Interpreting Your Soil Test Results

Alberta Farm Fresh 2015

Dr. Doug Waterer

Why soil test?

Immediate - Obtain an estimate of supply of nutrients available in your soil

Immediate - Obtain recommendations as to how to modify soil fertility to maximize yields of target crops

Longterm – track changes in your soil (+/-)
To get Maximum Value from your soil test...

Timely sampling

Need enough time between sampling and seeding to ... sample, get results back from lab, access required fertilizer
- Spring and Fall sampling both ok
- To get quick turn around from lab ... avoid times when everybody else is sampling

Sample correctly

- Enough soil
- Collected from random/representative areas of the field
- Sample to correct depth
  - 0-12” vs 0-24”
- Stored properly and shipped promptly
- Labelled properly

Sample / Field Information:
Crop Year: 2015
Field Name: RODNEY G (SITE D)
Legal Location: 37.5 W3
Soil Climatic Zone: Black
GPS Reference:
Acres:
Previous Crop:
Yield:
Stubble Management: Spread
Rotation: Continuous
To get Maximum Value from your soil test ...

Sample correctly
- Labelled properly

Intended Crop : ............
Yield Goal : ............
Rainfall/Irrigated : ............

To get Maximum Value from your soil test ...
What features of your soil do you want to have tested?

“Standard Package”
- soil texture 
- soil pH
- soil salinity
- P, K, S, Ca and Mg

To get Maximum Value from your soil test ...

Interpreting your soil test ...

Soil texture
- ie; sandy loam

- function of native rock and weathering processes
- determines suitability of soil for various crops and cropping practices
- minimal change over time
Interpreting your soil test results ...

Soil pH
- function of native rock and weathering processes
- influences nutrient availability in soil
- pH of 6.5 – 7.5 = ok for most Hort crops
- slowly influenced by management practices

Soil salinity
- function of native rock and weathering processes
- varies within field as a function of topography
- changes over time ...
  - due to addition of fertilizers/manure
  - irrigation
  - rising water table

Soil Organic Matter
- Residues from previous crops and native plants
  - Portion is stable (fully decomposed) = humus
  - Portion is unstable = breaks down with time
  - Humus provides soil strength, nutrient and water holding capacity
  - Unstable portion = slow-release source of nutrients
  - Maintains balanced animal/microbial population in soil = well aerated, fertile soil with fewer diseases

Soil Organic Matter
- 5% soil O.M. considered ideal
  - Sandy soils preferred in Hort crop production start off with low O.M. content (1-3%)
Soil Organic Matter

• 5% soil O.M. considered ideal
  – Soil O.M. content decreases due to:
    • Minimal return of crop residues in Hort Crop production
    • Frequent tillage + Irrigation + Application of fertilizers speed breakdown of O.M.

Decrease in soil O.M. even faster in vegetable crops

Estimated % cover remaining after harvest of various crops.

<table>
<thead>
<tr>
<th>Non-Fragile Crop Residue</th>
<th>% Cover</th>
<th>Fragile Crop Residue</th>
<th>% Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barley/Wheat</td>
<td>70-90</td>
<td>Carrots</td>
<td>&lt;10</td>
</tr>
<tr>
<td>Corn (grain)</td>
<td>75-95</td>
<td>Potatoes</td>
<td>10-20</td>
</tr>
<tr>
<td>Canola</td>
<td>60</td>
<td>Beans</td>
<td>30-40</td>
</tr>
<tr>
<td>Grain sorghum</td>
<td>70-80</td>
<td>Cabbage</td>
<td>50-60</td>
</tr>
<tr>
<td>Pasture/Hay Crops</td>
<td>80-90</td>
<td>Corn</td>
<td>50-70</td>
</tr>
</tbody>
</table>

Challenge

• Preserve/add soil O.M. in vegetable fields

Soil Building Crops

Interpreting your soil test results ...

Cation Exchange Capacity (CEC)

- Measure of ability of soil to hold/supply (+) charged nutrients (Mg, Ca, K, Cu, Zn etc)
- function of native rock
- function of soil organic
- changes slowly

High CEC soils = safe to fall-apply nutrients
Interpreting your soil test results ...

