INNOVATIVE WAYS TO ESTABLISH COVER CROPS

PRACTICAL FARMERS OF IOWA ANNUAL CONFERENCE | JANUARY 17, 2019

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BlairKellie
HomeAgainFinnegan
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Oats & Rye – Hagie Seeded
November

May
Cover Crops
Erich Wickman
Wickman Chemical
Soon there will be 9 Billion people in the world, yet fewer and fewer are working agriculture.

Automation and Technology are critical to feed a growing population with a shrinking labor force.
There have been tremendous advancements in agricultural technology over the past several decades, however, agrichemical spraying has not kept pace.
Stuck In The Mud
The Rantizo Concept

How Rantizo Works

1. Identify

- Soybean field in southern Iowa
- Field imagery identifies problem areas
How Rantizo Works

2. Diagnose

- Yellow streaking on leaves
- Nutrient deficiency
- Micronutrient application needed
How Rantizo Works

3. Apply

Treatment Plan:

• (6) 50’ x 200’ treatment strips
• (2) reps per treatment strip
• (3) treatment variants

#1 Water/NIS/Folia IQ Cu 2gal/ac
#2 Water/NIS/Folia IQ Cu 3gal/ac
#3 Water/NIS/Folia IQ Cu 3gal/ac
#4 Water/NIS/Folia IQ Cu 2gal/ac
#5 Water/NIS/Domark
#6 Water/NIS/Domark

*adjacent, non-treatment rectangles were used as checks for each treatment
How Rantizo Works

4. Verify

Leaf tissue analysis pre and post (DAT) treatment (Midwest Laboratories)

- Pre-test
- Post-test, Untreated
- Post-test, Treated

Copper Content (PPM)

50% increase in copper (pre to post-sampling)

Average Bushel + or – (compared to check area)

- Water/NIS/Domark
- Water/NIS/Folia IQ Cu

2.6% yield increase
Dry Application Opportunities

- Cover crop seeds
- Pollen
- Granular fertilizers
- Beneficial insects
Drone-Based Cover Crop Seeding
Why Drones for Cover Crops?

“Accuracy”

“Timing in between rains”

“Plots...seems like a no brainer”

“I was amazed how fast it can fill in small patches. It Turns around much faster than a tractor, airplane, or helicopter with no crop damage.”

“Aaverage farmer can buy, maintain and, fix themselves, unlike an air tractor.”

Benefits

- Increased field access
- Reduced crop damage
- Eliminated soil compaction

Use Cases

- Prevent plant patches
- Row crop interseed/overseed
- No till practices
- Nutrient retention
- Organic ecosystem facilitation
Cover Crop Seed Application

Rantizo Applications

- Location: Northern, IA
- Cover crop seed:
  - Annual rye
  - Crimson clover
  - Radish
  - Brassica mix
- Use case: Muddy patches in fields

I was amazed how fast it can fill in small patches. It turns around much faster than a tractor, airplane, or helicopter with no crop damage.

2 Likes
Spencer Stensrud
@SpencerStensrud

We used a 15 foot spread pattern and broadcast 10, 15, or 20 pounds of the annual rye, radish, crimson clover, and brassica mix. The goal is to increase water infiltration, hold back weeds, and increase nutrient availability. (And test effectiveness of drone broadcast seeding)
Cover Crop Seed Application

Rantizo Applications

- **Location**: Ainsworth, IA
- **Cover crop seed**: 8-way mix: cowpea, harry vetch, clover, radish, etc.
- **Use case**: Interseeding
Cover Crop Seed Application

Rantizo Applications

- Location: West Union, IA
- Cover crop seed:
  - Crimson clover 5.5 lb./ac
  - Harry vetch 15-10 lb./ac
- Productivity: 30 ac/hr
Cover Crop Seed Application
Cover Crop Seed Application

Rantizo Applications

- Location: Prairie Du Chien, WI
- Cover crop seed:
  - Buckwheat
Cover Crop Seed Application

Rantizo Applications

• Location: Hayesville, IA
• Cover crop seed: Cereal rye
• Use case: Standing corn
• Field size: 35-40 acres
• Application rate: 25 lb/acre

@rantizosprays cover crop on...Jake was an excellent pilot. We learned a lot...RAINED last night 😊😊
# Productivity Calculations

