1996-2015: 20 years of developing BMPs for FHB

UNIVERSITY of GUELPH
RIDGETOWN CAMPUS

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1996-2015: 20 years of developing BMPs for FHB

Outline

- 1996 epidemic
- Review of top Best Management Practices (BMPs) for FHB developed since 1996
- Crop rotation diversity is declining. Why?

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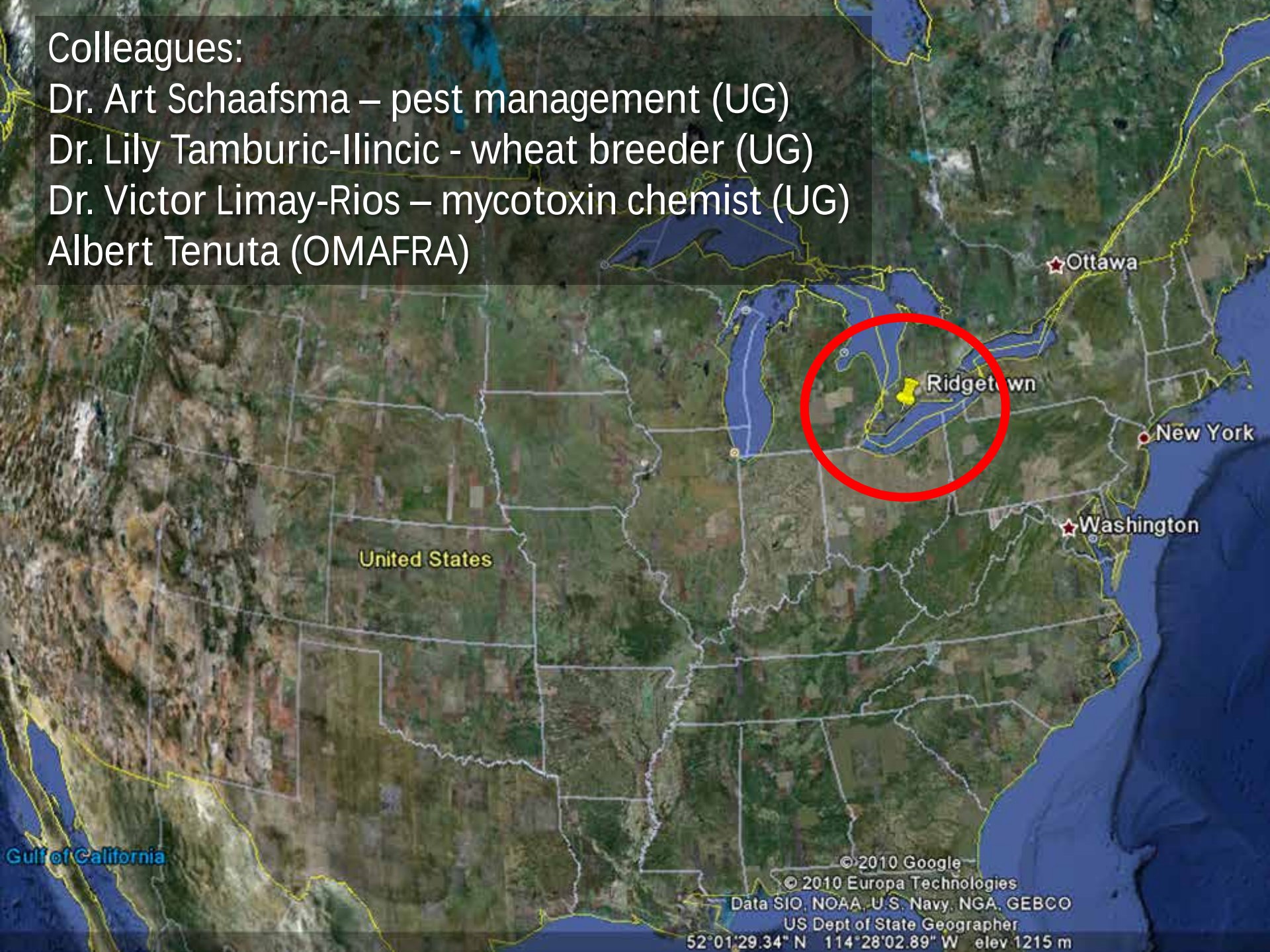
Colleagues:
Dr. Art Schaafsma – pest management (UG)
Dr. Lily Tamburic-Ilincic - wheat breeder (UG)
Dr. Victor Limay-Rios – mycotoxin chemist (UG)
Albert Tenuta (OMAFRA)
Ottawa
Ridgetown
New York
Washington
United States
Gulf of California
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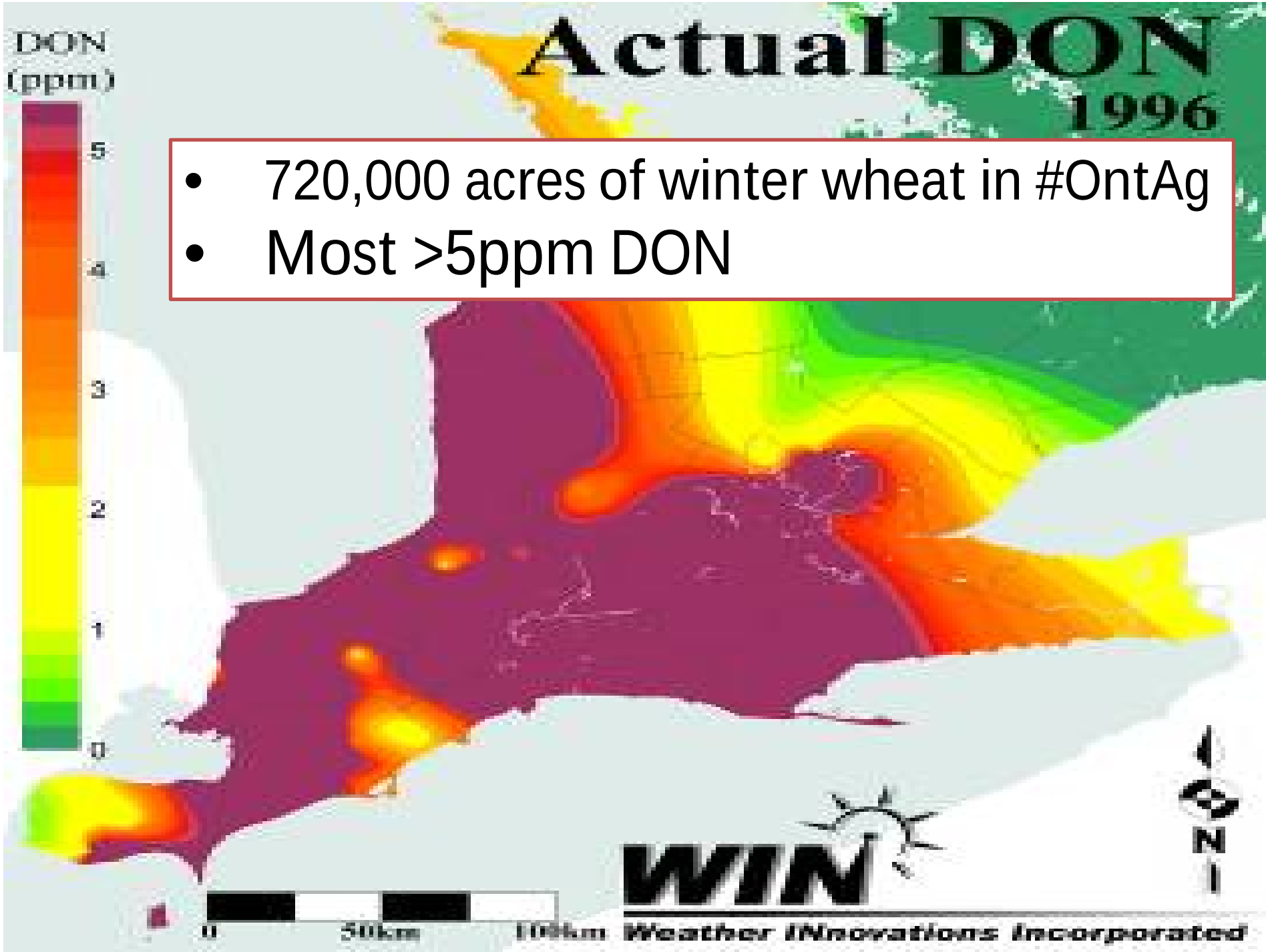
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
US Dept of State Geographer
52°01'29.34" N 114°28'02.89" W elev 1215 m