Levels of Nutrients
- Lab uses extraction techniques that approximate amount of nutrients present in soil sample that will be available within a typical growing season
- Optimal extraction technique varies with:

<table>
<thead>
<tr>
<th>Soil type</th>
<th>Nutrient</th>
<th>Opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phosphorus - P ppm</td>
<td>Bicarb</td>
<td>Bray-PI</td>
</tr>
<tr>
<td>33 M</td>
<td>56 M</td>
<td></td>
</tr>
<tr>
<td>28 M</td>
<td>42 L</td>
<td></td>
</tr>
</tbody>
</table>

1 ppm = 2 lbs/a

Fertilizer Recommendations
Total Crop Reqmt – Soil Level (from Test) = Amt Fertilizer recommended

Ex: for P fertility for potatoes ...
Total Req'd - Soil Test = Fertilizer Req'd
150 #/a (dBase) – (56 ppm*2) = 50 lbs/a

Total Crop Reqmt dBase
- Compilation of research results (field and ghse) of yield response to increasing fertility levels
- Assess relevance of this research to local situation (yield potential, production methods, soil type etc)
- Establish your lab's recommendations – then tweak in response to;
  - New data
  - Changing grower practices
Major Garden Crops on the CDN Prairies

Total Crop Reqmt dBase

Optimum Yield vs Optimum Profit?

Interpreting your soil test results...

Soil N
- Hort crops have high N reqmts and yields are v. responsive to applied N fertilizers
- However soil tests are of limited value in estimating soil's ability to supply crop's N needs

Why are tests of soil NO3 levels little value for estimating fertilizer N reqmts
If tests of soil NO3 levels are of little value for estimating fertilizer N reqmts ...

Option 1. Assume that there is no residual N left in soil.

Apply... 100% of crop’s N reqmnt

Valid if ...
- previous crop makes full use of applied N
- extensive leaching during crop and overwinter
- soil is low in O.M. or turn over of O.M. during crop year will be limited (cold, dry soil)

Option 2. Attempt to estimate amt of N that will be freed up from the O.M. pool over the course of a typical year

Apply... Crop’s N reqmnt – Soil N

Estimate is based on ...
- measurement of soil NO3 level
- measurement of soil O.M. content
- measurement/estimate of amt of N that will be released by mineralization of the O.M. over a typical season

Soil Test FAQ ....

• Are soil tests “necessary” – especially because my crops always look “OK”.

Answer – in Hort Crops worth > $1000/a .. just a little yield loss = $$$

A soil test is cheap insurance

Soil Test FAQ ....

• I don’t need to soil test – because I’m always generous with the fertilizer.

Answer: Fertilizer is expensive.

A $100 soil test on a 5a field pays for itself if helps the grower reduce fertilizer application by just 15%.

Excess fertilizer is also harmful to the environment..
Soil Test FAQ ....

• Do I really need to soil test every year ... especially because my fields always test about the same.

Answers:
- A soil test is cheap insurance
- A historic record of soil fertility is useful.

Remember
- Your soil is changing
- Every soil can use improvement
- Your soil's health is your responsibility

Soil Test FAQ ....

• If I send my soil samples to 2 different labs ... will I get the same results/recommendations

Answers:
- Results
  - Should be the same ... if they are using the same testing technique
- Recommendations
  - Each lab has their own database and way of forecasting crop nutrient requirements and fertilizer responses
  - Hopefully close to each other

Soil Test FAQ ....

• The results/recommendations I got from my soil test don't make sense

Answers:
- Labs have staff who should be able to answer your questions
- If not ........

Soil Test FAQ ....

• What else can the lab test for ...

Answer:
Range of services varies from lab to lab
- Heavy metals (Pb, Hg, As, Cd) – usually
- Other pollutants – ask
- Pesticide residues – less common
- Microbial concerns – uncommon

Welcome to the Vegetable Program at the Department of Plant Sciences, University of Saskatchewan.

www.veg.usask.ca
Vegetables + Saskatchewan