Helping growers protect their most valuable asset: **Soil**

Kaustubh D. Bhalerao, CEO
October 25, 2016
http://soildiagnostics.com
Managing soil productivity through actionable and cost effective diagnostics

**Vision:** Enable corn and soybean growers to reach full profit potential of their land through effective management of their soil-based diseases and nutrients

**Mission:** Develop and provide the best diagnostic tools so that corn and soybean growers can continuously analyze, monitor and take action to optimize the health of their soil
Soil is the growers’ *key asset* and the foundation for sustainability

- **Soil is more actionable than weather** – farmers can choose what they grow and where. A disproportionate level of focus in the agricultural industry is placed on understanding weather as opposed to soil.

- **Soil nutrients and pathogens need to be *diagnosed and monitored.*** Just as advances in human blood testing and diagnostics have been made over the past decade (numerous large companies exist in life sciences today as a result of these advances), similar advancement will be made in the diagnostics of soil.

- **Agronomists are the growers’ *trusted advisors*** and the best way to introduce Soil Diagnostics Inc’s products to the farming community.
Product Pipeline

- **FertiSaver-N** (Beta program now open)
  A rapid, high throughput soil test to determine the soil’s nitrogen supplying power

- **SCNExtractor** (Under negotiation for license)
  A parallelized, automated system to extract and quantify soybean cyst nematodes from soil samples

- **SoilDx Dashboard** (Available now under Beta program)
  An integrated Web-based service to control all Soil Diagnostics Inc. soil testing hardware, store soil test results, track device reliability, order consumables and generate site specific nutrient and nematode management recommendations

- **SCN Virulence test** (in development)
  DNA-based diagnostic to match field nematode types with appropriate resistant varieties

- **Soil Health Index** (in development)
  A panel of chemical and biological assays to monitor the overall health and resiliency of an agricultural soil
FertiSaver-N
A soil test to optimize nitrogen fertilizer usage
Agronomists demand **FertiSaver-N**

- Nitrogen on corn: $75-100/ac
- Excess nitrogen fertilizer is economically inefficient and ecologically harmful
- **FertiSaver-N** can save farmers approximately $35/ac

There is urgent demand from progressive agronomists and soil testing labs for a rapid, reliable and simple assay to quantify organic nitrogen in the soil.
Market Analysis:
• US Corn acres (2016): 96.3 M
• Segment currently addressed: Midwest farms >1000 acre: 25 M
• Initial target: IL & IA: 8 M

Channel:
• ~500 independent agronomists providing advice to large farmers
• Current reach: 6 committed customers (up to 1M acres)

Revenue Potential:
• $2 / acre / year
• 2017: 8-15 clients (2 M acres)
• 2022: 8 M acres
Soil test-based N recommendations

Lost sales ($35) Saves $25 Makes $10 Makes $2

Approximate $ benefit from FertiSaver-N
Soil test-based N recommendations

<table>
<thead>
<tr>
<th>Dealer</th>
<th>Farmer</th>
<th>Agronomist</th>
<th>Soil tester</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Send prescription to dealer</td>
<td>8. Sell Fertilizer</td>
<td>5. Deliver results</td>
<td></td>
</tr>
<tr>
<td>6. Prepare prescription</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Lost sales ($35) Saves $25 Makes $10 Makes $2

Approximate $ benefit from FertiSaver-N
Soil test-based N recommendations

1. Request nitrogen recommendation

Saves $25

Lost sales ($35)

Makes $10

Makes $2

Approximate $ benefit from FertiSaver-N
**FertiSaver-N: High Throughput Lab Test**

- **Fast**: 10x throughput over current method: Allows agronomists to reach more growers
- **Simple**: electronic measurement, Web-based interface (*SoilDx Dashboard*) - Low labor and skill requirements
- **Reliable**: Integrated calibration and validation, automated sample tracking - Reduced operator error
- **Secure**: End-to-end encryption

**Development Status:**
- ✓ Hardware validated
- ✓ Procedure optimized
- ✓ Web interface operational ([www.soildx.com](http://www.soildx.com))
- ✓ Provisional patent filed
- ✓ Recommendation model infrastructure in place.
- ✓ Product will become available for first clients in November 2016
FertiSaver-N Action Plan

**Recommendation for 2017**
Instructions: Add as much information as you can. Estimates will be used for missing values.

**Location Information**
We need to know your soil type. Please enter a location for the test. You may enter Latitude - Longitude or you may select your location on the map. Alternatively, you may select the soil series that corresponds to the test.

**Location**
![Map Image]

**Management Information**
The carbon/nitrogen composition of the residue from the last crop determines its decomposition rate. Low nitrogen residue like corn stover and wheat straw require a small amount of nitrogen to aid decomposition. The nitrogen requirement is offset by recent manuring history. No-till typically requires extra nitrogen unless your field has had enough time to equilibrate (typically over 5 years).

