Agri-Tech and Big Data

Winnipeg, Fairmont Hotel Oct 2nd-3rd 2017

Oct 3rd, 2017
Maurice Moloney Exec. Director and CEO
Canadian Investments in AgriTech

Canada has made substantial investments in AgriTech research, much of it involving Big Data.

• Canada First Research Excellence Fund (CFREF), $37 million on plant phenotyping (Saskatchewan)

• Canada First Research Excellence Fund (CFREF), $77 million on sustainable food production (Guelph)
What kinds of Data?

• Research Data with the potential for improving plant and animal breeding (eg phenotyping)

• Agronomic data leading to increases in efficiency in agricultural production

• Food supply and value chain data for increased efficiency, traceability and food safety
Computational approaches to digital phenotyping

Creating a digital signature

Analytical Digitization
Parsing faces and the creation of “Eigenfaces”
We need to build “eigenplant” models
Phenotyping (trait mapping) complex organisms
Corn developmental stages
Deep learning techniques are being used to recognize subtle differences in plant architecture


Ubbens and Stavness Univ of Saskatchewan
Field-level data are now generating datasets of \( G \times E \times M \)

\((\text{genetics } \times \text{environment } \times \text{management})\)
Image Acquisition Infrastructure

DRAGANFLY X4 – P
(12-15 min flight time)

DRAGANFLY COMMANDER
(20-25 min flight time)
# Field Based Data Acquisition

## RGB – RX100M3

<table>
<thead>
<tr>
<th>Altitude (m)</th>
<th>Resolution (mm)</th>
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<tbody>
<tr>
<td>15</td>
<td>4.1</td>
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<tr>
<td>30</td>
<td>8.2</td>
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<tr>
<td>45</td>
<td>12.3</td>
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<tr>
<td>60</td>
<td>16.4</td>
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## REDEEDGE

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<tr>
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<td>30</td>
<td>26.8</td>
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<tr>
<td>45</td>
<td>40.2</td>
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<tr>
<td>60</td>
<td>53.6</td>
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- Flights – 30m
- Sub cm resolution
Field scale data: durum wheat lines
~4000 plots, July 18

- Time course – resolution in time is an important metric
- Need to optimize temporal, spatial and spectral resolution
Field level image acquisition up close
Hyperspectral imaging can reveal nutrient status of plants in vivo

http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0116205
Big Data approaches are now being used along the food supply and value chain
Big Data approaches are now being used along the food supply and value chain.
FOOD FRAUD
Food fraud occurs when products are deliberately:

- Diluted
- Mislabelled or misrepresented
- Tampered with
- Substituted with another product

Profit
Cheap and/or easy to copy
Unsatisfied market demands
Difficulties in detection and proof

The cost of food fraud:

- Fraud costs the UK food & drinks industry £11bn per year
- Fraud contributes 5p to the price of a £1 loaf of bread...
- ...and 16p to the cost of a pint of beer
- Fraud costs consumers £424 per household per year

Fraud costs legitimate food retailers up to USD 15 billion a year*

* Grocery Manufacturers Association

Fraudulent food businesses don’t meet standards
ISO 22000 (food safety)
Big Data and the Food supply and value chain

- QA/QC
- Logistic data
- Provenance data

Primary Production → Rudimentary Processing → Advanced Processing → Wholesaler → Retail Sales

Value Chain: 1x, 3x, 10x, 20x, 50x

Block Chain Data Locking