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FOR FOOD SECURITY  
POTASHCORP - A FOUNDING PARTNER

## Global Food Security

**Meeting the challenge through research  
and innovation**

House of Commons Standing Committee on  
Agriculture and Agri-Food

May 9<sup>th</sup> 2018

Maurice Moloney Exec. Director and CEO

 UNIVERSITY OF  
SASKATCHEWAN

 Government  
of  
Saskatchewan



## GIFS Founding Facts

- **Founding partners: PotashCorp, the Province of Saskatchewan and the University of Saskatchewan**
- **PotashCorp investment = \$35M**
- **Saskatchewan investment = \$15 M**
- **Viterra has invested a further \$2 M**

**Through 2 Federal programs we have now raised an  
*additional \$50 M* in research funds**



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## Our Vision and Mission

**Vision:**

Ingenious science that delivers sustainable food security for the world.

**Mission:**

To help feed the world through transformative innovations in agriculture and food production that will benefit Saskatchewan's economic, social and environmental well-being and which will empower developing countries to achieve local food security.

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## The Perfect Storm



9.6 Billion people

70% more food

- Climate Change
- Water
- Nutrients
- Energy

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## GIFS Priority Areas

- Seed Development and Quality
- Root and Soil Biology (Rhizosphere)
- Digital Agriculture

### Platforms:

Wheat, Oilseeds, Pulses and Legumes

Crop Genomics and Bioinformatics



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## GIFS Priority Areas

- Seeds
- Soils
- Software

Genomics (genetic codes) of staple crops



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# Seeds

Seeds carry all the information needed to determine yield potential, input costs and product quality and value.



Mo17 F<sub>1</sub> B73



One of the biggest innovations in agriculture was the development of hybrids and the discovery of “hybrid vigor”

Hybrids are expensive to make, but also require a farmer to repurchase the seeds each year.

GIFS technology helps to make hybrids in crops where the cost is prohibitive



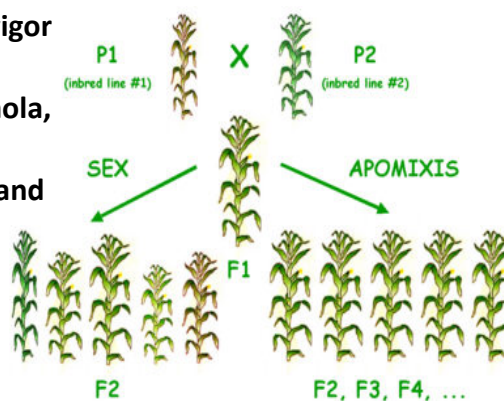
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## Alternative next generation hybrid crops

- Key areas include apomixis (seeds without sex), hybrid vigor
- Applicable to all major crops including: wheat, barley, Canola, pulses and protein crops
- Relevant to both developed and developing countries



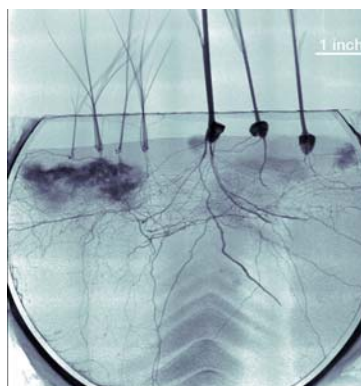
Springer and Stupar. 2007. Genome Research 17:264

## Soils: the hidden half

Like the human body, plants rely on their microbiome (bacteria and fungi), most of which are found in the soil

### Roots and their Microbiome

- Protects roots
- Solubilizes nutrients
- Improves soil fertility
- Fixes nitrogen from air



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**Bacterial nodules on roots of legumes fix nitrogen from the air, reducing the need for fertilizers**



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The carbon produced from fossil fuel burning is about 8.4 Billion tons per year. Roots could absorb this at the rate of 50 tons per hectare requiring 160 M hectares (easily done).


Canadian Farmers who practice “no till” agriculture already absorb enough CO<sub>2</sub> to remove *two million cars* off our roads annually

Digital Agriculture

# P<sup>2</sup>IRC


PLANT PHENOTYPING AND  
IMAGING RESEARCH CENTRE

## 2017 | 2nd ANNUAL SYMPOSIUM




Designing Crops for **Global Food Security**

This research has been undertaken thanks to funding from the Canada First Research Excellence Fund.



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[www.p2irc.usask.ca/](http://www.p2irc.usask.ca/)



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*Growing science for life*  
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# Digital Agriculture

## P<sup>2</sup>IRC

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Becoming *the* Global Resource  
for Digital Plant Breeding,  
accessible to the developed  
and developing world by 2022

Designing Crops for **Global Food Security**


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## Field Imaging for better crops



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



**DRAGANFLY COMMANDER**  
(20-25 min flight time)

AUVs (drones) allow for the first time a digital “photocopy” of  
every field trial at low cost. Finding traits and trends becomes a  
hundred times easier