1996


Actual DON
1996
DON
(ppm)
5
4
3
2
1
0
• 720,000 acres of winter wheat in #OntAg
• Most >5ppm DON
0
50km
100km
WIN
Weather INnovations Incorporated
N


#OntAg FHB management
Then and NOW
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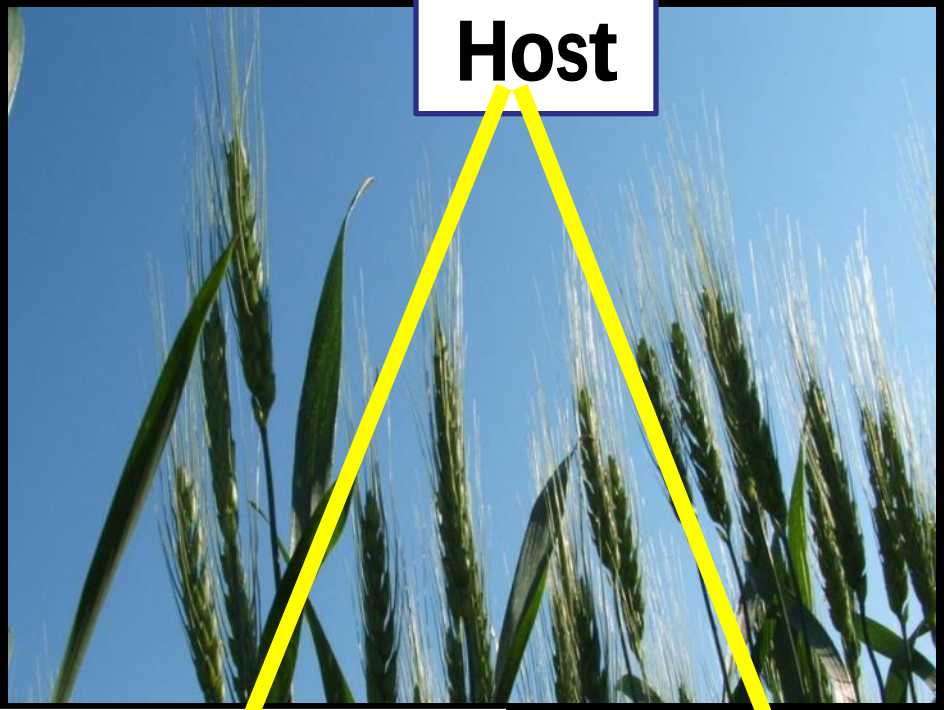
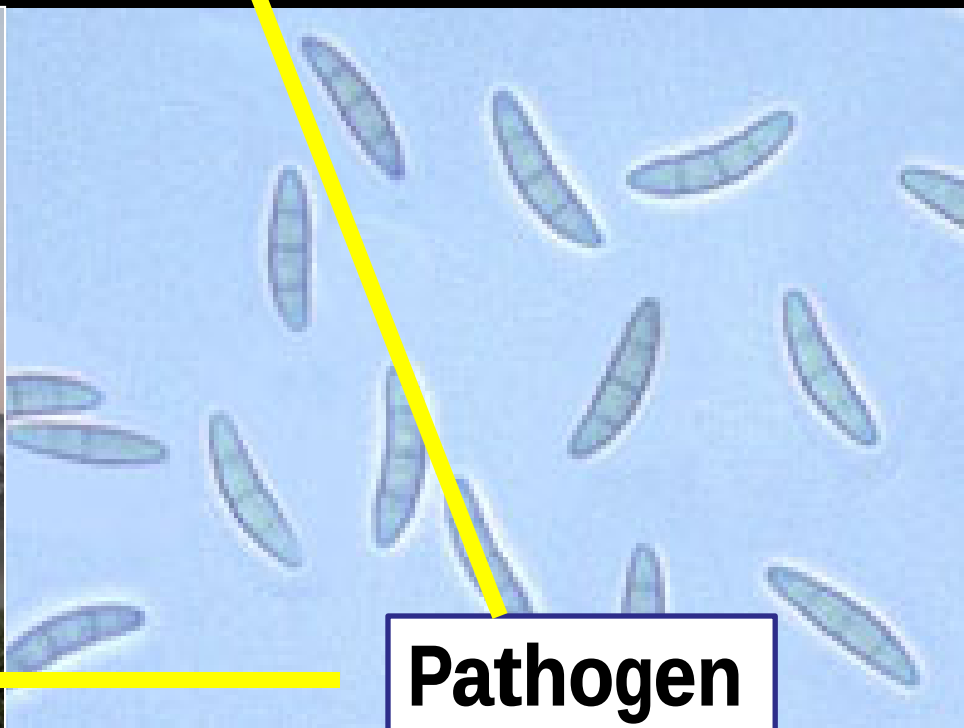
The Disease Triangle