<table>
<thead>
<tr>
<th>Lbs. per acre</th>
<th>Acres per hour</th>
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<tbody>
<tr>
<td>10</td>
<td>12</td>
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<td>15</td>
<td>8</td>
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<td>20</td>
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<td>30</td>
<td>4</td>
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<tr>
<td>40</td>
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Additional Statistics
Agricultural Spraying Market

Agrichemicals
• Decreased effectiveness
• Increased spray frequency

Custom Applicators
• Treat 70% of U.S. cropland
• Heightened operational challenges
  - Labor shortages
  - Capital expenditures
  - Employee safety

Global annual chemical application market

$36B
Path to Unmanned Spraying

- Autonomous flight
- Collision avoidance
- Terrain follow
- Manual reloading
- Autonomous reloading
- Integrated imagery
- Autonomous refueling
- Swarming
- Electrostatics
- Cartridges

Fully Autonomous
Spot Spraying Benefits

Assumptions

- **Total acres = 100**
- **Chemical cost per acre = $35**
- **Yield increase per acre treated = 15 (bu/ac)**
- **Price per bushel = $4**

<table>
<thead>
<tr>
<th>Assume NAC (NaC) = 100%</th>
<th>Assume NAC (NaC) = 75%</th>
<th>Assume NAC (NaC) = 50%</th>
<th>Assume NAC (NaC) = 25%</th>
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<tbody>
<tr>
<td>% of acres requiring treatment</td>
<td>Drone</td>
<td>Ground</td>
<td>Aerial</td>
</tr>
<tr>
<td>% of acres treated</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
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<tr>
<td>Total chemical cost</td>
<td>$3,500</td>
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<tr>
<td>Profit/acre</td>
<td>$14</td>
<td>$18</td>
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<td>Total profit</td>
<td>$1,350</td>
<td>$1,800</td>
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<tr>
<td>Drone advantage (hire vs. ground)</td>
<td>$ (450)</td>
<td>$ (450)</td>
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</table>
# Multiple Pass Scenario

<table>
<thead>
<tr>
<th>% ac requiring treatment</th>
<th>1st Pass</th>
<th>2nd Pass</th>
<th>3rd Pass</th>
<th>Spot Spraying Cost</th>
<th>Full Coverage Cost</th>
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</thead>
<tbody>
<tr>
<td>% ac treated</td>
<td>25%</td>
<td>10%</td>
<td>5%</td>
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<tr>
<td>Total chemical cost</td>
<td>$875</td>
<td>$350</td>
<td>$175</td>
<td>$1400</td>
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Rantizo Spray Economics

Cost per Acre vs. Acres Applied

2020 Milestones
• Mix & Fill Station
• Swarming

2021 Milestones
• Trailer

2022 Milestones
• Electrostatics
• Cartridges

* $150/hour rate
Revenue Opportunities

Drone, Sprayer and Software Sales
- Equipment sales
- Franchise/Distributorship

Application Service and Training
- Application service sales
- Partnership service royalties

Agrichemical Cartridges

Data Aggregation
78% 

Increase to serviceable area with same labor force when increasing to 100 mile radius from 75 mile radius
### Lafayette, IN Weather Data – June 2018

#### Traditional Methods – 47 Hours to Spray

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<th>Monday</th>
<th>Tuesday</th>
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<th>Thursday</th>
<th>Friday</th>
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<td>2</td>
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</tr>
</tbody>
</table>

**Legend:**
- **GREEN** = 8 or more legal spray hours in a day
- **YELLOW** = Less than 8 legal spray hours in a day
- **RED** = Could not spray due to off-label weather conditions, rainfall event, or fields too wet.

