Please note that the responses to this survey were collected prior to the 2018 e-coli outbreak in leafy greens.
AILRC Research Survey 2018

• 24 on-line responses were collected between February 21\textsuperscript{st} and April 13\textsuperscript{th}, 2018
• 45 paper surveys collected at the Southwest Ag Summit in February 2018 were manually entered
• 69 respondents started the survey
• 66 with usable data
AILRC Research Survey 2018

• 66 usable surveys
• 17 equipment companies, PCAs, consulting, etc.
• 14 seed companies
• 35 iceberg lettuce producer surveys (representing 21 producers)
• 2018 data set for 66 total usable surveys
• 2018 data set for 35 producer only surveys
• 2012 data set for comparison
Survey Categories

1. Areas of Research
2. Diseases and Disorders
3. Soil and Water Management
4. Technology
5. Insects and Nematodes
6. Food Safety
7. Organic
8. Other
Areas of Research

All 2018 Surveys (66)

Priority* Ranking

- **High**
  - Disease Control and Management: 48 Respondents
  - Insect Control and Management: 25 Respondents
  - Water Management: 23 Respondents
  - Variety Improvement and Trials: 25 Respondents
  - Seeds and Stand Establishment: 20 Respondents
  - Weed Control and Management: 22 Respondents
  - Food Safety and Contamination: 19 Respondents
  - Fertilizer Use and Management: 14 Respondents
  - Post-Harvest Handling and Shipping: 10 Respondents
  - Cultivation and Tillage Practices: 8 Respondents

- **Medium High**
  - Disease Control and Management: 17 Respondents
  - Water Management: 21 Respondents
  - Variety Improvement and Trials: 20 Respondents
  - Seeds and Stand Establishment: 18 Respondents
  - Weed Control and Management: 16 Respondents
  - Food Safety and Contamination: 14 Respondents
  - Fertilizer Use and Management: 20 Respondents
  - Post-Harvest Handling and Shipping: 15 Respondents
  - Cultivation and Tillage Practices: 16 Respondents

- **Medium**
  - Disease Control and Management: 12 Respondents
  - Water Management: 14 Respondents
  - Variety Improvement and Trials: 11 Respondents
  - Seeds and Stand Establishment: 9 Respondents
  - Weed Control and Management: 9 Respondents
  - Food Safety and Contamination: 9 Respondents
  - Fertilizer Use and Management: 20 Respondents
  - Post-Harvest Handling and Shipping: 17 Respondents
  - Cultivation and Tillage Practices: 12 Respondents

- **Medium Low**
  - Disease Control and Management: 4 Respondents
  - Water Management: 5 Respondents
  - Variety Improvement and Trials: 2 Respondents
  - Seeds and Stand Establishment: 2 Respondents
  - Weed Control and Management: 9 Respondents
  - Food Safety and Contamination: 8 Respondents
  - Fertilizer Use and Management: 8 Respondents
  - Post-Harvest Handling and Shipping: 8 Respondents
  - Cultivation and Tillage Practices: 7 Respondents

- **Low**
  - Disease Control and Management: 1 Respondent
  - Water Management: 3 Respondents
  - Variety Improvement and Trials: 8 Respondents
  - Seeds and Stand Establishment: 2 Respondents
  - Weed Control and Management: 3 Respondents
  - Food Safety and Contamination: 3 Respondents
  - Fertilizer Use and Management: 3 Respondents
  - Post-Harvest Handling and Shipping: 6 Respondents
  - Cultivation and Tillage Practices: 2 Respondents

*Priority ranking based on a weighted average
Areas of Research

2018 Producers Only (35)

Disease Control and Management
Insect Control and Management
Weed Control and Management
Water Management
Food Safety and Contamination
Variety Improvement and Trials
Fertilizer Use and Management
Seeds and Stand Establishment
Cultivation and Tillage Practices
Post-Harvest Handling and Shipping