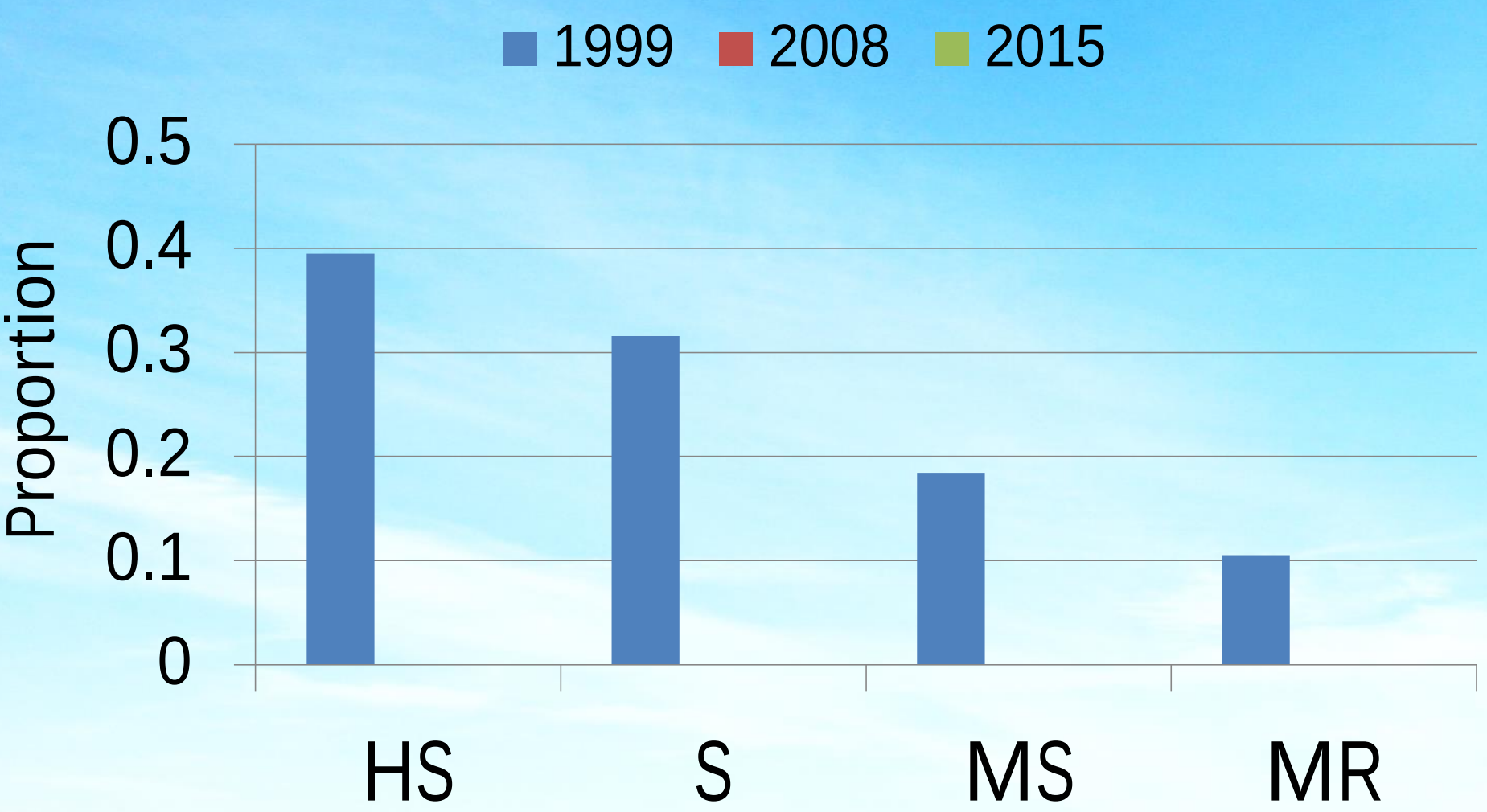
Host

Environment



Pathogen

1. NOW: better cultivars



Source: Ontario Cereal Crop Committee
www.gocereals.ca

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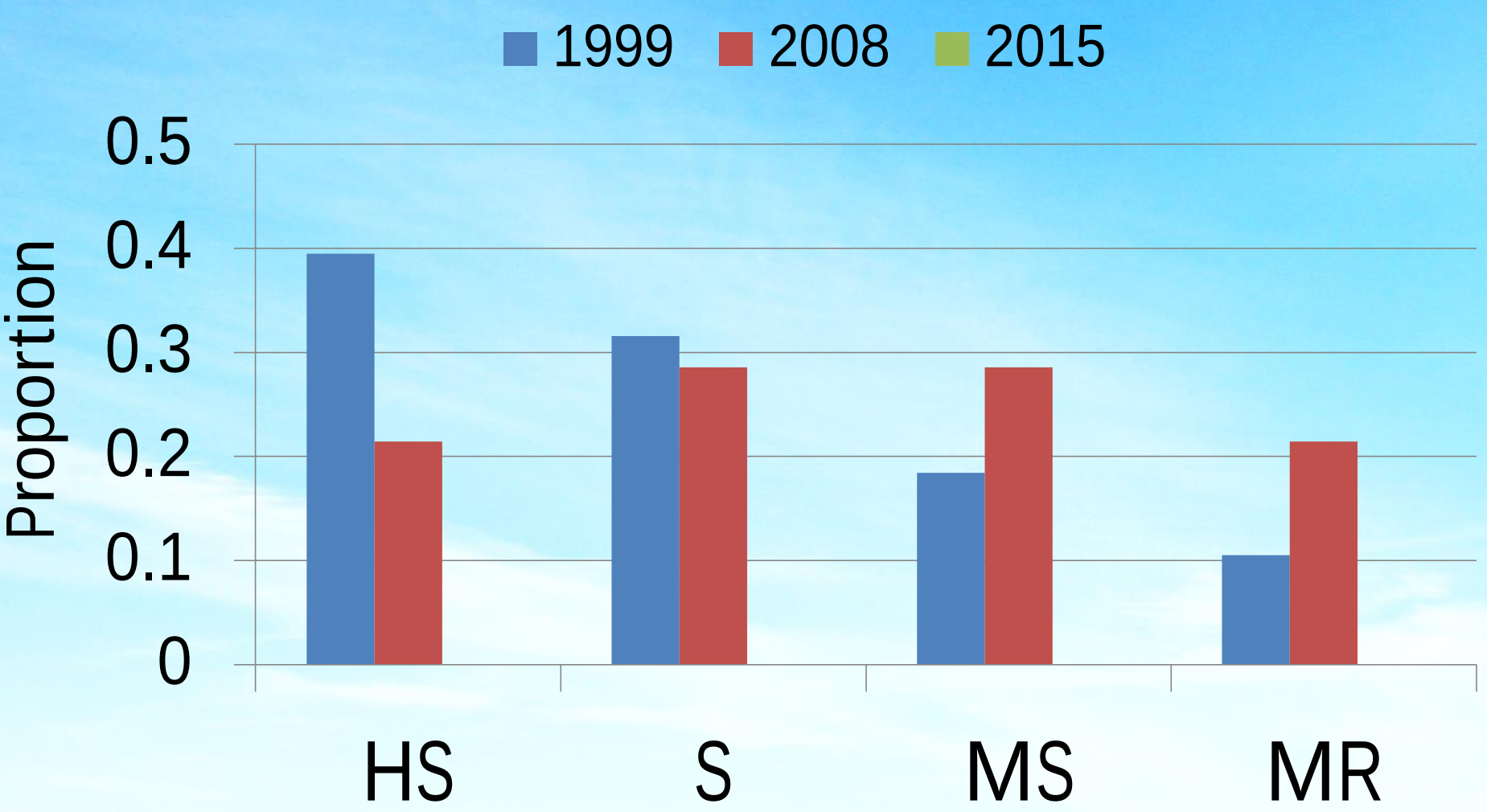
1. NOW: better cultivars