#### 106 Legal Hours Ignoring Rainfall

<table>
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<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
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<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

**Legend:**
- **GREEN** = 8 or more hours with no temperature inversion and favorable wind speeds during daylight hours
- **YELLOW** = Less than 8 hours with no temperature inversion and favorable wind speeds during daylight hours
- **RED** = Could not spray due to temperature inversion or off-label wind speeds

Platform Feature: Drone

- DJI Agras MG-1P
- Market leader in drone development
- Built for agricultural spraying
Platform Feature: Upgrade Kit

- 20' swath width
- 2.7 gallon tank
- 14 acres/hour
- 3.5 acres/charge
Automates the refill process
- Reduces refill time and operator fatigue
- Improves productivity to 23 acres/hour
- The agility of the drone is extended to all aspects of chemical handling
Platform Feature: Software Suite

- Desktop and mobile friendly interfaces
- Job scheduling and inventory tracking
- Back office and in-field status monitoring
- Job list and truck loading checklist
- Automated equipment configuration
- Invoicing and reporting
Platform Feature: Trailer

- Custom applicators desire a full package
- Contains everything needed to spray
  - Generator
  - Water Tank
  - Mix & Fill
  - Workspace
- Observation deck enables more flights
Platform Development: Electrostatics
Platform Development: Cartridges

- Safer chemical handling
- Auto-docking and reloading
- Streamlined logistics
- Enhanced security
- Recurring revenues
Existing data companies simply gather and identify information.

The Rantizo platform utilizes an intelligence vault of data to identify pests, diagnose treatments, accurately apply solutions and verify success.

This intelligence vault is valuable for farmers, ag retailers, and industry partners.
Rantizo Territories
Barriers to Entry

Intellectual Property

Granted
- License & Distributorship rights for issued patent
- Trademark for Rantizo®
- Trademark for Fly & Apply®

Filed
- Provisional patent for cartridge reloading system

Planned
- Patent for reconfigurable boom
- Patent for software integration

Licensing
- Part 137 Certification (multiple states)
- 2 Employees with Part 107 Certification & Commercial Pesticide Licenses
Partners
Rantizo In The News

Winner:
- 2018 AgLaunch Pitch Competition
- 2019 Ag Innovation Competition
- 2019 Pappajohn Iowa Venture Competition
- 2019 Best Tech Startup

Voted:

Featured In:
Successful

Location: 41.699952, -92.012435
Crop: Soybeans
Identified Pest: Waterhemp
Prescribed Treatment: Liberty
Application Rate: 38 oz/ac
Wind: 5 mph NE
Temperature: 83°F
Not Successful

Location: 41.720188, -92.047765
Crop: Soybeans
Identified Pest: Waterhemp
Prescribed Treatment: Dicamba
Application Rate: 8 oz/ac
Wind: 3 mph SW
Temperature: 88° F
Prediction & Prescription

Sample Analysis

Waterhemp Treatment by Pesticide

Pesticide Applied

- **Roundup**
- **Dicamba**
- **Liberty**
Prediction & Prescription

Sample Analysis
Waterhemp Treatment by Pesticide

Pesticide Applied
- **Roundup**
- **Dicamba**
- **Liberty**
Near Term Market Opportunities

High Value Use Cases

• Specialty crops
• Greenhouses
• Organics
• Test plots
• Pollen application
• Beneficial insects

Spot Spraying

Rescue Situations
## The Competition

<table>
<thead>
<tr>
<th>Company</th>
<th>Equipment Cost</th>
<th>Per Acre Cost</th>
<th>Under 55 lbs.</th>
<th>FAA Approved</th>
<th>Multi-state licensing</th>
<th>Integrated imagery</th>
<th>Ease of use</th>
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</thead>
<tbody>
<tr>
<td>RANTIZO</td>
<td>$$</td>
<td>$</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>High</td>
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<tr>
<td>Leading Edge Aerial Technologies</td>
<td>$$$</td>
<td>$$</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>High</td>
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<tr>
<td>KIWI</td>
<td>$$$</td>
<td>$$</td>
<td>✓</td>
<td>×</td>
<td>✓</td>
<td>×</td>
<td>Low</td>
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<tr>
<td>hse.com</td>
<td>$</td>
<td>$$</td>
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<td>×</td>
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<td>hyl.io</td>
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<td>✓</td>
<td>×</td>
<td>×</td>
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<tr>
<td>Scorpion Drones</td>
<td>$</td>
<td>N/A</td>
<td>✓</td>
<td>×</td>
<td>×</td>
<td>×</td>
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<tr>
<td>YAMAHA</td>
<td>$$$</td>
<td>$$$</td>
<td>×</td>
<td>✓</td>
<td>×</td>
<td>×</td>
<td>Medium</td>
</tr>
</tbody>
</table>
# Rantizo Spray Economics

