CropManage: Online irrigation and nutrient management tool

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Salinas River at Chualar Bridge  (January 2017)
Nitrogen Use Reporting

TIER 2/TIER 3 FARMS WITH HIGH NITRATE LOADING RISK
TOTAL NITROGEN APPLIED REPORT - RANCH/RISK UNIT & FIELD/BLOCK
Page 1 of 3 - September 26, 2016 Version

CONDITIONAL WAIVER OF WASTE DISCHARGE REQUIREMENTS FOR DISCHARGES FROM IRRIGATED LANDS - REGIONAL BOARD ORDER R3-2012-0011
Annually by October 1st, Tier 2 and Tier 3 dischargers with High Nitrate Loading Risk must report total nitrogen applied and present in the soil.
Hover over the cells/boxes with your mouse for more information on what is required. Refer to instructions for further detail.

SECTION I: GENERAL RANCH INFORMATION (Space for more parcels and multiple counties available on page 2)

<table>
<thead>
<tr>
<th>AV#:</th>
<th>Ranch Global ID:</th>
<th>Ranch/Risk Unit or Field/Block Name</th>
<th>Physical Ranch Acres Reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fallow Acres:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sum of Total Crop Acres:</td>
</tr>
</tbody>
</table>

SECTION II: NITROGEN APPLIED WITH IRRIGATION WATER (include all uses, e.g. leaching; and all sources, e.g. CSIP or PVWMA delivered water)

<table>
<thead>
<tr>
<th>Section II-A: PVWMA/CSIP water use</th>
<th>Section II-B: PVWMA/CSIP water</th>
<th>Section II-C: Well/city water (or other non-PVWMA/CSIP source)</th>
<th>Section II-D: Nitrogen applied with irrigation water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Was PVWMA/CSIP water used during the reporting period?</td>
<td></td>
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</tbody>
</table>

Average Nitrate Concentration in Well/City Water (mg/L)

Estimated Total Volume of Well/City Water Applied to Entire Reporting Acres During Reporting Period (gallons)

Nitrogen Applied with Irrigation Water (lbs/ranch-ac)

SECTION III: NITROGEN APPLIED WITH COMPOST & AMENDMENTS

<table>
<thead>
<tr>
<th>Physical Acres Receiving Compost &amp; Amendments</th>
<th>Nitrogen Applied in Compost &amp; Amendments (total lbs)</th>
</tr>
</thead>
</table>

SECTION IV: NITROGEN APPLIED WITH FERTILIZERS & OTHER MATERIALS AND NITROGEN PRESENT IN SOIL (The Excel tool "N from fertilizers" assists with calculations in this section)

<table>
<thead>
<tr>
<th>Specific Crop(s) Grown and Harvested During Reporting Period (Select from List on Page 3)</th>
<th>Total Crop Acres</th>
<th>Nitrogen Present in Soil (lbs/ac)</th>
<th>Nitrogen Applied in Fertilizers and Other Materials (lbs/ac-crop)</th>
<th>O/C</th>
<th>Additional Information</th>
<th>Specific Crop(s) Grown and Harvested During Reporting Period (Select from List on Page 3)</th>
<th>Total Crop Acres</th>
<th>Nitrogen Present in Soil (lbs/ac)</th>
<th>Nitrogen Applied in Fertilizers and Other Materials (lbs/ac-crop)</th>
<th>O/C</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
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<td>8.</td>
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<td>18.</td>
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</tr>
</tbody>
</table>
Tools for making water and nitrogen fertilizer decisions at the field level

- Soil nitrate quick test
- Weather-based irrigation scheduling
On-farm challenges in implementing tools for managing water and fertilizer:

- Multiple fields to manage and track
- Other decisions and activities to coordinate
- Calculations involved for N and water management decisions are time consuming
- Collected data needs to be available to the decision maker(s) and decisions need to be communicated to field staff
CropManage: online irrigation and N management decision support tool

https://cropmanage.ucanr.edu
Weather-based irrigation scheduling

Converting Reference ET to Crop ET:

\[ \text{ET}_{\text{crop}} = \text{ET}_{\text{ref}} \times K_{\text{crop}} \]

\( K_c \) can vary from 0.1 to 1.2
Crop N uptake models
Crops currently supported

Vegetables:
- Romaine (40 and 80-inch wide beds)
- Iceberg (40 and 80-inch wide beds)
- Leaf lettuce (80-inch wide beds)
- Broccoli (summer and winter plantings)
- Cauliflower (summer and winter plantings)
- Cabbage (red and green)
- Celery
- Spinach (baby, teen, bunch)
- Baby lettuce (red, green)
- Mizuna
- Cilantro