Source: Ontario Cereal Crop Committee
www.gocereals.ca

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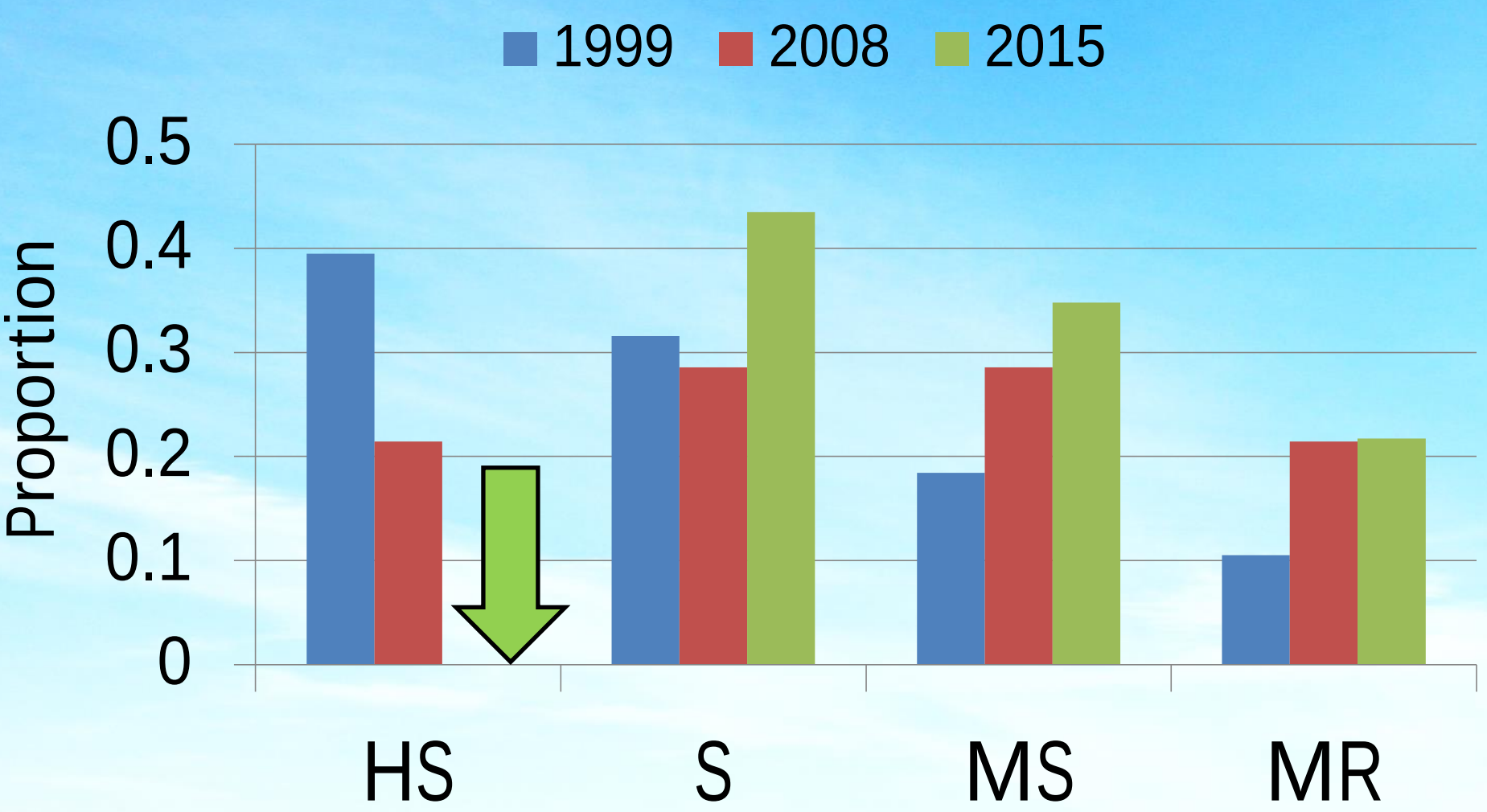
1. NOW: better cultivars



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Source: Ontario Cereal Crop Committee
www.gocereals.ca