Priority ranking based on a weighted average

*Priority ranking based on a weighted average
## Areas of Research

<table>
<thead>
<tr>
<th>2012 Producers</th>
<th>2018 All</th>
<th>2018 Producers Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disease Control and Management</td>
<td>Disease Control and Management</td>
<td>Disease Control and Management</td>
</tr>
<tr>
<td>Food Safety and Contamination</td>
<td>Insect Control and Management</td>
<td>Insect Control and Management</td>
</tr>
<tr>
<td>Insect Control and Management</td>
<td>Water Management</td>
<td>Weed Control and Management</td>
</tr>
<tr>
<td>Weed Control and Management</td>
<td>Variety Improvement and Trials</td>
<td>Water Management</td>
</tr>
<tr>
<td>Fertilizer Use and Management</td>
<td>Seeds and Stand Establishment</td>
<td>Food Safety and Contamination</td>
</tr>
<tr>
<td>Water Management</td>
<td>Weed Control and Management</td>
<td>Variety Improvement and Trials</td>
</tr>
<tr>
<td>Post-Harvest Handling and Shipping</td>
<td>Food Safety and Contamination</td>
<td>Fertilizer Use and Management</td>
</tr>
<tr>
<td>Seeds and Stand Establishment</td>
<td>Fertilizer Use and Management</td>
<td>Seeds and Stand Establishment</td>
</tr>
<tr>
<td>Variety Improvement and Trials</td>
<td>Post-Harvest Handling and Shipping</td>
<td>Cultivation and Tillage Practices</td>
</tr>
<tr>
<td>Cultivation and Tillage Practices</td>
<td>Cultivation and Tillage Practices</td>
<td>Post-Harvest Handling and Shipping</td>
</tr>
</tbody>
</table>
Diseases and Disorders

All 2018 Surveys (66)

Priority ranking based on a weighted average
### Diseases and Disorders

**2018 Producers Only (35)**

**Priority Ranking**

- **High**
- **Medium**
- **Low**

- **Fusarium**: High 28, Medium 6, Low 1
- **Downy Mildew**: High 27, Medium 5, Low 1
- **Sclerotinia Drop**: High 26, Medium 6, Low 2
- **Powdery Mildew**: High 21, Medium 10, Low 2
- **Bottom Rot**: High 15, Medium 17, Low 1
- **Tipburn**: High 12, Medium 10, Low 1
- **Bolting**: High 8, Medium 14, Low 1
- **Big Vein**: High 5, Medium 13, Low 10
- **Rib Discoloration**: High 6, Medium 13, Low 10
- **Bacterial Leaf Spot**: High 4, Medium 16, Low 17
- **Lettuce Chlorosis Virus**: High 4, Medium 9, Low 17
- **Beet Western Yellows**: High 3, Medium 5, Low 24
- **Other: Romain Dieback**: Medium 1
- **Other: Verticillium**: Medium 1

*Priority ranking based on a weighted average*
# Diseases and Disorders

<table>
<thead>
<tr>
<th>2012 Producers</th>
<th>2018 All</th>
<th>2018 Producers Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sclerotinia Drop</td>
<td>Fusarium</td>
<td>Fusarium</td>
</tr>
<tr>
<td>Powdery Mildew</td>
<td>Downy Mildew</td>
<td>Downy Mildew</td>
</tr>
<tr>
<td>Fusarium</td>
<td>Sclerotinia Drop</td>
<td>Sclerotinia Drop</td>
</tr>
<tr>
<td>Bottom Rot</td>
<td>Powdery Mildew</td>
<td>Powdery Mildew</td>
</tr>
<tr>
<td>Downy Mildew</td>
<td>Bottom Rot</td>
<td>Bottom Rot</td>
</tr>
<tr>
<td>Tipburn</td>
<td>Tipburn</td>
<td>Tipburn</td>
</tr>
<tr>
<td>Big Vein</td>
<td>Big Vein</td>
<td>Bolting</td>
</tr>
<tr>
<td>Rib Discoloration</td>
<td>Bolting</td>
<td>Big Vein</td>
</tr>
<tr>
<td>Lettuce Chlorosis Virus</td>
<td>Rib Discoloration</td>
<td>Rib Discoloration</td>
</tr>
<tr>
<td>Bolting</td>
<td>Bacterial Leaf Spot</td>
<td>Bacterial Leaf Spot</td>
</tr>
<tr>
<td>Bacterial Leaf Spot</td>
<td>Lettuce Chlorosis Virus</td>
<td>Lettuce Chlorosis Virus</td>
</tr>
<tr>
<td>Beet Western Yellows</td>
<td>Beet Western Yellows</td>
<td>Beet Western Yellows</td>
</tr>
<tr>
<td>Other: Major sclero</td>
<td>Other: Romain Dieback</td>
<td>Other: Romain Dieback</td>
</tr>
<tr>
<td></td>
<td>Other: Verticillium</td>
<td>Other: Verticillium</td>
</tr>
</tbody>
</table>
Soil and Water Management

All 2018 Surveys (66)

*Priority ranking based on a weighted average
### Soil and Water Management

#### 2018 Producers Only (35)

<table>
<thead>
<tr>
<th>Field</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen Management</td>
<td>17</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>Soil Salinity Management</td>
<td>13</td>
<td>19</td>
<td>2</td>
</tr>
<tr>
<td>Irrigation Management</td>
<td>13</td>
<td>17</td>
<td>4</td>
</tr>
<tr>
<td>Phosphate Fertilizer Efficacy</td>
<td>8</td>
<td>21</td>
<td>3</td>
</tr>
<tr>
<td>Phosphorus Fertilizer</td>
<td>5</td>
<td>23</td>
<td>4</td>
</tr>
<tr>
<td>Compost Materials</td>
<td>5</td>
<td>21</td>
<td>5</td>
</tr>
<tr>
<td>Drip Irrigation</td>
<td>7</td>
<td>14</td>
<td>11</td>
</tr>
</tbody>
</table>