**Tillage practice**
Conventional Tillage

**Previous crop**
Soybean

**Previous crop yield (in bushels per acre)**
58

**Plant population (# of plants per acre)**
32000

**Recent manuring history (pounds of manure applied)**
0

**Typical corn yields for your location (Optional. This is calculated from your location's productivity index)**

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**FertiSaver-N Action Plan**

**Residue Decomposition**
30 lb/ac
Fall 2016

Since you are going corn over corn, we recommend getting a headstart on decomposing your 2016 corn stover residue with 30 lb/ac of anhydrous ammonia applied after (suitable date). Inhibitor products are not necessary.

**PH / Soil Texture Improvement**
3 ton/ac
Fall 2016

Your pH is a little below optimal. We suggest applying 3 ton/ac of lime in the form of calcium oxide (CaO) or calcium carbonate (CaCO₃) in order to restore the soil to neutral pH, critical for optimal mineralization. Gypsum (CaSO₄) will provide sulfur, but will not restore your pH levels.

**Preplant Nitrogen**
70 lb/ac
Spring 2017

Apply 70 lb/ac as anhydrous ammonia if you can get in 4 weeks before planting. Closer to planting, or as sidedress after germination, we suggest 70 lb/ac as ammonium nitrate. This is your primary fertilizer application.

**Late Sidedress**
30 lb/ac
Late Spring 2017

A late sidedress of 30 lb/ac may be necessary if 2017 Spring turns out to be cooler and / or wetter than usual. We strongly recommend a nitrate test prior to application to determine exactly how much nitrogen you will need.

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Helping farmers protect their most valuable asset: Soil
FertiSaver-N Beta Program

• Six soil testing labs
• Beta test hardware & software
• Participation fee ($5,000) covers discounted hardware and free software license for 1 year
## Competition

<table>
<thead>
<tr>
<th></th>
<th>Solvita SLAN</th>
<th>In-Season Nitrate Testing</th>
<th>Computational Tools</th>
<th>Do Nothing / Status Quo</th>
<th>FertiSaver-N</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Throughput</strong></td>
<td>100-150/d</td>
<td>100-150/d</td>
<td>∞</td>
<td>NA</td>
<td>1500 /d</td>
</tr>
<tr>
<td><strong>Utility in Planning</strong></td>
<td>Low</td>
<td>None</td>
<td>Low</td>
<td>NA</td>
<td>High (Action Plan tool)</td>
</tr>
<tr>
<td><strong>Realtime Actionability</strong></td>
<td>NA</td>
<td>Yes</td>
<td>Yes</td>
<td>NA</td>
<td>Yes (planned)</td>
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<tr>
<td><strong>Cost to grower</strong></td>
<td>$30/ac</td>
<td>$5/ac</td>
<td>$2-10/ac</td>
<td>$0</td>
<td>$10/ac</td>
</tr>
<tr>
<td><strong>Benefit to grower</strong></td>
<td>No evidence</td>
<td>Rarely</td>
<td>$20-35 in IL / IA</td>
<td>$0</td>
<td>$35 in IL / IA</td>
</tr>
<tr>
<td><strong>Biggest challenge</strong></td>
<td>DIY</td>
<td>High variability</td>
<td>Depends on input data (GIGO)</td>
<td>Lowered profitability</td>
<td>Market penetration</td>
</tr>
</tbody>
</table>
SCNExtractor
A rapid soil test to quantify a soybean pathogen
Soybean cyst nematode (SCN) is the most devastating pathogen of soybean. Yield losses in the U.S. are estimated at $1.8 billion in 2015. Given that soybean was planted on 85.1 million acres in 2015 and yielded an average of $427 per acre, the loss is approximately $21 per acre, or 5% of the value of the soybean output.
Business Model: Products and Services

- Agronomists / Soil testing labs will increase their productivity as follows:
  - Purchase and set up testing hardware (one time expense, or structured as a monthly payment) for both *SCNEExtractor* and *FertiSaver-N*
  - Access *SoilDx Dashboard* and pay a flat annual license fee to cover Web infrastructure and IT support
  - Pay a per-test fee on every test done.
- Additional recurring revenues from:
  - Generating recommendations and reports
  - Product promotion / advertisement revenue on generated recommendations and reports
Team

- Kaustubh Bhalerao, PhD (Agricultural Engineering, Automation, Synthetic Biology, Web technologies), CoFounder and CEO
- Saeed Khan, PhD (Soil Science / Biochemistry)
- Chinmay Soman, PhD (Nanotechnology, Environmental microbiology, Data Science)
- Benjamin Thompson, BS Technical Systems Management, (Automation and Hardware Development)