2. NOW: better fungicides

triazole fungicide
@ Day+3
TF Nozzles 20 GPA

untreated

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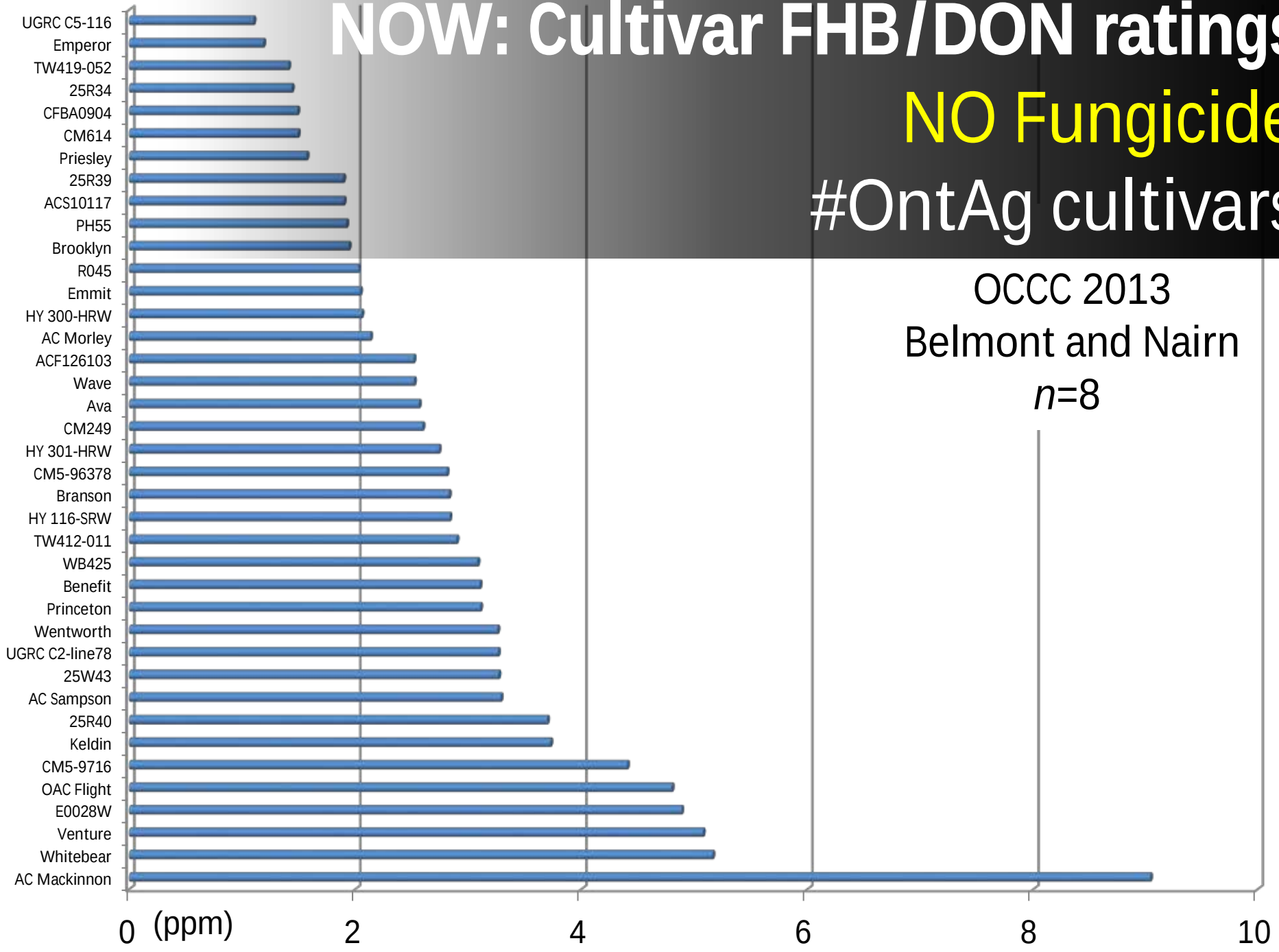
NOW: Cultivar FHB/DON ratings

