Using Weather and Other Data in Making Production Decisions

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Agronomy Update 2017
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Lethbridge, Alberta
VISION

THE PRECISION AGRICULTURE PLATFORM

The Right Data

Decisions with Impact

Ease of Use

Scalable Solution

INTEGRATED: AGRONOMY, HARDWARE, SOFTWARE
SYSTEM INTEGRATION CREATES VALUE

DATA INTEGRATION

Equipment - Weather - Agronomy - Support - VRT
Over half of yield variability can be explained by weather variability (*Dzotsi, 2012*).

Some estimates are as high as 80% (*Hoogenboom, 2000*)

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<table>
<thead>
<tr>
<th>Source of Error</th>
<th>Error Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor Accuracy</td>
<td>5%</td>
</tr>
<tr>
<td>Gauge Height</td>
<td>10%</td>
</tr>
<tr>
<td>6 km Distance</td>
<td>27%</td>
</tr>
<tr>
<td>19 km Distance</td>
<td>39%</td>
</tr>
<tr>
<td>36 km Distance</td>
<td>50%</td>
</tr>
<tr>
<td>54 km Distance</td>
<td>59%</td>
</tr>
</tbody>
</table>

Distance errors based on Ahrens 2006; Sensor accuracy based on published specifications; Height errors based on Kurtyka 1953;
<20% of fields are within 6 km of a weather station.

- 6 km radius, 39 km apart
- 6 km radius, 30 km apart
Quick Math Spring Wheat
240 – 155 = 85 mm
85 mm \times 15 \text{ kg/mm/ha} = 1275 \text{ kg/ha}
19 \text{ bu/acre difference}
40-50 \text{ lb N acre fertilizer difference}
Quick Math Spring Wheat

240 – 155 = 85 mm

85 mm X 15 kg/mm/ha = 1275 kg/ha

19 bu/acre difference

40 – 50 lb N/acre fertilizer difference

Station Observations 2016

Season Accumulations within 5 mm

Graph showing precipitation data with labels for "Precip. Raymond IMCIN" and "Precip. Milk River Ridge Reservoir".
A weather station located as close to the field as possible ensures the most site-specific data – and therefore the most accurate data is being used for decision support.
Weather

Sun, 01:25 pm
Mostly Cloudy

0.6 °C
Feels Like: -
POP: -
Amount: -
RH: 56%
Gust: 40.2 km/h
Wind: 30.5 km/h
from W

Historical Weather

PAST 24 HOURS   PAST 7 DAYS   PAST 30 DAYS   PAST 6 MONTHS

View weather summary

Notifications (East Raymond Farming)

Crop Health
You have new crop health imagery: Field: 14, 15 Jensen (NN28-Sec 33-5-20 W4)
Image Date: 2016-12-16 22:08:00.959009 Field: 14, 15 Jensen (NN28-Sec 3...

Crop Health
You have new crop health imagery: Field: 14, 15 Jensen (NN28-Sec 33-5-20 W4)
Image Date: 2016-11-21 14:29:23.825236 Field: 11 Gough (SEC 3-6-20 W4) ...
Weather Manager

UPDATE
Sun Jan 15 11:30 am MST

Ensign S 2
CA-AB-0375

MOISTLY CLOUDY

63 %
Relative Humidity

1.0 °C
Temperature

-2.0 °C
Feels like

0.00 mm
Rain (day)

4.8 km/h from WNW
Wind

--
Wind Gust

--
Dewpoint

[Map Image]
GROWTH STAGE

<table>
<thead>
<tr>
<th>Stage</th>
<th>Feekes</th>
<th>Zadoks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter dormancy</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Tillering</td>
<td>2</td>
<td>21</td>
</tr>
<tr>
<td>Jointing</td>
<td>3</td>
<td>26</td>
</tr>
<tr>
<td>Boot</td>
<td>4</td>
<td>30</td>
</tr>
<tr>
<td>Heading &amp; Flowering</td>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>32</td>
</tr>
<tr>
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<td>8</td>
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<tr>
<td></td>
<td>9</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>10.1</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>10.5</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>90</td>
</tr>
</tbody>
</table>
Day 0: Start spraying wheat for suppression of Fusarium Head Blight when 75% of the heads on main stems are fully emerged.

