



## Plan

- Historical and philosophical background on precision agriculture (PA)
- Examples of PA research
- New research platform on precision horticulture at AAC

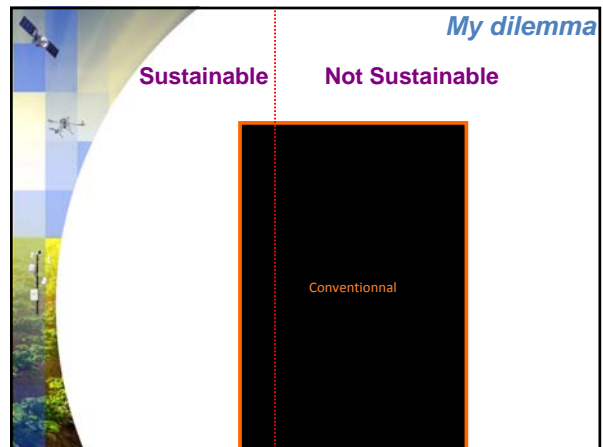
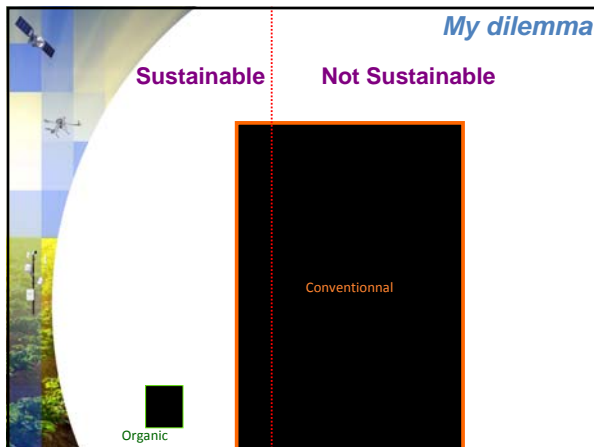
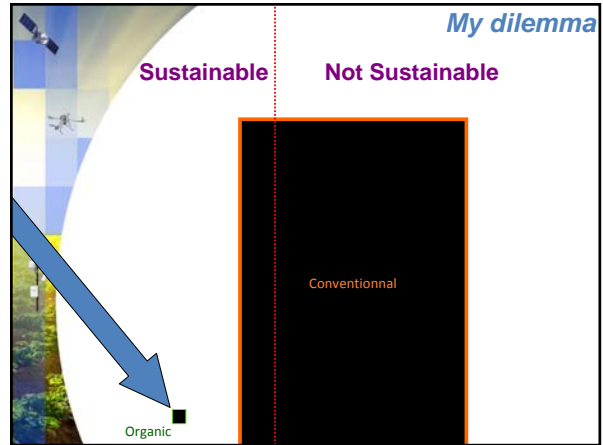
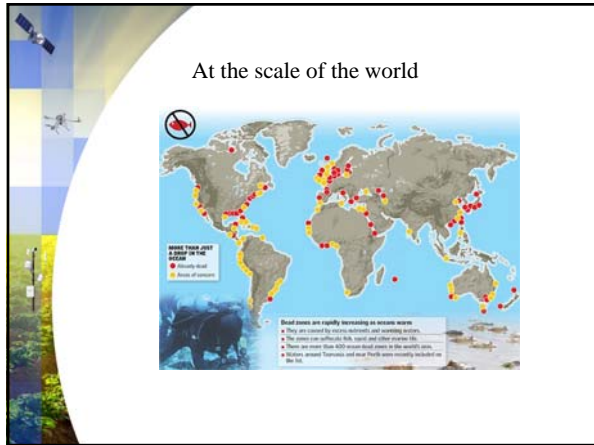
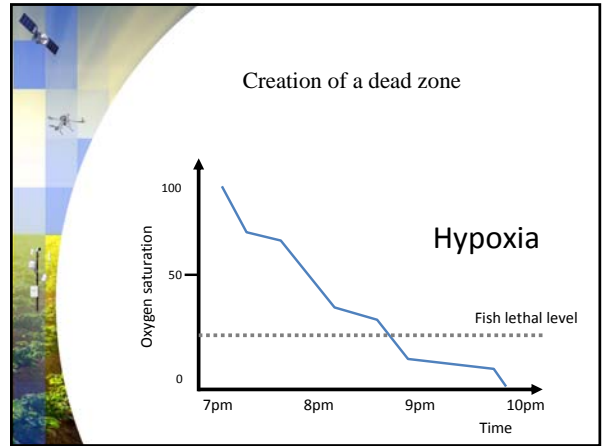
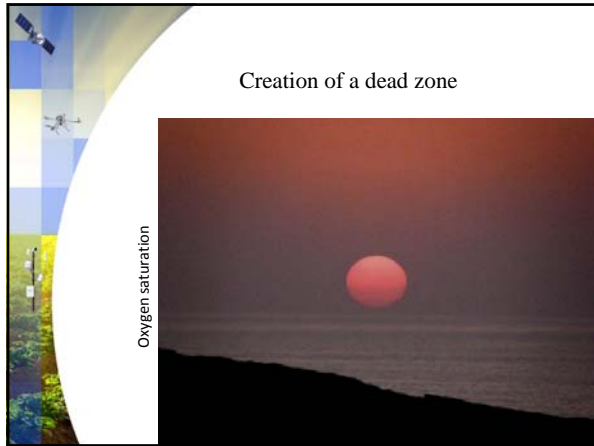
Studied agronomy at Université Laval