NO Fungicide

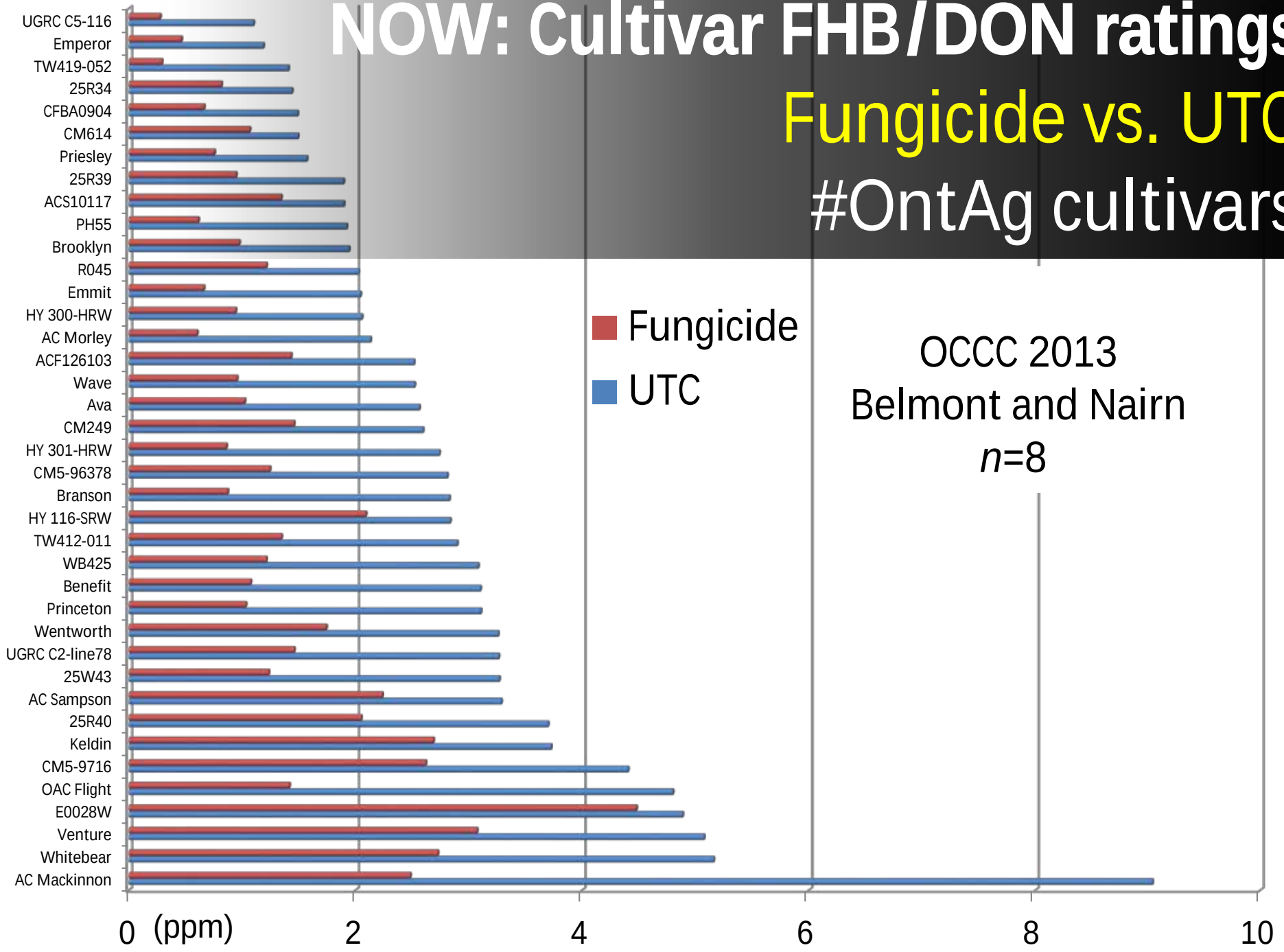
#OntAg cultivars



NOW: Cultivar FHB/DON ratings

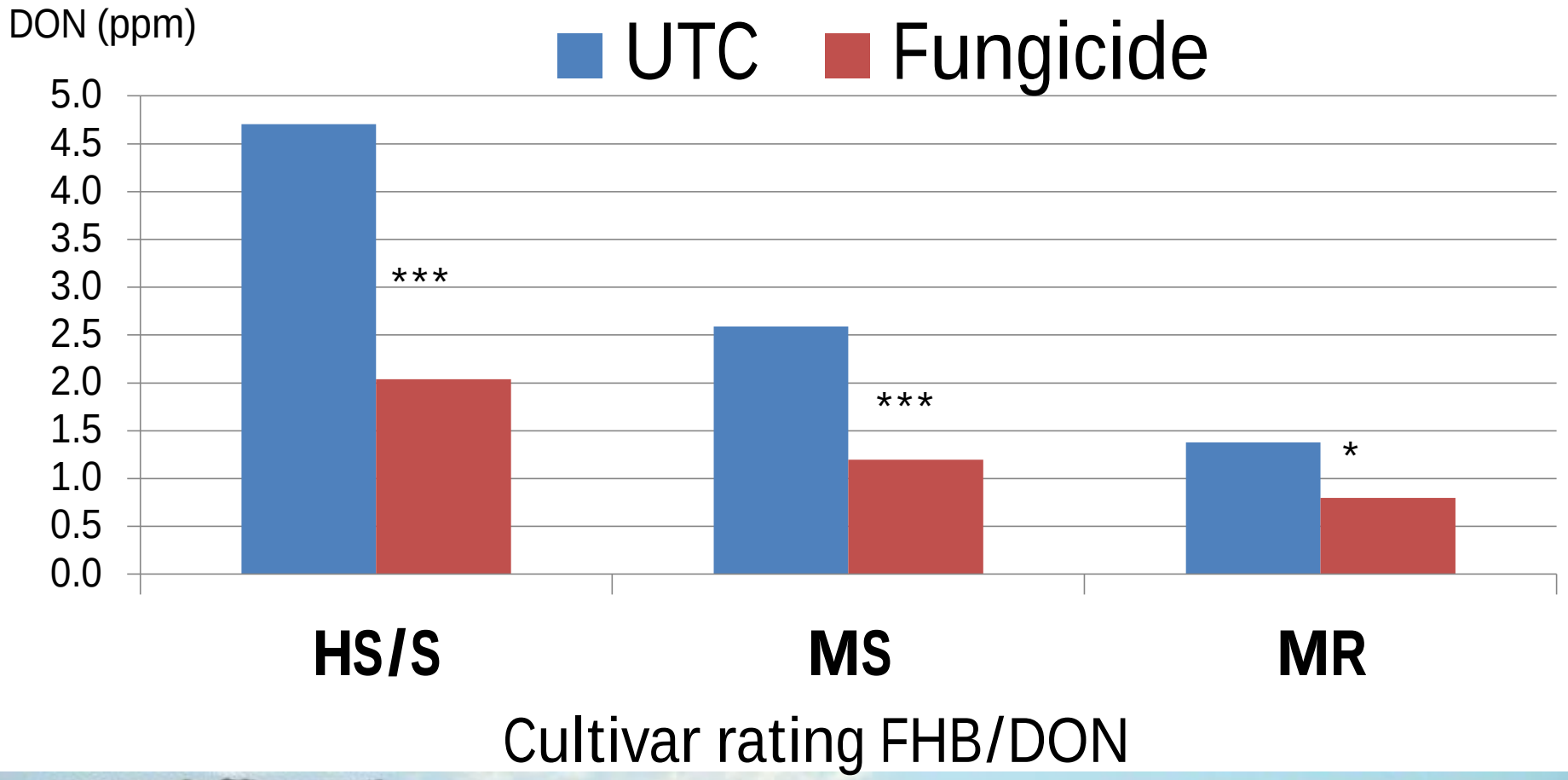
Fungicide vs. UTC

#OntAg cultivars



3. NOW: cv. resistance vs. fungicide strategy

#OntAg cultivar ratings from 2013



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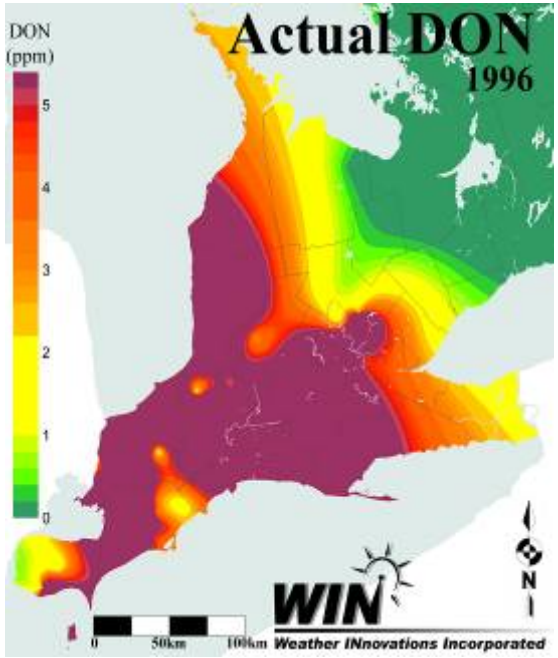
