July</td>
<td>90</td>
<td>10.8</td>
</tr>
<tr>
<td>August</td>
<td>100</td>
<td>12</td>
</tr>
<tr>
<td>September</td>
<td>100</td>
<td>12</td>
</tr>
<tr>
<td>October</td>
<td>90</td>
<td>10.8</td>
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<td>November</td>
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Tree Water Status 2010

![Graph showing tree water status from 6/4/2010 to 9/3/2010. The x-axis represents dates from 6/4/2010 to 9/3/2010, and the y-axis represents stem water potential in psi. The graph includes three lines: Evap Pan, Tensiometer, and Dry. The dates and corresponding water potentials are as follows:
- 6/4/2010: Evap Pan and Tensiometer are close to 80 psi, Dry is above 100 psi.
- 6/11/2010: Evap Pan and Tensiometer are around 70 psi, Dry is above 100 psi.
- 6/18/2010: Evap Pan and Tensiometer are close to 60 psi, Dry is above 100 psi.
- 6/25/2010: Evap Pan and Tensiometer are close to 50 psi, Dry is above 100 psi.
- 7/2/2010: Evap Pan and Tensiometer are around 40 psi, Dry is above 100 psi.
- 7/9/2010: Evap Pan and Tensiometer are close to 30 psi, Dry is above 100 psi.
- 7/16/2010: Evap Pan and Tensiometer are close to 20 psi, Dry is above 100 psi.
- 7/23/2010: Evap Pan and Tensiometer are close to 10 psi, Dry is above 100 psi.
- 7/30/2010: Evap Pan and Tensiometer are close to 10 psi, Dry is above 100 psi.
- 8/6/2010: Evap Pan and Tensiometer are close to 10 psi, Dry is above 100 psi.
- 8/13/2010: Evap Pan and Tensiometer are close to 10 psi, Dry is above 100 psi.
- 8/20/2010: Evap Pan and Tensiometer are close to 10 psi, Dry is above 100 psi.
- 8/27/2010: Evap Pan and Tensiometer are close to 10 psi, Dry is above 100 psi.
- 9/3/2010: Evap Pan and Tensiometer are close to 10 psi, Dry is above 100 psi.]
Summary

• If you have to choose between water and fertilizer, choose water
• Water is key to many important processes involved in the development of a pecan crop
• Well capacity for pecans should be approx. 4000 gal/acre/day
• Irrigation provides the most immediate results and the fastest return on investment of virtually any management practice you can use