Day +2: Flowering begins with yellow anthers in the middle of the heads. Perfect timing!

Day +5: Anthers turn white and dry up when flowering is complete. Too late!

Stop spraying when 50% of the heads on main stems are in flower.
SPRAYING WHEAT
SPRAYING WHEAT

GDD (0 C)

GDD Actual
GDD Predicted

FUNGICIDE
725 - 825 GDD
JUNE 22-25

FLOWERING COMPLETE DAY +5

HEADS EMERGED DAY 0

25/Apr/16 25/May/16 25/Jul/16 25/Aug/16
DO I SPRAY THIS FIELD THIS YEAR?

If You Spray Product X in the next 5 to 7 days there is a 80% chance of an economic response.
## Spraying Wheat Equipment

<table>
<thead>
<tr>
<th>SPEED</th>
<th>FUEL</th>
<th>ENGINE SPEED</th>
<th>WORK RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 kph</td>
<td>30 litres/hr</td>
<td>2100 rpm</td>
<td>90 acres/hr</td>
</tr>
</tbody>
</table>

## Spraying Wheat Weather

<table>
<thead>
<tr>
<th>WIND</th>
<th>DIRECTION</th>
<th>TEMP</th>
<th>HUMIDITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 kph</td>
<td>SSW</td>
<td>21 °C</td>
<td>38 %</td>
</tr>
</tbody>
</table>

## Spraying Wheat Product

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>RATE</th>
<th>WATER</th>
<th>CROP STAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOLICUR</td>
<td>200 mL/acre</td>
<td>40 L/acre</td>
<td>59-60 Zadoks</td>
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</table>
Big Data refers to data sets that are too large or complex for traditional data processing and analytical approaches. Challenges include analysis, capture, data curation, search, sharing, storage, transfer, visualization, querying, and information privacy.
THE THIRD REVOLUTION – BIG DATA

SEED

FERTILIZER

DATA ECOSYSTEM

HADOOP

CLOUD STORAGE

PROGRAM MODELING

WEATHER

OPERATION

IMAGERY

RECOMMENDATIONS TO FARMER

CROP PROTECTION

WEATHER MONITORING
MID - SEASON YIELD FORECAST DATA

Yield Forecast

<table>
<thead>
<tr>
<th>Bushel/acre</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>80</td>
<td>90</td>
</tr>
<tr>
<td>2</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>70</td>
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<tr>
<td>3</td>
<td>20</td>
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<td>4</td>
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<tr>
<td>5</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
</tr>
</tbody>
</table>

Yield
Models that explicitly or mechanistically simulate cropping system processes and generate outputs such as biomass accumulation, yield, nitrogen leaching loss etc. from inputs variables relating to soil, weather, and management practices.
MODELLING NITROGEN

DYNAMIC MODEL USING WEATHER DATA, AS APPLIED N, SOIL TEST DATA AS INPUTS. FIELD/ZONE CENTRIC SOIL CHARACTERISTICS AND LOCALIZED WEATHER ARE USED TO PARAMETERIZE AND DRIVE THE MODEL.
SUMMARY

• WEATHER DATA CAN INFORM DECISIONS

• THE MORE FIELD CENTRIC THE MORE USEFUL THE DATA

• AUTOMATION AND INTEGRATION OF WEATHER DATA UNLOCKS VALUE

• NEW ANALYTICAL TECHNIQUES WILL DRIVE NEW WAYS TO USE WEATHER DATA
YOU CAN’T MANAGE THE WEATHER BUT THE MORE YOU KNOW ABOUT THE WEATHER THE BETTER YOU CAN MANAGE
THANK YOU
FOR BEING ON THE EDGE