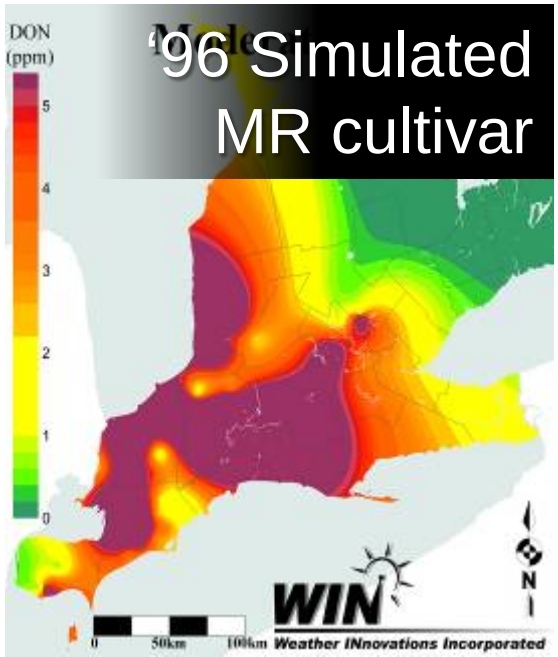
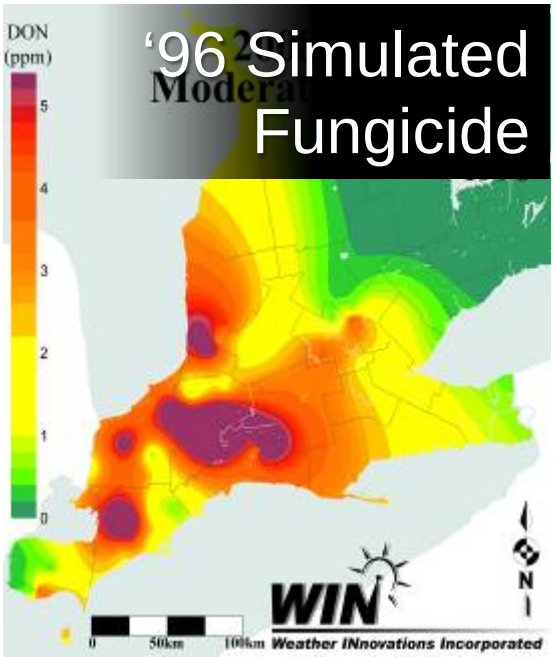
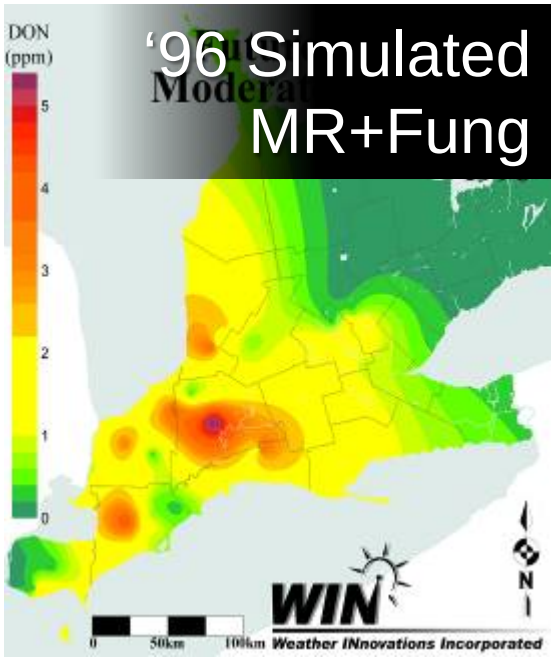


Simulated 1996: Effect of MR cultivar + fungicide is additive







4. NOW: Application technology

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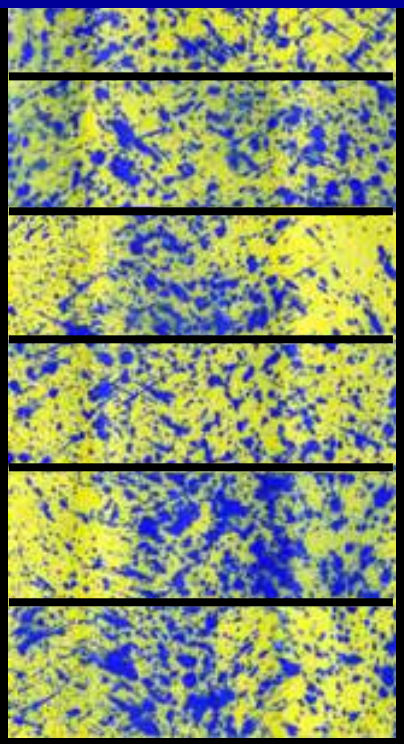
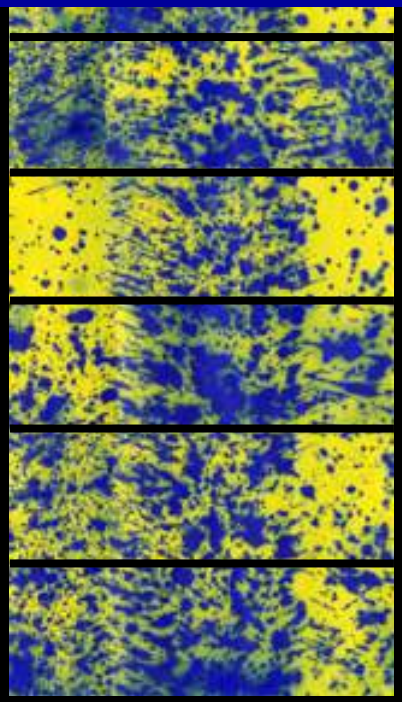
Nozzle Configurations Compared