Details at http://soildiagnostics.com/about
Strategic partnerships

AGRIBLE™

Advanced Nutrient Engine

360 YIELD CENTER

Fertilizer Application Equipment Manufacturer

CTC

Leading Crop Consultant
Advisers

• Scientific:
  Richard L. Mulvaney, Professor, University of Illinois
  Kris N. Lambert, Associate Professor, University of Illinois
  Greg Tylka, Professor, Iowa State University

• Business:
  Chris Harbourt, CEO, Agrible
  Rob Schultz, Managing Partner, Serra Ventures
  Narendra Kale, Founder, Kale Logistics Solutions / Accelya
  Gary Durack, Founder, The TEKMILL

• Agriculture:
  Ken Ferrie, Crop Tech Consulting
  Gerald Tumbleson, 2005-06 President, National Corn Growers Association
Financial Projections for **FertiSaver-N**
2016(Q3) - 2020(FY)

![Graph showing accumulated value and net accumulated value without SBIR over time]

**Estimated Phase II NSF SBIR Award**

### Market Metrics
<table>
<thead>
<tr>
<th></th>
<th>Q3-4 2016</th>
<th>Phase II Yr 1</th>
<th>Phase II Yr 2</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acres covered</td>
<td>0</td>
<td>185,000</td>
<td>627,500</td>
<td>1,502,500</td>
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<tr>
<td>% Market captured</td>
<td>0.00</td>
<td>0.96</td>
<td>2.58</td>
<td>3.96</td>
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<tr>
<td>Test revenue @ $3/test</td>
<td>$0</td>
<td>$222,000</td>
<td>$753,000</td>
<td>$1,803,000</td>
</tr>
<tr>
<td>Total Revenue</td>
<td>$100,000</td>
<td>$897,000</td>
<td>$1,498,400</td>
<td>$1,047,000</td>
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<tr>
<td>Total COGS</td>
<td>$61,200</td>
<td>$159,250</td>
<td>$329,620</td>
<td>$533,530</td>
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**Personnel**

<table>
<thead>
<tr>
<th></th>
<th>Science</th>
<th>Engineering</th>
<th>Marketing / Sales</th>
<th>Administration</th>
</tr>
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<tr>
<td>Q3-4 2016</td>
<td>$0</td>
<td>$12,000</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Phase II Yr 1</td>
<td>$54,000</td>
<td>$84,000</td>
<td>$0</td>
<td>$12,000</td>
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<tr>
<td>Phase II Yr 2</td>
<td>$249,000</td>
<td>$254,000</td>
<td>$80,000</td>
<td>$62,000</td>
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</table>

**Other**

<table>
<thead>
<tr>
<th></th>
<th>Legal</th>
<th>Accounting</th>
<th>Travel</th>
<th>Total Revenue</th>
<th>Total Expense</th>
<th>Gross income (EBIT)</th>
<th>Tax (35%)</th>
<th>Net Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q3-4 2016</td>
<td>$4,000</td>
<td>$1,200</td>
<td>$6,000</td>
<td>$100,000</td>
<td>$88,000</td>
<td>$12,000</td>
<td>$4,200</td>
<td>$7,800</td>
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<tr>
<td>Phase II Yr 1</td>
<td>$24,000</td>
<td>$2,400</td>
<td>$12,000</td>
<td>$897,000</td>
<td>$392,650</td>
<td>$504,350</td>
<td>$176,523</td>
<td>$327,828</td>
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<tr>
<td>Phase II Yr 2</td>
<td>$24,000</td>
<td>$12,000</td>
<td>$24,000</td>
<td>$1,498,400</td>
<td>$1,228,120</td>
<td>$270,280</td>
<td>$94,598</td>
<td>$175,682</td>
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<tr>
<td>2019</td>
<td>$24,000</td>
<td>$12,000</td>
<td>$60,000</td>
<td>$2,260,600</td>
<td>$1,882,730</td>
<td>$377,870</td>
<td>$132,255</td>
<td>$245,616</td>
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</tbody>
</table>

**Estimate based on current operating costs and assumed revenue of $1.2 / acre**

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**Potential Phase II NSF SBIR Award**

- **Soil testing season**
- **Accumulated value**
- **Net accumulated value without SBIR**

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**Financial Projections for FertiSaver-N 2016(Q3) - 2020(FY)**
Funding and commercialization history

- **SCNExtractor** prototyping and proof-of-concept awards: $105,000 (2013, 2014)

- Illinois I-Start Award for business development: $11,000 (2015)

- National Science Foundation SBIR Phase I for **FertiSaver-N**: $150,000 (2016)

- **FertiSaver-N** Beta Program: $30,000 anticipated in Sep-Oct 2016

- **SCNExtractor** consulting and licensing revenue $100,000 anticipated
Funding needs

• Soil Diagnostics, Inc. requests $150,000 for business development:
  • Hiring 1-2 sales associates
  • Developing marketing materials
  • Travel and Materials