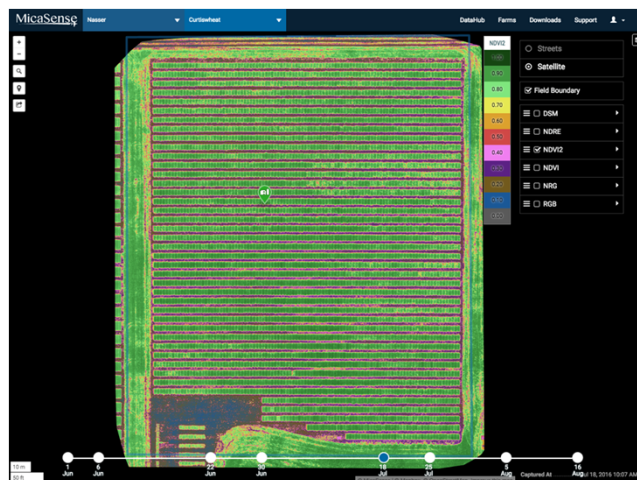
P<sup>2</sup>IRC Plant Phenotyping  
and Imaging  
Research Centre

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## Early generation durum wheat lines ~4000 plots, July 18 (flowering)



- Time course – resolution in time is an important metric
- Need to optimize temporal, spatial and spectral resolution

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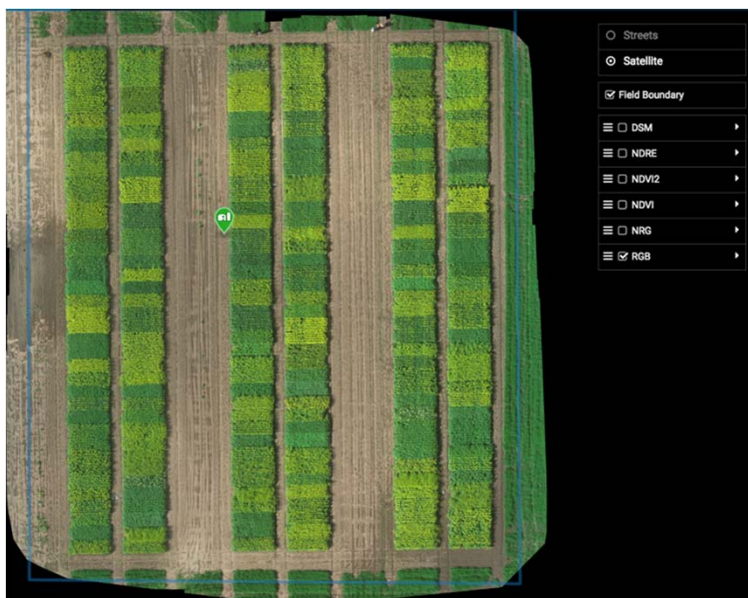


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## 2016 canola phenotyping trial: 50 founder lines + checks





**Technology use in the Developing World is now routinely “skipping a generation”**

**Recent technologies are being mobilized to the developing world rapidly**



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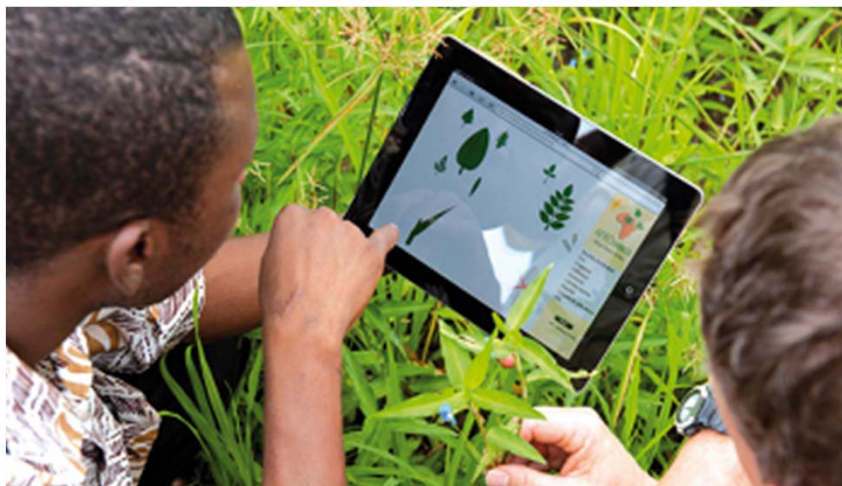
## **Mobilizing Technology to the developing world: Skipping a generation**



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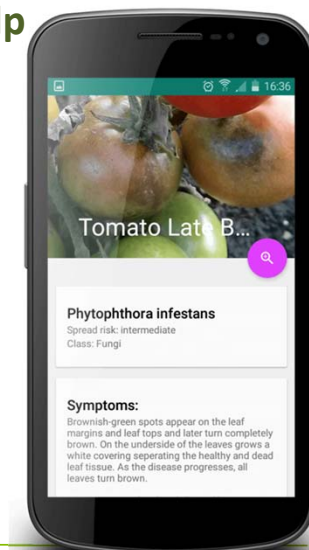
## Digital Agriculture has already arrived in Africa



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## Smartphones can diagnose plant diseases - with our help



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## Blight Resistant Potatoes in two years: Understanding biodiversity



Why transgenic (GM) crops make sense



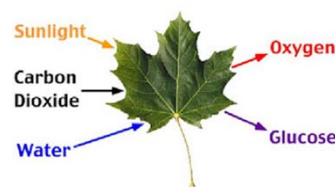
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## Will we be allowed to feed 9.6 billion?

Crop agriculture is now based on  
molecular genetics and IT

- Many recent discoveries and innovations are reproducible in the hands of farmers in developed and developing countries
- Biotechnological approaches have the merit of speed and precision, with outstanding results. IT will help this.
- It is critical that the developing world has the opportunity to adopt rapidly new breeding technologies and digital agriculture methods



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