Ag production requires inputs  
A lot of inputs

- Soil tillage
- Remove all plants
- Low organic matter
- No crop residuals

Soil degradation  
Erosion

At the scale of a continent



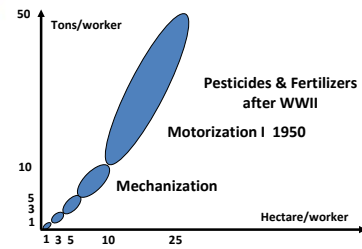
How did we get there?

### Colonization

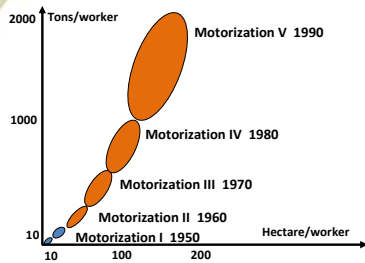
- Few people
- Huge fields
- Need for more efficiency



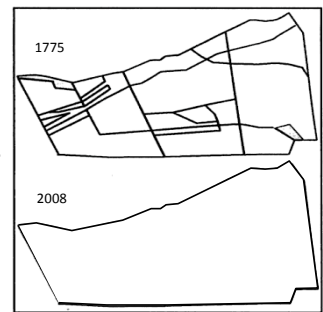
### Mechnization and motorization



### Mechnization and motorization



60 hectares field  
1775: 22 fields  
1875: 5 fields



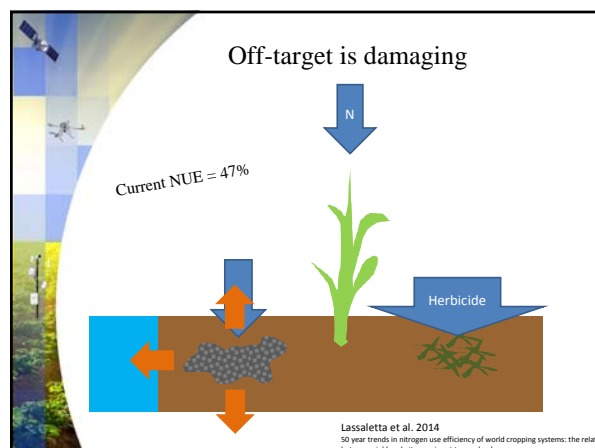
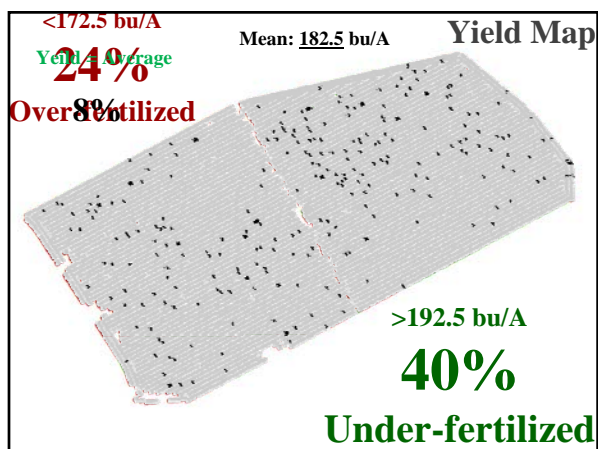
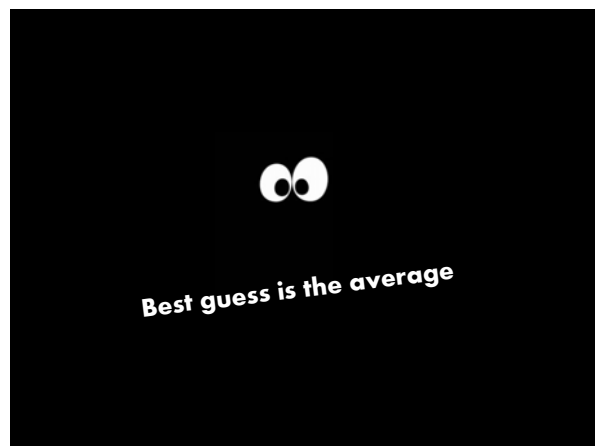
Stafford, 2006

### Manual weeding



What about that field?






