Simulated Hail and Hail Assessments in Row Crops

Justin McMechan
Crop Protection and Cropping Systems Specialists

EASTERN NEBRASKA RESEARCH AND EXTENSION CENTER

Hail Know Project
Simulated Hail Machine
Hail Raiser 2.0

Built in Metrics

Variable Wind Speed
(Bypass Hydraulics)
(Pitot Static Tube)

Ice Flow
(Optical RPM)

Arduino
Computer System

Hail Know Project
Research Questions

1. Do all surviving plants have similar yield potentials?
2. Can we improve final grain yield prediction if we account for plant damage?
3. What happens to yield predictions if Goss’s wilt is present?
4. Does timing of evaluation change the yield predictions?

Early Season Damage Assessments

Hail Know Project
Evaluating Hail Damage

- Late season disease interactions
- Bacterial and fungal pathogen interactions
- UAV evaluation methods

Legend:
- Mycotoxin Samples (3 lbs. grain/samples)
- Grading Samples (3 lbs. grain/sample)
- Damage Assessment
- Simulated Hail

Hail Know Project
Evaluating Stalk Damage
Push / Pinch Test
Evaluate 100 plants

Prioritize harvest based on fields with highest frequency of damage stalks
Ear Damage

- Ear damage
  - direct losses
  - insects
    - Sap beetles
  - ear diseases
Late Season Evaluations

- **Maturity Line Weight**
  - 1/100\(^\text{th}\) of an acre (<20 bu/acre)
  - 1/1000\(^\text{th}\) of an acre (>20 bu/acre)

- **Determine development stage**
  - Break ear in half and determine milk line

- **Weight**
  - Shell and discard portions of ear without kernels

- **Stage x weight factor for total yield**
### Appraisal Method

<table>
<thead>
<tr>
<th>Method</th>
<th>Use...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stand Reduction Method</td>
<td>for planted acreage with no emerged seed, and from emergence to the milk stage.</td>
</tr>
<tr>
<td>Hail Damage Method</td>
<td>for hail damaged corn beginning with the 7th leaf stage and until the corn reaches the milk stage.</td>
</tr>
<tr>
<td>Maturity Line Weight Method</td>
<td>For corn grain appraisals, from the milk stage until kernels are fully mature and moisture drops below 40 percent.</td>
</tr>
<tr>
<td>Weight Method</td>
<td>for all corn appraisals after the corn kernels are fully mature and kernel moisture drops below 40 percent.</td>
</tr>
</tbody>
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- 1110-1200 (Reserved)
Plant Damage: Node Cut/Breaks

- **Node Cut Off / Broken**
  - Applies to V1 through R3.5
  - 20 plant sample
  - Determine total number of nodes per plant
  - Begin at node above unifoliate leaves

14 nodes
Plant Damage: Node Cut/Breaks

- **Node Cut Off / Broken**
  - 14 nodes
  - 8 nodes
  - $\frac{8}{14} = 57\%$ Cutoff
  - Stage: R2

- FCIC counts unifoliate node

<table>
<thead>
<tr>
<th>Stage of Growth</th>
<th>51</th>
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<th>54</th>
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<tbody>
<tr>
<td>V1-V2</td>
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<td>7.2</td>
<td>7.3</td>
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</table>

Hail Know Project
Plant Damage: Leaf Defoliation

- Defoliation begins at R1
- Only estimate on trifoliates below cut or broken node
- 30% = 5% loss
- Total Loss: 32.6%

40% defoliation
Defoliation and Production Loss

Soybean Stage:
- Vc-Vn
- R1
- R2
- R3
- R4
- R5
- R6

% Defoliation:
- 100
- 75
- 50
- 25
- 10

Production Loss

FCIC 2016
Seed Count Method

- **Stages:** R7-R8
- **Determines seeds per square foot**
  - Converted to bushels per acre
- **Number of live plants in 10-ft row**
  - Select 5 representative plants
  - Don’t count plants without seed

*Determine*

- Average number of plants per foot
- Average number of seed per plant
- Seed size: 100 seeds in graduated cylinder (cc filled)
Seed Count Method

- Multiply
  - Row Width Factor 30” – 0.80

<table>
<thead>
<tr>
<th>Row Width</th>
<th>Factor</th>
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<tr>
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<td>1.33</td>
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<td>0.71</td>
<td>B*</td>
<td>2.22</td>
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<td>1.20</td>
<td>36”</td>
<td>0.67</td>
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</table>

Hail Know Project
Seed Count Method

- Multiply
  - Row Width Factor: 30” – 0.80
  - Seed Size Factor: 25 CC’s per 100 seeds = 0.085

<table>
<thead>
<tr>
<th>CC’s Per 100 Seeds</th>
<th>Factor</th>
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<th>CC’s Per 100 Seeds</th>
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<td>20</td>
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</tbody>
</table>

If unable to obtain 100 mature beans in sample due to immaturity or swelling from excess moisture, use factor .092 unless otherwise authorized.
Multiply

- Row Width Factor 30” – 0.80
- Seed Size Factor: 25 CC’s per 100 seeds = 0.085
- Plants per foot: 4 plants
- Seeds per plant: 50 seeds
- Yield: 13.6 bu/acre
What about stem damage?

- Difficult to evaluate, not taken into account by adjuster
- Plants may be more susceptible to lodging in the fall
Hail Know

1. The Hail Storm
2. Assess My Damage
3. Handle My Insurance
4. Replant My Crop
5. Manage My Recovering Crop
6. Are Cover Crops For Me?

Crop Damage Assessment
Prepare for and recover from hail

Scout Fields for Damage
- Make a list of hail-damaged fields to give to your crop insurance agent.
- Assess your fields by driving by or walking in them. See what’s going on.

Call Insurance Agent
- Contact your insurance agent as soon as you’ve got a handle on the damage.
- Take notes from your discussion.
- Be sure you understand your coverage policy.

Wait 4 to 6 Days...or More
- Be patient. Give your crop a chance to recover and grow. The wait time is dependent on time of year and weather.
- During that time, contact your local Extension educator for resources and post-storm program information.
- If the hail storm occurred early in the season, contact your seed dealer to check availability of seed. Consider product characteristics.

Assess Plant Regrowth
- Before you decide to replant, assess regrowth potential of damaged plants.
- Determine surviving plants per acre and use decision tables to calculate yield potential.

For more information visit cropwatch.unl.edu/hail
This project was funded by a USDA National Institute of Food & Agriculture Smith-Lever Special Needs Grant with matching funds from the University of Nebraska-Lincoln.
Thank You
What questions do you have?

Twitter
@justinmcmechan

Email
justin.mcmechan@unl.edu