*Priority ranking based on a weighted average*
# Soil and Water Management

<table>
<thead>
<tr>
<th>2012 Producers</th>
<th>2018 All</th>
<th>2018 Producers Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen Management</td>
<td>Soil Salinity Management</td>
<td>Nitrogen Management</td>
</tr>
<tr>
<td>Phosphate Fertilizer Efficacy</td>
<td>Nitrogen Management</td>
<td>Soil Salinity Management</td>
</tr>
<tr>
<td>Phosphorus Fertilizer</td>
<td>Irrigation Management</td>
<td>Irrigation Management</td>
</tr>
<tr>
<td>Compost Materials</td>
<td>Phosphate Fertilizer Efficacy</td>
<td>Phosphate Fertilizer Efficacy</td>
</tr>
<tr>
<td>Drip Irrigation</td>
<td>Phosphorus Fertilizer</td>
<td>Phosphorus Fertilizer</td>
</tr>
<tr>
<td></td>
<td>Drip Irrigation</td>
<td>Compost Materials</td>
</tr>
<tr>
<td></td>
<td>Compost Materials</td>
<td>Drip Irrigation</td>
</tr>
</tbody>
</table>
Technology

All 2018 Surveys (66)

*Priority ranking based on a weighted average
Technology

2018 Producers Only (35)

Priority*  High  

Mechanical/Chemical Thinning  22  6  4  
Remote Sensing (Sensors and Drones)  9  19  5  
Other: Mechanical Weeding  1  
Other: Mechanical or Chemical Weeding  

*Priority ranking based on a weighted average
## Technology

<table>
<thead>
<tr>
<th>2012 Producers</th>
<th>2018 All</th>
<th>2018 Producers Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical/Chemical Thinning</td>
<td>Mechanical/Chemical Thinning</td>
<td>Mechanical/Chemical Thinning</td>
</tr>
<tr>
<td>Remote Sensing (Sensors and Drones)</td>
<td>Remote Sensing (Sensors and Drones)</td>
<td>Remote Sensing (Sensors and Drones)</td>
</tr>
<tr>
<td>Other: Mechanical or Chemical Weeding</td>
<td>Other: Mechanical Weeding</td>
<td>Other: Mechanical Weeding</td>
</tr>
<tr>
<td>Other: Mechanical Weeding</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Insects and Nematodes

All 2018 Surveys (66)

*Priority ranking based on a weighted average
Insects and Nematodes

2018 Producers Only (35)

Priority ranking based on a weighted average

- Thrips: 17 High, 13 Medium, 3 Low
- Aphids: 16 High, 14 Medium, 3 Low
- Whiteflies: 9 High, 14 Medium, 10 Low
- Cabbage Looper: 7 High, 18 Medium, 8 Low
- Beet Armyworm: 5 High, 18 Medium, 10 Low
- Seedling Pests (crickets, beetles): 5 High, 17 Medium, 10 Low
- Budworm: 2 High, 15 Medium, 16 Low
- Other: Diamondback Moth: 4 High
- Other: Bagrada Bug/Beetle: 2 High

*Priority ranking based on a weighted average
# Insects and Nematodes

<table>
<thead>
<tr>
<th>2012 Producers</th>
<th>2018 All</th>
<th>2018 Producers Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thrips</td>
<td>Thrips</td>
<td>Thrips</td>
</tr>
<tr>
<td>Aphids</td>
<td>Aphids</td>
<td>Aphids</td>
</tr>
<tr>
<td>Whiteflies</td>
<td>Whiteflies</td>
<td>Whiteflies</td>
</tr>
<tr>
<td>Beet Armyworm</td>
<td>Beet Armyworm</td>
<td>Cabbage Looper</td>
</tr>
<tr>
<td>Seedling Pests</td>
<td>Cabbage Looper</td>
<td>Beet Armyworm</td>
</tr>
<tr>
<td>(crickets, beetles)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Budworm</td>
<td>Seedling Pests (crickets, beetles)</td>
<td>Seedling Pests (crickets, beetles)</td>
</tr>
<tr>
<td>Cabbage Looper</td>
<td>Budworm</td>
<td>Budworm</td>
</tr>
<tr>
<td>Other: Bird Control</td>
<td>Other: Diamondback Moth</td>
<td>Other: Diamondback Moth</td>
</tr>
<tr>
<td>Other: Bagrada Bug/Beetle</td>
<td>Other: Bagrada Bug/Beetle</td>
<td>Other: Bagrada Bug/Beetle</td>
</tr>
</tbody>
</table>
Food Safety

