Nvision:
Remote sensing to visualize AND CORRECT nitrogen (N) deficiency in corn

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Corn

• $65 billion/year
• Yield is highly dependent on nitrogen (N) fertilizer
• Nitrogen is lost in wet weather
2008-2011: wet springs across the Corn Belt

Outlined areas > 16 inches rain April-June

2008

2009

Corn Belt

2 billion bushels of lost yield potential = $10 billion
...and the wet area (i.e. the market) is expanding.
This problem can be corrected by applying more N fertilizer

But less than 10% of farmers have done so

WHY NOT?

Lack of decision support
Product: Decision Support
• Which fields have problems? Which are OK?
• How much yield am I losing?
• How much more fertilizer do I need?

Platform: Remote Sensing
• Healthy corn is dark green
• N-deficient corn is light green
• You can see it from the air
• Can survey LARGE areas quickly
NVision: quantitative decision support

aerial photo

yield loss map (ave 74)

N rate map: fix the problem

Will rescue N pay?
Where’s the money?

cost vs benefit

<table>
<thead>
<tr>
<th>Cost Item</th>
<th>$/acre</th>
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</thead>
<tbody>
<tr>
<td>Average corn profit 2004-2013 (USDA)</td>
<td>65.4</td>
</tr>
<tr>
<td>Projected Nvision price</td>
<td>-3.9</td>
</tr>
<tr>
<td>Loss if rescue N applied but not needed</td>
<td>-1.1</td>
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<tr>
<td>Net return to rescue N in trials</td>
<td>127.6</td>
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NVision in the market

- Patents issued June 2012, Aug 2013
- Main competing product is crop canopy sensors
  - Mounted on ground rigs
  - Can do a good job in individual fields, but can’t tell you which fields to go to
- Simulation models are a new entry in the market—could compete, could complement
Market Strategy

• Approach customers (farmers) via fertilizer sellers
• Seek agreements with corporate offices
  – But also market at individual locations
• Distribute product via agricultural cloud / software providers already used by fertilizer sellers
Development Milestones: Remote Sensing

1. Test satellite imagery to validate
   - Only imagery obtained from airplanes is validated
2. Develop strategy: optimal use of satellites, airplanes, drones
3. Negotiate prices and other terms with remote sensing providers
   - Contracts if appropriate
   - Redundancy to guarantee service
   - Include airplanes for weather flexibility
Development Milestones: Information Processing

1. Develop channels for information flow to agricultural cloud / software providers
2. Develop automated processing systems
   a. Interface with or operate within systems of ag cloud providers
3. Develop customer (farmer, fertilizer seller) interface and supporting software
Development Milestones: Marketing

1. Marketing campaign to educate major fertilizer sellers
   - Corporate offices first, then key sales locations

2. ROI campaign
   - Average cost $50/acre, average return $170/acre in 11 on-farm trials with rescue N fertilizer after excess rain
   - Based on 4-year average prices for corn and N fertilizer
   - High ROI for farmer means excellent opportunities for Nvision (marketing & coordination), fertilizer sellers, ag cloud providers, & remote sensing providers
Nvision: Summary

- Nitrogen is lost in wet weather, corn yield is lost ($10 billion 2008-2011)
- Remote sensing can visualize nitrogen deficiency
- Patented process converts remote sensing to quantitative decision support tools
  - Applying more fertilizer rescues corn yields
Nvision: Summary

- Existing capacity can be harnessed to support this product
  - Remote sensing
  - Agricultural cloud / software
  - Fertilizer sellers

- Someone has to market the product and coordinate the above players

- Propose a new entity: NVision