The goal of precision agriculture?

*To match the soil and crop needs with the input delivery using various sources of intelligence*

To use all the techniques and technologies available to see what the farmer cannot see anymore from the top of his tractor.



**Some examples of PA research**

**1. Variable-rate N management**

**1. Variable-rate N management**

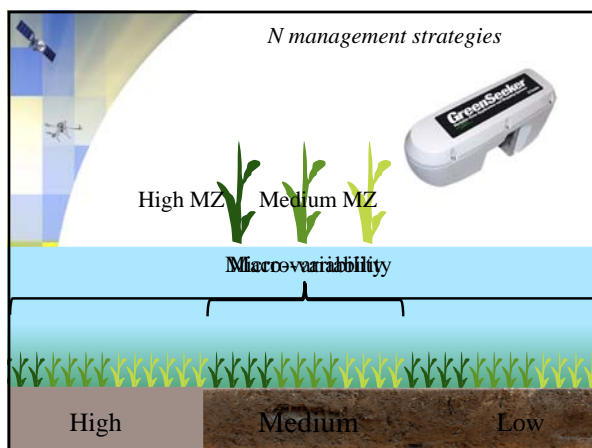
**Problem:** N deficiencies cause yield loss and pollutes the biosphere.

**Approach:** Use PA techniques to increase N use efficiency.

**Results:** Increasing the precision in N management increases NUE and reduces GHG emissions.

**Funding:** FRQNT and Fluid Fertilizer Foundations

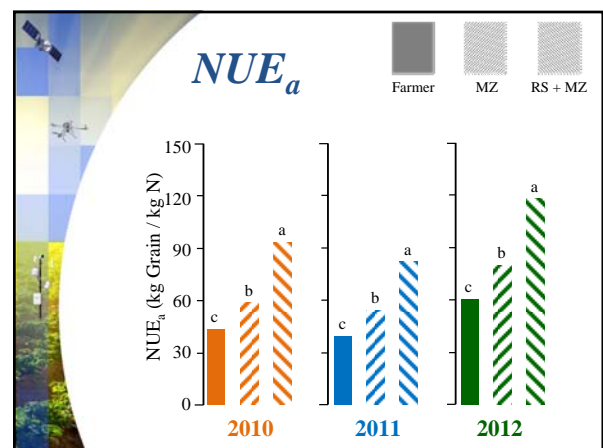
*N management strategies*



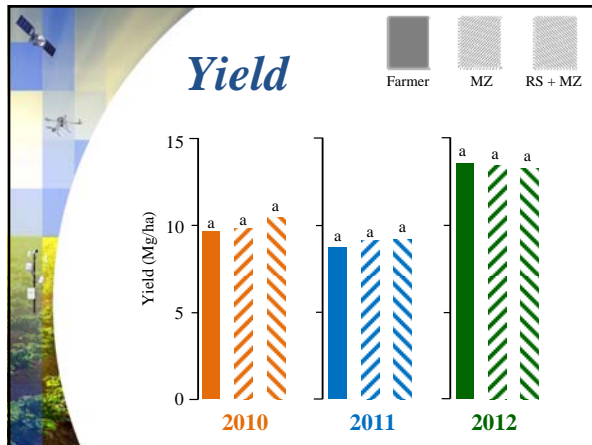
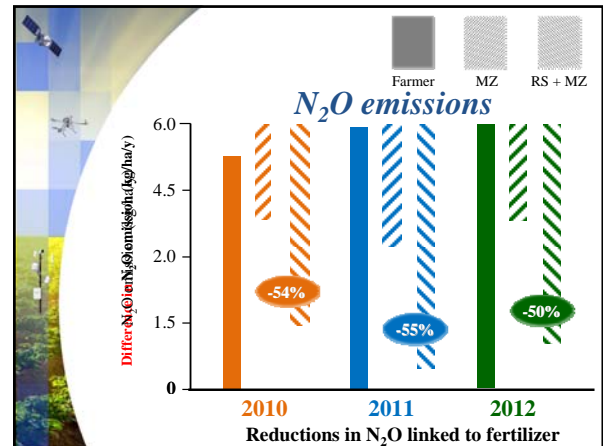
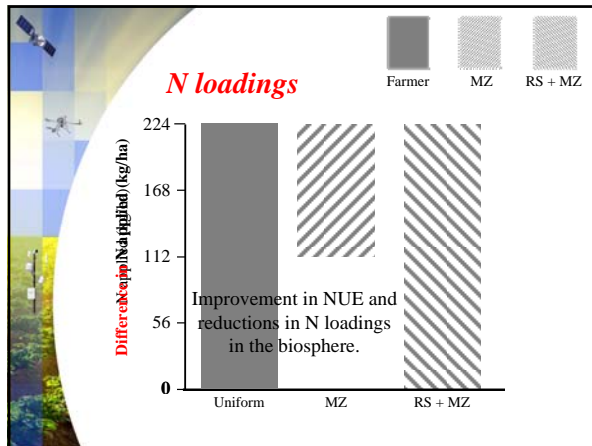
High MZ Medium MZ