Berries
- Strawberry (UC and proprietary varieties)
CropManage 2.0 released Nov 1, 2015

- Improved user-interface
- Faster speed
- Flexibility to support different types of commodities
- Web application protocol interface (API)
Scheduling and irrigation

New Watering

Watering Date

Irrigation Method
- Germination Sprinkler
- Sprinkler
- Drip
- Rainfall

Edit Irrigation Event

Watering Date: 05/23/2016

Irrigation Method:
- Germination Sprinkler
- Sprinkler
- Drip
- Rainfall

Recommended Water: 0.27 in, 1.80 hours

Water Applied:
- 0.00 in
- 0.00 hours

Manager Amount Recommendation:
- 0.00 in
- 0.00 hours

CIMIS Precipitation:
- 0.00 in

Rainfall Applied:
- 0.00 in

Save  Save and Close  Close  Delete
## Irrigation Summary Table

<table>
<thead>
<tr>
<th>Date</th>
<th>Irrigation Method</th>
<th>Irrigation Interval (days)</th>
<th>Recommended Maximum Irrigation Interval (days)</th>
<th>Recommended Water - in.</th>
<th>Applied Water - in.</th>
<th>Rainfall (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/6/2016</td>
<td>Sprinkler</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>1.8 in</td>
<td>0.0</td>
</tr>
<tr>
<td>8/8/2016</td>
<td>Sprinkler</td>
<td>2</td>
<td>0.9 days</td>
<td>0.4 in</td>
<td>1.1 in</td>
<td>0.0</td>
</tr>
<tr>
<td>8/10/2016</td>
<td>Sprinkler</td>
<td>2</td>
<td>1.1 days</td>
<td>0.3 in</td>
<td>1.0 in</td>
<td>0.0</td>
</tr>
<tr>
<td>8/15/2016</td>
<td>Sprinkler</td>
<td>5</td>
<td>2.2 days</td>
<td>0.4 in</td>
<td>0.8 in</td>
<td>0.0</td>
</tr>
<tr>
<td>8/26/2016</td>
<td>Sprinkler</td>
<td>11</td>
<td>4.7 days</td>
<td>0.6 in</td>
<td>1.1 in</td>
<td>0.0</td>
</tr>
<tr>
<td>9/3/2016</td>
<td>Drip</td>
<td>8</td>
<td>3.2 days</td>
<td>0.7 in</td>
<td>0.9 in</td>
<td>0.0</td>
</tr>
<tr>
<td>9/8/2016</td>
<td>Drip</td>
<td>5</td>
<td>3.3 days</td>
<td>0.5 in</td>
<td>0.6 in</td>
<td>0.0</td>
</tr>
<tr>
<td>9/12/2016</td>
<td>Drip</td>
<td>4</td>
<td>3.4 days</td>
<td>0.4 in</td>
<td>0.6 in</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11.02 inches</td>
<td>16.06 inches</td>
</tr>
</tbody>
</table>
Transparency on how recommendations are made

Irrigation Recommendation Summary

Average ET<sub>o</sub> = 0.17 inches/day
Average Crop Coefficient = 0.40
Distribution Uniformity = 85.00%
Days Since Last Irrigation = 5 days
Leaching Requirement = 0.00% / 100
Total Precipitation = 0.00 inches

Base Amount = Average ET<sub>o</sub> * Average Crop Coefficient * Days Since Last Irrigation * 100

0.40 inches = 0.17 inches/day * 0.40 * 5 days * 100

Distribution Uniformity = 85.00%

Recommended Irrigation Amount = Base Amount / (1 - Leaching Requirement) - Total Precipitation

0.40 inches = 0.40 inches / (1 - 0.00) - 0.00 inches

Date: 9/8/2016

Recommended Irrigation Amount: 0.40 inches
Identify when and who made entries

<table>
<thead>
<tr>
<th>Date</th>
<th>Irrigation Method</th>
<th>Irrigation Interval (days)</th>
<th>Recommended Maximum Irrigation Interval (days)</th>
<th>Recommended Water (in.)</th>
<th>Applied Water (in.)</th>
<th>Rainfall (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/7/2016</td>
<td>Drip</td>
<td>4</td>
<td>3.5 days</td>
<td>0.9</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>9/12/2016</td>
<td>Drip</td>
<td>5</td>
<td>4.2 days</td>
<td>0.9</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>9/18/2016</td>
<td>Drip</td>
<td>6</td>
<td>4.2 days</td>
<td>1.1</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>9/19/2016</td>
<td>Drip</td>
<td>1</td>
<td>3.8 days</td>
<td>0.2</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>9/26/2016</td>
<td>Drip</td>
<td>4</td>
<td>4.3 days</td>
<td>0.7</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>9/27/2016</td>
<td>Drip</td>
<td>4</td>
<td>3.7 days</td>
<td>0.9</td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td>10/3/2016</td>
<td>Drip</td>
<td>6</td>
<td>4.4 days</td>
<td>1.1</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>10/12/2016</td>
<td>Drip</td>
<td>9</td>
<td>4.7 days</td>
<td>1.5</td>
<td>1.0</td>
<td></td>
</tr>
</tbody>
</table>

