Digital Farming

Solutions for Every Farm

Hamburg; 12 June 2018
Roslyn Chua
Agenda

// Key Trends driving adoption of digital technologies in farms globally

// Case studies on different business models in the industry

// Bayer Digital Farming – key principles
How Digital Farming Solutions Work

- Mobile Products/Sensors
  - Data
  - Understand what happens locally!
- Command Centre
  - Agronomic Decision Engine
  - Analyze and plan agronomy! Keep the overview!
- Crop Protection + field specific timing + variable application maps
  - Decision Support
  - Do!
Key trends driving adoption of digital solutions globally – different needs are giving rise to different solutions

USA
Driven by need to increase return on investment in field crops
- Ave. farm size: 175 hectares
- Corn-Soy rotation most common - increased need for efficiency given the crop prices in recent years
- Adoption of variable rate enabled terminals: 15% of total arable land

Western Europe
Driven by need and regulations to use inputs sustainably – only where and when needed
- Ave. farm size: 55 hectares
- French action plan on plant protection products published in April 2018
- Adoption of variable rate enabled terminals: ~5% of total arable land

China
Driven by need to achieve scale in farm operations and to ensure farmer safety
- Ave. farm size: 0.50 hectare
- Total number of farmers: 300 mn
- Mechanization of Crop Protection only at 7% of total arable land today
Different crops, geographies offer different optimization potential

Ensure relevance by providing solutions on key job steps
Founded in 2014, Farmers Business Network (FBN) is a farmer-to-farmer agronomic information network.

Through crowdsourced data, FBN provides recommendations on seeds, fertility, and crop protection. In addition, it sells generic products directly in their platform as well as connecting farmers to buyers of their crop.

**Key Points:**

- 17Mn Paid acres – one of the leaders in direct to farm engagement
- Raised ~US200 Mn funding to date (Temasek, Google Ventures)

Source: Farmers Business Network Website, Market Research
### Bayer Digital Farming: Solutions for Every Farm

**June 2018**

Roslyn Chua

Source: Farmers Business Network Website, Market Research
Farm X
90 fields / 2,033.06 acres

Soil Performance vs My Region

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>SPI</th>
<th>My Avg. Yield (bu/A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manganese</td>
<td>0.79</td>
<td>233.2</td>
</tr>
<tr>
<td>Shank</td>
<td>0.6</td>
<td>225.0</td>
</tr>
<tr>
<td>Rutland</td>
<td>0.59</td>
<td>225.4</td>
</tr>
<tr>
<td>Virgil</td>
<td>0.86</td>
<td>223.3</td>
</tr>
<tr>
<td>Brooklin</td>
<td>0.82</td>
<td>228.8</td>
</tr>
<tr>
<td>Callin</td>
<td>0.78</td>
<td>217.2</td>
</tr>
<tr>
<td>Bremon</td>
<td>0.9</td>
<td>215.3</td>
</tr>
<tr>
<td>Dana</td>
<td>0.81</td>
<td>215.3</td>
</tr>
<tr>
<td>Millbrook</td>
<td>0.9</td>
<td>213.1</td>
</tr>
<tr>
<td>Drummer-Miford</td>
<td>0.79</td>
<td>213.5</td>
</tr>
<tr>
<td>Harvard</td>
<td>0.85</td>
<td>212.0</td>
</tr>
<tr>
<td>Glace</td>
<td>0.91</td>
<td>211.0</td>
</tr>
<tr>
<td>Flanagan</td>
<td>0.91</td>
<td>210.8</td>
</tr>
<tr>
<td>Elbus</td>
<td>0.91</td>
<td>208.4</td>
</tr>
<tr>
<td>Miford</td>
<td>0.81</td>
<td>207.7</td>
</tr>
<tr>
<td>Idaho</td>
<td>0.88</td>
<td>207.4</td>
</tr>
<tr>
<td>Mina</td>
<td>0.95</td>
<td>206.9</td>
</tr>
<tr>
<td>Parks</td>
<td>0.7</td>
<td>205.8</td>
</tr>
<tr>
<td>Prosper</td>
<td>0.85</td>
<td>205.1</td>
</tr>
<tr>
<td>Wrenat</td>
<td>0.61</td>
<td>204.6</td>
</tr>
<tr>
<td>Drummer</td>
<td>0.84</td>
<td>203.7</td>
</tr>
<tr>
<td>Toronto</td>
<td>0.85</td>
<td>202.7</td>
</tr>
</tbody>
</table>

My Operation vs My Region

Source: Farmers Business Network Website, Market Research
Case study: Bayer Digital Farming: Solutions for Every Farm // June 2018 // Roslyn Chua

Source: Farmers Business Network Website, Market Research
Founded in 2007, XAG is an drone / UAV spray and sensing manufacturer and service provider.

Provides various solutions – hardware, drone spray applications through partners, academy training on agronomy and drone piloting, and various crop insights through remote sensing.

**Key Points:**

- #2 Drone Spray service provider in China
- Holistic agronomy solutions

Source: Farmers Business Network Website, Market Research
## Competencies of various Smart Sprayer technologies

<table>
<thead>
<tr>
<th>Company</th>
<th>Tech used</th>
<th>Technology method</th>
<th>Tech specifications</th>
<th>On-farm problem being solved</th>
<th>Estimated farm-level investment on technology</th>
<th>Launch Year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WEEDIT</strong></td>
<td>Camera on sprayer</td>
<td>▪ Identifies green areas, maps it, correlates green = weed patch;</td>
<td>Not crop specific</td>
<td>Herbicide optimization</td>
<td>From Croplands Australia - PhantomDrive system retails Weedit Kit: Eur 80.000 (+GST)</td>
<td>In-market in Australia, Argentina, Brazil, Canada, Russia; USA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Night spraying feasible</td>
<td></td>
<td>(mostly in pre-burndown application)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>JOHN DEERE</strong></td>
<td>Camera on sprayer</td>
<td>▪ Identifies crop vs’ weeds; weed in between planting rows</td>
<td>Tested in lettuce and cotton (0-12 inches)</td>
<td>Herbicide optimization</td>
<td>-</td>
<td>Estimated in 2019</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Ink jet nozzles allowing centimeters of accuracy with 0 drift</td>
<td>Speed: 6-8 mph</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BOSCH</strong></td>
<td>Camera on sprayer</td>
<td>▪ Identifies crop vs’ weeds; mixes individual nozzle prep</td>
<td>Not crop specific</td>
<td>Crop Protection optimization</td>
<td>-</td>
<td>Estimated in 2019 +</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Has pre-mixing unit in entire spray system</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Market Research
Bosch / Bayer xarvio Smart Sprayer. Detects which weed specie is present and selects herbicide accordingly. Available 2021 #agritechnica

https://twitter.com/ndubuc/status/930563719813312512?lang=en
Bayer’s driving principles in the area of Digital Farming

**Bayer’s Know-how**

Leverage our experience and expertise in **Agronomy in Seeds and Crop Protection**

Connect this expertise with Digital technologies to **solve** broader on-farm problems

**Commitment**

**Collaborations** in the development of digital solutions to **create innovative solutions** and technologies together with existing experts

**Motivation**

**Make agriculture more sustainable** and efficient.

**Support farmers** to meet increasing challenges.

**Focus so far**

**Optimization of crop protection**, with measurable results and clear value at farm level
Digital Farming is about solving an on-farm problem.

Different solutions are already used in real life fields across the world.

Start developing digital products WITH your farmers, not for your farmers.