Macrovariability

High Medium Low







2. Precision irrigation

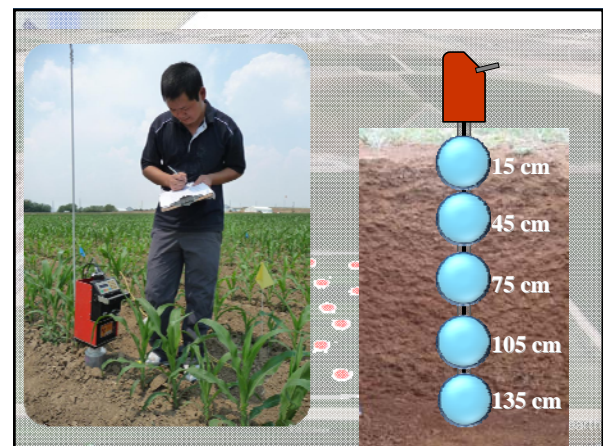
**2. Precision irrigation**

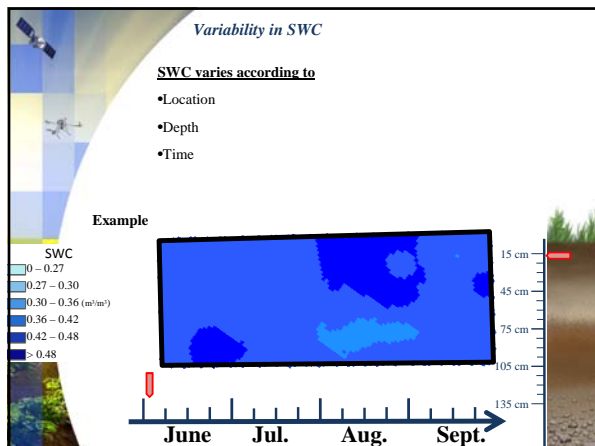
**Problem:** In the US western states, water scarcity is becoming a major issue and farmers are looking for techniques to improve the amount of crop per drop.