**Totals**

14.50 inches
17.08 inches

In partnership with **CDFA & FREP**
CropManage supports flowmeter data
Flowmeters can help reveal irrigation problems

- Volume applied
- Application rate
- Pressure management
- Interrupted flow
Spatial CIMIS ETo Reporting
New Soledad CIMIS Station
CropManage interfaces with Satellite Irrigation Management Support (SIMS)
Comparison of CropManage and SIMS estimates of canopy cover (broccoli)
Field Evaluation of Canopy Cover

Oklahoma State University
Dept. of Plant and Soil Science
Canopeo was accurate for vegetable crops
Reflectoquant Test Strip Reader

\[ y = 0.99x - 7.15 \]
\[ R^2 = 0.99 \]
CropManage 3.0
More intuitive user interface under development

- Simplify user interface
- Easy to read on smart phones and tablet computers
- Intuitive to navigate
- Simple for field staff to use (irrigators, foremen)
- Better designed for communicating between decision makers and field staff
Main menu
### Plantings menu

#### Bondenson

<table>
<thead>
<tr>
<th>Planting A</th>
<th>Planting B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Event</strong></td>
<td><strong>Event</strong></td>
</tr>
<tr>
<td>18 Oct 2016 (Today)</td>
<td>18 Oct 2016 (Today)</td>
</tr>
<tr>
<td>Germination Sprinkler</td>
<td>Germination Sprinkler</td>
</tr>
<tr>
<td>UAN28</td>
<td>UAN28</td>
</tr>
<tr>
<td>Quick Nitrate Strip</td>
<td>Quick Nitrate Strip</td>
</tr>
<tr>
<td>19 Oct 2016 (Tomorrow)</td>
<td>19 Oct 2016 (Tomorrow)</td>
</tr>
<tr>
<td>Germination Sprinkler</td>
<td>Germination Sprinkler</td>
</tr>
<tr>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

View all events by: [Grid], [List], [Calendar]

<table>
<thead>
<tr>
<th>Planting C</th>
<th>Planting D</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Event</strong></td>
<td><strong>Event</strong></td>
</tr>
<tr>
<td>1 Mar 2016</td>
<td>1 Mar 2016</td>
</tr>
<tr>
<td>Cauliflower-transplanted, 1 row, 40-inch bed, winter</td>
<td>Cauliflower-transplanted, 1 row, 40-inch bed, winter</td>
</tr>
</tbody>
</table>

View all events by: [Grid], [List], [Calendar]
Communication and Record Keeping of Fertilizer Applications
Various options to view summaries of field activities

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Date</th>
<th>Units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>18</td>
<td>0.42 in.</td>
<td>0-14-14</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>18</td>
<td>0.42 in.</td>
<td>0-14-14</td>
</tr>
<tr>
<td>Soil Samples</td>
<td>18</td>
<td>0.42 in.</td>
<td>Strip</td>
</tr>
</tbody>
</table>

Totals:
- 31.73 in.
- 47.00 lbs N/acre
- 7 Events
Factoring in irrigation water nitrogen
Additional Crops in Development
Summary

- Web-based decision support tools are an efficient way to extend research based recommendations to growers
- CropManage is designed to help growers customize water and nitrogen management for specific field conditions
- Opportunities exist for improving CM capabilities and to expand to additional commodities
Upcoming Workshops and Trainings

- CropManage Hands-on Training, UCCE Santa Cruz, Watsonville, March 29
- CropManage Hands-on Training, UCCE Monterey, Salinas, April 13
Opportunities for on-farm demonstrations and trainings:

- Nitrogen and water management demonstration trials
- Irrigation and fertigation for staff (English and Spanish)
- CropManage trainings for staff (English/Spanish)
Acknowledgements:

- UCCE Advisors/Specialists
- UC ANR programming staff
- CDFA-Fertilizer Research Education Program
- CDFA-Specialty Crop Research Grant Program
- CA Dept of Water Resources
- UC Division of Agriculture and Natural Resources
- Growers and Shippers