Who is Daniel Geisseler?

(Background, Expertise, Interests)

Vegetable Crops Program Team Meeting

Dec. 9-10, 2014
My Background

• Grew up on a small family farm in Switzerland
• Apprenticeship as a farmer
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- B.S. in international agriculture
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- B.S. in international agriculture
- Worked as teacher and farm advisor in Switzerland
- M.S. and Ph.D. in soil science at UC Davis
Research experience 1

Can soil test be used to predict N mineralization during cropping season?

- Aerobic and anaerobic incubations
- Hot KCl
- Illinois soil N test
- ..... 

⇒ Relationship with N mineralization in the field generally not close enough
The biochemistry of N turnover in soil

- Extracellular enzymes
- N uptake by soil microorganisms
Research experience III

• Fate of N in forage crops fertilized with lagoon water
  – Regular soil and plant sampling
  – Quantification of water and fertilizer applications
  – Simulation of crop growth, N and water dynamics with a soil-crop model

⇨ Challenging system to study
⇨ Combination of field trials with model application is an interesting approach
My Background

Post-doc at University of Kassel, Germany

– Research included effects of tillage and fertilization on C and N storage in soils

Post-doc at UC Davis

– Compiled available literature about nutrient management to write crop-specific nutrient management guidelines
Fertilization Guidelines for Major Crops Grown in California

These guidelines are based on research results from studies carried out in California and elsewhere. For an optimal fertilization program, site-specific information on soil type, climate and crop management need also to be taken into account.

After choosing a crop from the list below, detailed information can be accessed by moving the mouse over any shape with the symbol ①.

- Cotton
- Almonds
- Processing Tomatoes
- Corn
- Broccoli
- Lettuce
- Wheat
- Grapevines
- Walnuts
- Alfalfa
- Strawberries

Soil and Plant Tissue Sampling
- Soil Test Sampling Instructions
- Sampling for Soil Nitrate Determination
- Soil Sampling in Orchards
- Plant Tissue Sampling

Additional Resources, Links
- Organized by Topic
- Organized by Source

New! Nitrogen Partitioning and Seasonal Uptake Curves

Developed in collaboration by
- CDFA
- FREP
- UCDavis
- LAND, AIR AND WATER RESOURCES
Fertilization Guidelines

Processing Tomatoes Fertilization Guidelines

Funding provided by:

Nitrogen (N)

Soil Test

Preplant N

Starter N

Phosphorus (P₂O₅)

Soil Test

P

Potassium (K₂O)

Soil Applied N / Foliar N

Preplant N

Starter N

For drip-irrigated processing tomatoes, Hartz and Bottoms found that a seasonal rate of approximately 175 lbs N/acre is adequate to maximize fruit yields in most soils. Contact your local farm advisor for more information.

Krukekopf and coworkers carried out a study in the Central Valley in ten furrow irrigated fields. A response to N fertilization was observed in only four fields. In the responsive fields, no significant yield increase with sidedress N application rates above 100 lbs/acre was observed. The total available N in these fields, which included the pre-sidedsidedress nitrate-N in the top 2 feet of the profile and the sidedress N, averaged 170 lbs/acre. Based on this and other studies, the recommended seasonal N application rate for furrow irrigated tomatoes is 100-150 lbs N/acre.

Acknowledgements

Additional Information:
• Tomato Production in California (Historic Background, Production Practices)
• FREP Database

Application Rate
Mode of Application
Fertilizer Type
Time of Application

Cooperative Extension – Vegetable Center
Vegetable Crops Nutrient Management
University of California - Integrated Pest Management online
Resources: Fertilization guidelines

http://apps.cdfa.ca.gov/frep/docs/guidelines.html
Nitrogen uptake of cotton grown in Fresno and Kings County was determined by harvesting the aboveground biomass at different times during cotton development. Cotton plants took up little N until they reached the early square stage. Most N was taken up between the early square and peak bloom stage (Fritschi et al., 2004).

Measured immediately before defoliation, more than half of the aboveground N of Accala cotton was in the seeds. Nitrogen in the fiber and burs accounted for about 15% (Fritschi et al., 2004).

### Nitrogen Removed at Harvest

Cotton yield and N removed at harvest. The N application rate was 150 lbs/acre.

<table>
<thead>
<tr>
<th>Study location</th>
<th>Years</th>
<th>Lint yield (lbs/acre)</th>
<th>Aboveground N (lbs/acre)</th>
<th>N in seed and lint (lbs/acre)</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accala Cotton</td>
<td>1998-2000</td>
<td>1411</td>
<td>172</td>
<td>106</td>
<td>Fritschi et al., 2003; 2004</td>
</tr>
<tr>
<td>Fresno &amp; Kings Counties</td>
<td>1999-2000</td>
<td>1457</td>
<td>113</td>
<td>83</td>
<td>Fritschi et al., 2003; 2004</td>
</tr>
</tbody>
</table>
Outlook

- Add more crops
- Add interactive quizzes
Fertilization quizzes

**Tomato fertilization quiz**

1. When do tomatoes take up most of the seasonal N?
   - [ ] During vegetative growth (before bloom)  **Correct!** Generally more than 60% of the seasonal N is taken up between early fruit set and red fruit stage
   - [x] Between early fruit set and red fruit stage
   - [ ] Between red fruit stage and harvest

2. True or false: Starter P should be applied to tomato transplants, even in fields with adequate P test values
   - [ ] True
   - [x] False  **Incorrect.** Often nurseries do not P-fertilize and the transplants arrive deficient, so it is a good idea to apply some starter P even if soil test P is adequate. For more information see Starter P-Application rate

[Calculate my score]
Outlook

- Add more crops
- Add quizzes
- Add case studies
# Case studies

## Grain corn

<table>
<thead>
<tr>
<th>Variety</th>
<th>5H-515</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Davis, Yolo County</td>
</tr>
<tr>
<td>Soil type</td>
<td>Rincon silt loam</td>
</tr>
<tr>
<td>Irrigation system</td>
<td>Furrow irrigation</td>
</tr>
</tbody>
</table>

## Nitrogen inputs

<table>
<thead>
<tr>
<th>N fertilizer applications</th>
<th>lbs N/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preplant Urea Broadcast, incorporated</td>
<td>100</td>
</tr>
<tr>
<td>Starter UN32 Band below seed</td>
<td>40</td>
</tr>
<tr>
<td>Topdress at 8-leaf stage Urea Banded in</td>
<td>50</td>
</tr>
<tr>
<td>Residual soil nitrate-N top foot 5 ppm</td>
<td>17.5</td>
</tr>
<tr>
<td>2nd foot 3 ppm</td>
<td>10.5</td>
</tr>
</tbody>
</table>

Expected N mineralization from residues: small
Expected N mineralization from manure: none

Total available N: 218
Case studies

- Wheat
- Corn
- Lettuce
- Carrot
- Cotton
Outlook

- Add more crops
- Add quizzes
- Add case studies

- Are the guidelines useful for your work with growers?
- How could they made more useful?
Thank you!

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