All 2018 Surveys (66)

Priority ranking based on a weighted average

Deterrent/Repellant Devices for Birds: 36 High, 17 Medium, 1 Low
Rapid Product E-coli Test: 34 High, 16 Medium, 4 Low
Deterrent/Repellant Devices for Wildlife: 30 High, 23 Medium, 7 Low
Water Quality Monitoring - Contaminants: 20 High, 25 Medium, 7 Low
Water Quality Monitoring - Heavy Metals: 17 High, 24 Medium, 11 Low
Biosolids on Adjacent Land: 10 High, 31 Medium, 11 Low

*Priority ranking based on a weighted average
Food Safety

2018 Producers Only (35)

Priority* Ranking:
- Deterrent/Repellant Devices for Birds: High (25), Medium (9)
- Deterrent/Repellant Devices for Wildlife: High (21), Medium (11)
- Rapid Product E-coli Test: High (19), Medium (10), Low (4)
- Water Quality Monitoring - Contaminants: High (13), Medium (14), Low (5)
- Water Quality Monitoring - Heavy Metals: High (13), Medium (10), Low (9)
- Biosolids on Adjacent Land: High (5), Medium (18), Low (9)

*Priority ranking based on a weighted average
# Food Safety

<table>
<thead>
<tr>
<th>2012 Producers</th>
<th>2018 All</th>
<th>2018 Producers Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deterrent/Repellant Devices for Birds</td>
<td>Deterrent/Repellant Devices for Birds</td>
<td>Deterrent/Repellant Devices for Birds</td>
</tr>
<tr>
<td>Deterrent/Repellant Devices for Wildlife</td>
<td>Rapid Product Ecoli Test</td>
<td>Deterrent/Repellant Devices for Wildlife</td>
</tr>
<tr>
<td>Water Quality Monitoring - Contaminants</td>
<td>Deterrent/Repellant Devices for Wildlife</td>
<td>Rapid Product Ecoli Test</td>
</tr>
<tr>
<td>Rapid Product Ecoli Test</td>
<td>Water Quality Monitoring - Contaminants</td>
<td>Water Quality Monitoring - Contaminants</td>
</tr>
<tr>
<td>Biosolids on Adjacent Land</td>
<td>Water Quality Monitoring - Heavy Metals</td>
<td>Water Quality Monitoring - Heavy Metals</td>
</tr>
<tr>
<td>Water Quality Monitoring - Heavy Metals</td>
<td>Biosolids on Adjacent Land</td>
<td>Biosolids on Adjacent Land</td>
</tr>
</tbody>
</table>
Organic

All 2018 Surveys (66)

Priority*  
High

- Organic: No Specific Issue: 11
- Mildew: 4
- Aphid: 2
- Better genetics for organic: 1
- Disease Resistant Varieties: 1
- Organic Options and Ideas: 1
- Organic Seed: 1
- Organic Seed Treatments: 1
- Pest resistance: 1
- Thrip: 1
- Use of animal based fertilizers: 1
- Nutritional components: 1

Low

*Priority ranking based on a weighted average
Organic

2018 Producers Only (35)

Priority ranking based on a weighted average

- Organic: No Specific Issue
  - High: 8
  - Medium: 8
  - Low: 5
- Mildew
  - High: 2
- Aphid
  - High: 1
- Better genetics for organic
- Disease Resistant Varieties
- Organic Options and Ideas
  - Organic Seed
  - Organic Seed Treatments
  - Pest resistance
  - Thrip
- Use of animal based fertilizers
- Nutritional components

*Priority ranking based on a weighted average*
## Organic

<table>
<thead>
<tr>
<th>2012 Producers</th>
<th>2018 All</th>
<th>2018 Producers Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beetles</td>
<td>Organic: No Specific Issue</td>
<td>Organic: No Specific Issue</td>
</tr>
<tr>
<td>Post harvest and handling</td>
<td>Mildew</td>
<td>Mildew</td>
</tr>
<tr>
<td>Aphid</td>
<td>Aphid</td>
<td></td>
</tr>
<tr>
<td>Better genetics for organic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disease Resistant Varieties</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nutritional components</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic Options and Ideas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic Seed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic Seed Treatments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pest resistance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thrip</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of animal based fertilizers</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Other

Total and Producer Only

Disease Control/Resistance

- High
- Medium
- Low

2
### Other

<table>
<thead>
<tr>
<th></th>
<th>2012 Producers</th>
<th>2018 All</th>
<th>2018 Producers Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fertilizer</td>
<td></td>
<td>Disease Control/Resistance</td>
<td>Disease Control/Resistance</td>
</tr>
<tr>
<td>Labor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pest management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-harvesting and harvesting</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>