**Approach:** To study spatial and temporal variability of soil water content to develop adapted strategies.

**Results:** SWC varies in space, time and depth.

**Funding:** Valley Irrigation, 21st Century Eq. and CO Corn Board





### 3. Early detection of N deficiency

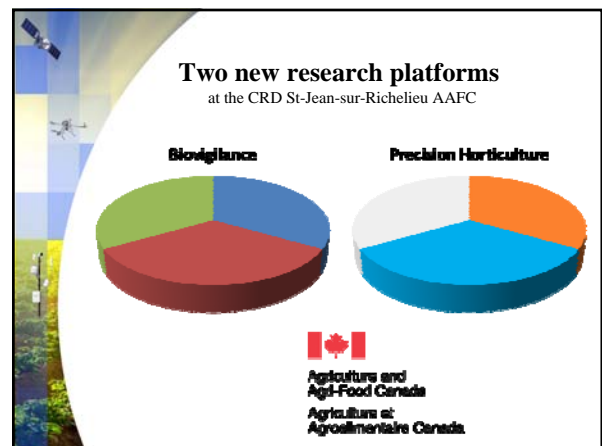
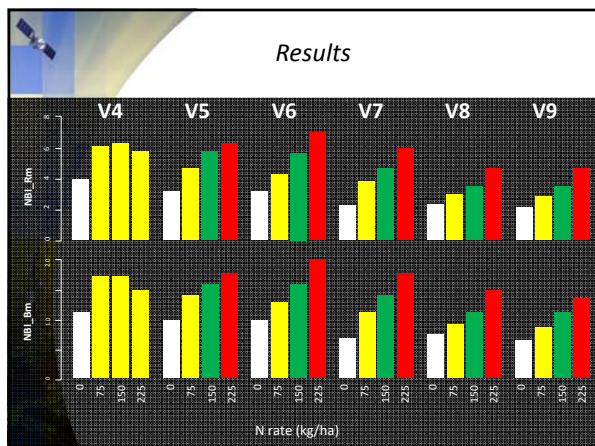
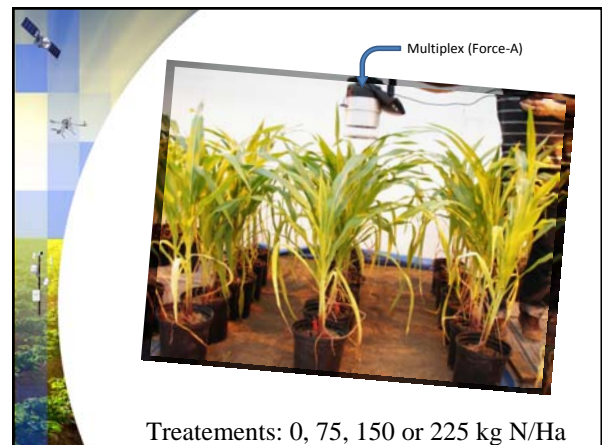
**3. Early detection of N deficiency**

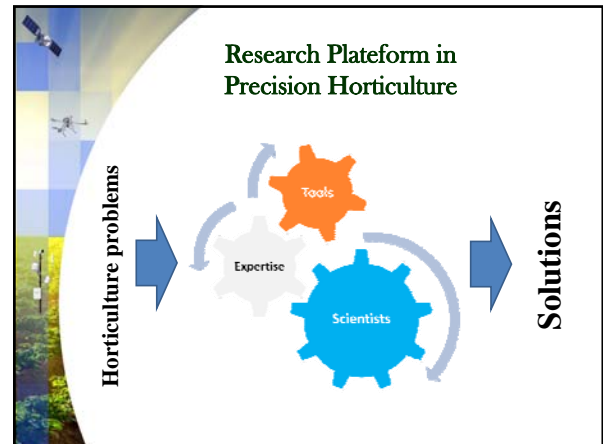
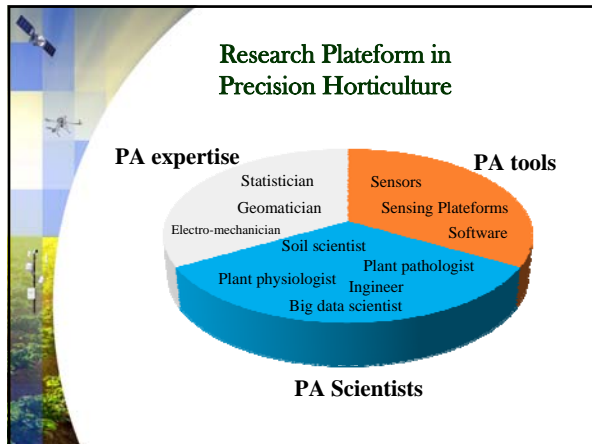
**Problem:** Crop remote sensing tools work best from V8 to V12 growth stages of corn, but farmers are applying N from V4.

**Approach:** To study the potential of crop sensors based on fluorescence for early detection of N deficiency.

**Results:** It is possible to detect N variability from V5 using fluorescence.

**Funding:** Force-A





### Research Platform in Precision Horticulture

**Examples of projects:**

- Vegetable crop yield monitoring
- Precision mechanical weed management in carrots
- Spatial assessment of seeding operations
- Spatio-temporal characterisation of pest infestations
- Systematic literature review on precision horticulture

### Agricultural revolutions

|   | Sustainable                         |                                     |
|---|-------------------------------------|-------------------------------------|
|   | YES                                 | NO                                  |
| Early 18 <sup>th</sup> century: Colonisation<br>➤ Increase in land usage                            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Mid-19 <sup>th</sup> century: Industrial revolution<br>➤ Increase in fuel usage                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Mid-20 <sup>th</sup> century: Green revolution<br>➤ Increase in water, nutrients and pesticides use | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Now: Sustainable revolution?<br>➤ Increase in data usage  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |

# Thanks

# Questions?

**Louis Longchamps PhD**  
Research Scientist in Precision Horticulture  
Louis.Longchamps@canada.ca