Assessing Organic Farm Nutrient Management

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Research Question
What are current organic farming operations practicing and can they properly apply fertilizers for crop growth as well as environmental sustainability?

Introduction & Background
How do organic farming rules influence the nutrient management practices on organic farms? There is insufficient evidence to show the current regulations on nutrient sourcing and application are feasible and effective.

- The term “organic” is often coupled with the idea of “sustainability;” however, organic production does not necessarily ensure sustainable production. [1]
- Nitrogen is a consistent limiting factor in this process and can make it difficult for farmers to create and maintain that proper nutrient balance. [2]
- Overfertilization is a common occurrence with farming today with significant impacts on the environment, like eutrophication and harmful algal blooms. [3]

Results

<table>
<thead>
<tr>
<th>Survey Participants</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Certified</td>
<td>16</td>
</tr>
<tr>
<td>Non-Certified</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
</tr>
</tbody>
</table>

Example t-test
Hypothesis: Farmers who test their irrigation water for nutrients before irrigating will have lower nutrient values.

\[ H_0: \mu_1 = \mu_2 \quad H_1: \mu_1 \neq \mu_2 \]

When p-value < 0.05, reject \( H_0 \)

- Test irrigation water Phosphorus 0.082

Conclusions
- As the interest in organic farming increases, it becomes increasingly important to employ feasible and environmentally sustainable nutrient management
- Practices are currently extremely varied

- Nutrient levels very high
- Organic farmers are not achieving ideal N:P
- Approaching significance
- Need a larger and more diverse sample

References

Methods
- Online survey distributed to organic farm owners/operators
- Collection/Data analysis on nutrient management practices, how and when nutrients are applied, what fertilizers are applied, and if nutrient calculations and/or soil tests are being used
- Collection and testing of soil samples offered through survey
- Comparison and statistical analysis of survey and lab results

<table>
<thead>
<tr>
<th>Participant ID</th>
<th>Nitrogen Application (lb/ac)</th>
<th>Phosphorus Application (lb/ac)</th>
<th>NO3-N ppm</th>
<th>N Level</th>
<th>PO4-P ppm</th>
<th>P Level</th>
<th>N:P</th>
</tr>
</thead>
<tbody>
<tr>
<td>OF2</td>
<td>Unsure*</td>
<td>Unsure*</td>
<td>11</td>
<td>Medium</td>
<td>19</td>
<td>Medium</td>
<td>0.58</td>
</tr>
<tr>
<td>OF7</td>
<td>Unsure**</td>
<td>Unsure**</td>
<td>7.6</td>
<td>Low</td>
<td>8</td>
<td>Low</td>
<td>0.95</td>
</tr>
<tr>
<td>OF11</td>
<td>Unsure**</td>
<td>Unsure**</td>
<td>235</td>
<td>Very High</td>
<td>192</td>
<td>Very High</td>
<td>1.22</td>
</tr>
<tr>
<td>OF14</td>
<td>30</td>
<td>5</td>
<td>29</td>
<td>High</td>
<td>145</td>
<td>Very High</td>
<td>0.20</td>
</tr>
<tr>
<td>OF17</td>
<td>Unsure*</td>
<td>Unsure*</td>
<td>30</td>
<td>High</td>
<td>12</td>
<td>Medium</td>
<td>2.50</td>
</tr>
<tr>
<td>OF19</td>
<td>200</td>
<td>150</td>
<td>85.91</td>
<td>Very High</td>
<td>59.87</td>
<td>Very High</td>
<td>1.48</td>
</tr>
</tbody>
</table>

| Average:       |                              |                                 | 66.42     | Very High | 72.64     | Very High | 1.16|

Unsure* - too many fields with variable values
Unsure** - does not keep track of this value
Low (0-9.9 ppm) - high probability that applying nutrients will elicit a growth response
Medium (10-25.9 ppm) - moderate probability of plant growth from application
High (26-50.9 ppm) - little or no response expected from the application of this nutrient
Very High (51+ ppm) - adding the nutrient may reduce growth or cause imbalance

**Irrigation Water Tested**

- No
- Yes

Phosphorus (ppm)

Variable | Nutrient | P-value |
----------|----------|---------|
Test irrigation water | Phosphorus | 0.082 |

Collection and testing of soil samples offered through survey
Comparison and statistical analysis of survey and lab results

Mentor: Rebecca Muenich, PhD
School of Sustainable Engineering
Arizona State University

Survey Response: 19

**Phosphorus (ppm)**

- 0.58
- 0.95
- 1.22
- 2.50
- 1.48
- 0.082

**Irrigation Water Tested**

- No
- Yes

**Phosphorus (ppm)**

- 0.58
- 0.95
- 1.22
- 2.50
- 1.48
- 0.082

Participants: 19