## Assumptions:
- 5 drones/swarm
- $150/hour
- $4/acre minimum when using swarms
- 8 hours/day
- 80 spray days/year

## Introduction of:
- >55lb unit and swarming capability - 2020
- Accelerated electrostatic adoption - 2021
- ~100lb unit - 2022
- ~150lb unit and alternative fuel source - 2023

### Single Drone

<table>
<thead>
<tr>
<th>Drone</th>
<th>A/hr</th>
<th>A/day</th>
<th>$/A</th>
<th>$/hr</th>
<th>Drones to Cover 1MM Acres</th>
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</thead>
<tbody>
<tr>
<td>Agras</td>
<td>6</td>
<td>47</td>
<td>$25.37</td>
<td>$150</td>
<td>264</td>
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<tr>
<td>w/ Pump Upgrade</td>
<td>10</td>
<td>82</td>
<td>$14.65</td>
<td>$150</td>
<td>153</td>
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<tr>
<td>w/ Pump &amp; Boom Upgrade</td>
<td>13</td>
<td>106</td>
<td>$11.31</td>
<td>$150</td>
<td>118</td>
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<tr>
<td>T16</td>
<td>14</td>
<td>115</td>
<td>$10.39</td>
<td>$150</td>
<td>108</td>
</tr>
<tr>
<td>w/ modifications</td>
<td>18</td>
<td>147</td>
<td>$8.15</td>
<td>$150</td>
<td>85</td>
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<tr>
<td>Rantizo ESS 55</td>
<td>22</td>
<td>174</td>
<td>$6.89</td>
<td>$150</td>
<td>72</td>
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<td>Rantizo ESS 75</td>
<td>28</td>
<td>222</td>
<td>$5.39</td>
<td>$150</td>
<td>56</td>
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<tr>
<td>Ground Application</td>
<td>75</td>
<td>600</td>
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<tr>
<td>Aerial Application</td>
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<td>1,200</td>
<td>$15.00</td>
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</tbody>
</table>

### Swarm

<table>
<thead>
<tr>
<th>Swarm</th>
<th>A/hr</th>
<th>A/day</th>
<th>$/A</th>
<th>$/hr @ $4/A</th>
<th>Swarms to Cover 1MM Acres</th>
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</thead>
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<td>w/ modifications</td>
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<td>T16 w/ modifications</td>
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<td>736</td>
<td>$4.89</td>
<td>$450</td>
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<td>Rantizo ESS 55</td>
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<td>871</td>
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<td>Rantizo ESS 75</td>
<td>139</td>
<td>1,112</td>
<td>$3.24</td>
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## Cost per Acre vs. Acres Applied

- $2.00 - 5,000,000 Acres
- $4.00 - 10,000,000 Acres
- $6.00 - 15,000,000 Acres
- $8.00 - 20,000,000 Acres
- $10.00 - 25,000,000 Acres

## Acres / Day

- Agras
- w/ Pump Upgrade
- w/ Pump & Boom Upgrade
- T16
- w/ modifications
- Rantizo ESS 55
- Rantizo ESS 75

*$150/hour rate
# Rantizo Differentiation

<table>
<thead>
<tr>
<th>Spray Method</th>
<th>Application cost per acre</th>
<th>Equipment Cost</th>
<th>Field Condition Independent</th>
<th>Crop Agnostic</th>
<th>Spot Spraying Capability</th>
<th>Reduced Soil Compaction/Crop Damage</th>
<th>Overspray/Drift</th>
<th>Autonomy</th>
<th>Agrichemical Exposure</th>
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<td>RANTIZO</td>
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<td>✗</td>
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</table>
25% The percent of growers that stated input costs were their biggest challenge

Savings per acre on input costs through use of precision ag (USDA) $12
"We don’t want to own the machinery, we don’t like owning machinery because it has to sit all year, not enough use, don’t want too much extra seasonal labor."

"I don’t want to keep equipment and cost that goes into maintenance...I’m not an agronomist so he will provide expertise, tell me what to do and save me money in the long run."

"Hard to get into fields because they're so wet here."
Segment Opportunity

- 286 million acres of commercially treated cropland
- $7-$11/acre per spray depending on application method
- $2.6B - $10.4B opportunity in commercial custom application