Egan Spring Wheat Management

Jessica A. Torrion
Assistant Professor- Crop Physiology
Northwestern Ag Research Center, Kalispell, MT

Optimizing N and Water Use for Sustainable Wheat Production: A collaborative project with Univ. of Idaho
Egan

• Developed for resistance in wheat midge via \textit{sm1} gene

• Stripe rust resistance (\textit{Yr36})

• The first variety developed with high grain protein content (\textit{Gpc-B1}) gene
Egan- a pest control tool

• Nitrogen Management
• Water Management

Objective: Determine the optimal N and water requirement for Egan
Row spacing: 8 inches; Target population: 25 plants/ft²
Available Soil Water @spring: 2.8”
Total Rainfall: 6.2”
Irrigation: 5” (100ET), 3.8” (75ET), 2.5”(50ET)
Evapotranspiration (ET)
ETc = ETo x Kc

*For example:*

**Creston W. Station**

ETo: 0.4

Current Kc: 0.8

ETc = 0.4 x 0.8 = 0.32 in

http://www.usbr.gov/pn/agrimet/cropcurves/crop_curves.html
Permanent Wilting Point

Remaining water adheres to soil particles and is unavailable to plants

Field Capacity

Water held in micropores

Available water-plant roots can absorb this

Saturated Water Content

Drains out of the root zone

Field capacity

Available water for plant growth
<table>
<thead>
<tr>
<th>Soil Texture</th>
<th>Water Holding Capacity (in/ft soil)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coarse sand</td>
<td>0.25-0.75</td>
</tr>
<tr>
<td>Fine sand</td>
<td>0.75-1.00</td>
</tr>
<tr>
<td>Loamy sand</td>
<td>1.10-1.20</td>
</tr>
<tr>
<td>Sandy loam</td>
<td>1.25-1.40</td>
</tr>
<tr>
<td>Fine sandy loam soil</td>
<td>1.50-2.00</td>
</tr>
<tr>
<td>Silt loam</td>
<td>2.00-2.50</td>
</tr>
<tr>
<td>Silty clay loam</td>
<td>1.80-2.00</td>
</tr>
<tr>
<td>Silty clay</td>
<td>1.50-1.70</td>
</tr>
<tr>
<td>Clay</td>
<td>1.20-1.50</td>
</tr>
</tbody>
</table>

[https://casoilresource.lawr.ucdavis.edu/gmap/](https://casoilresource.lawr.ucdavis.edu/gmap/)  
[https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm](https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm)
Water Holding Capacity of a Fine Sandy Loam Soil

1.5 or 2 ft Soil Depth to Consider: early vegetative

3 ft Soil Depth to Consider: ~Boot

\[
PAW_{\text{Today}} = PAW_{\text{yesterday}} - \text{CropET} - \text{Other Losses} + \text{Rainfall} + \text{Irrigation}
\]
<table>
<thead>
<tr>
<th>Permanent Wilting Point</th>
<th>Field Capacity</th>
<th>Saturated Water Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remaining water adheres to soil particles and is unavailable to plants</td>
<td>Water held in micropores</td>
<td>Drains out of the root zone</td>
</tr>
</tbody>
</table>

Available water for plant growth

Wilting point $\rightarrow$ Field capacity $\rightarrow$ Saturated Water Content
Crop ET: ~12 inches Total
100ET (+ 5.0” I)
75ET (+ 3.8” I)
50ET (+ 2.5” I)
Rainfed
Water: 0.0025
N: 0.2948
Water x N: 0.5526
Water: 0.9261
N: 0.0001
Water x N: 0.0662
## Based on 1-yr (2016) data alone

<table>
<thead>
<tr>
<th></th>
<th>N Treatment lbs</th>
<th>Irrigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield</td>
<td>98</td>
<td>50ET</td>
</tr>
<tr>
<td>Protein</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>Adjusted Gross Income</td>
<td>98 (150)</td>
<td>50ET</td>
</tr>
</tbody>
</table>

6.2” R + 2.5” I + ~2.8” spring stored moisture in the soil
DISCUSSION