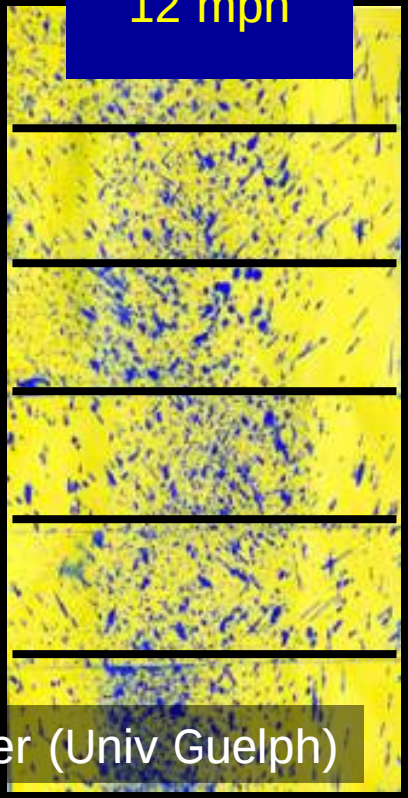
FWD-BACK TT11004
12 mph

TurboFlood
Alternate on Boom
12 mph

TwinJet
12 mph

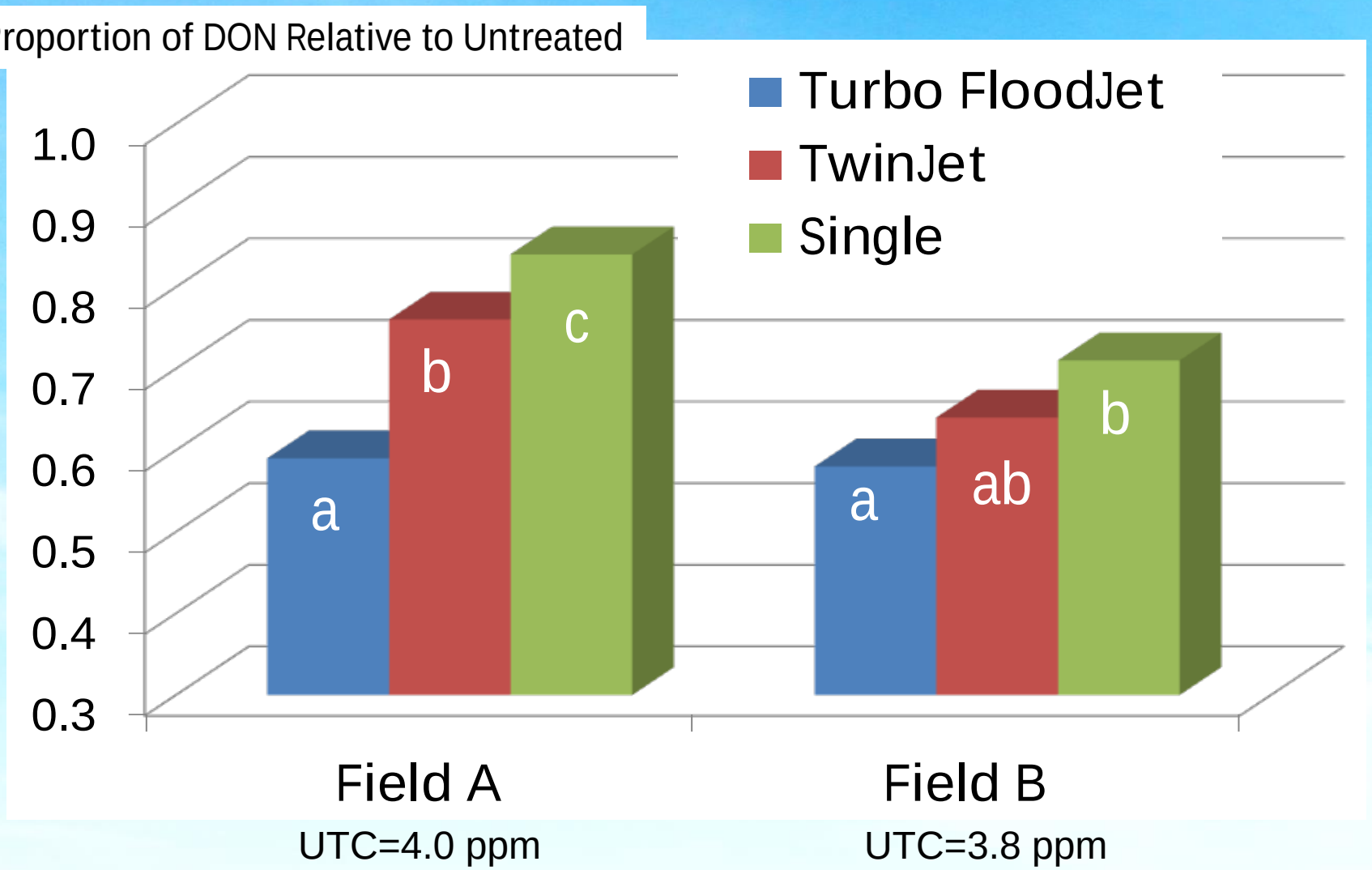






Hooker (Univ Guelph)

Nozzle configuration vs. DON



Statistical differences @ P=0.05

5. NOW: DONcast -- predicting DON

* Web-based delivery since 2000

www.weathercentral.ca

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Important Information:

Actual DON concentrations may differ from the DON estimated. For estimates at heading, certain weather conditions between heading and harvest may influence the final (actual) DON. All estimates are based on timely harvests at maturity; harvest delays caused by wet weather have been shown to increase DON levels. These elevated DON levels cannot be estimated at heading, and therefore, are not factored into the model.

Estimates should only be used as a guide to help make management decisions. Weather Innovations Incorporated, or their employees, assume no liability from the use of this

DONCast Calculator

Select the field location for which you would like to obtain DON estimates, then select a new heading date. You may change the probability of precipitation predictions as desired. Click 'Calculate DON estimates to obtain the predicted values.

Agronomy Data

Select a field location

	Location	Variety	Heading Date	Post-2006 Pre-2007 Tillage	2006 Crop	Post-2005 Pre-2006 Tillage	2005 Crop
C	Lakeshore	VIENNA	May 31	Conventional	Corn	Conventional	Wheat
C	Home Field	25R47	June 5	No-Till	Dry Field Beans	No-Till	Corn
C	Inland	25K41	June 2	No-Till	Dry Field Beans	No-Till	Corn

Heading Date

The preset heading date for Inland is **June 2, 2007**.
If desired, choose a new heading date for selected field.

1 | May | 2007 | Update

*Please note, there is a limit of 3 changes allowed to heading dates for each location.

*Note to DONcast Users: The format of the forecast data has changed this year. In the past probability of precipitation was expressed as a percent value. The probability is now in millimeters. If you change any predicted values in the calendar, please ensure they are in mm.

Probability Of Precipitation (mm) for "Inland"

If you disagree with the forecast probability of rain, enter your own rain values below in mm.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	12	13	14	15	16 13.6	17 0.1
18 0.0	19 2.0	20 5.9	21 7.0	22 11.2	23 3.6	24 0.0
25 0.2	26	27	28	29	30	1

Today | November | Decembe | Reset to automated forecast

Calculate DON Estimates

Interpretation:

...at heading is not uniform within the wheat canopy and across the field, ...heading dates three days before and after the average heading date are ...timates of DON a few days before or after the average heading date may indicate that concerning levels are imminent.

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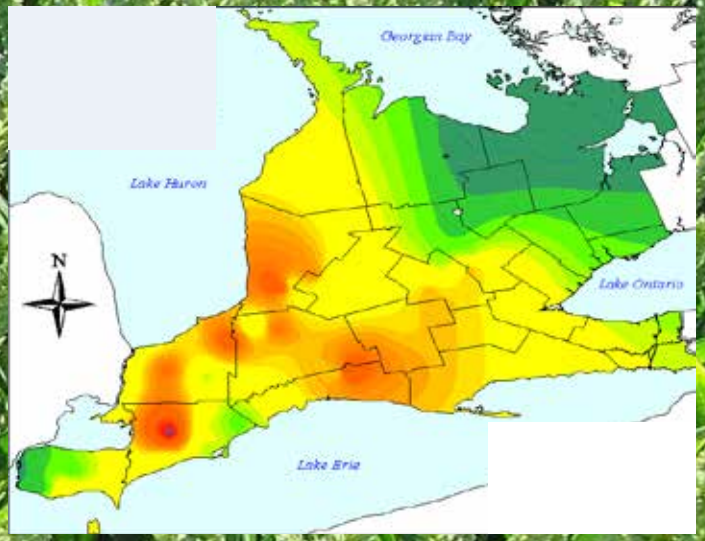
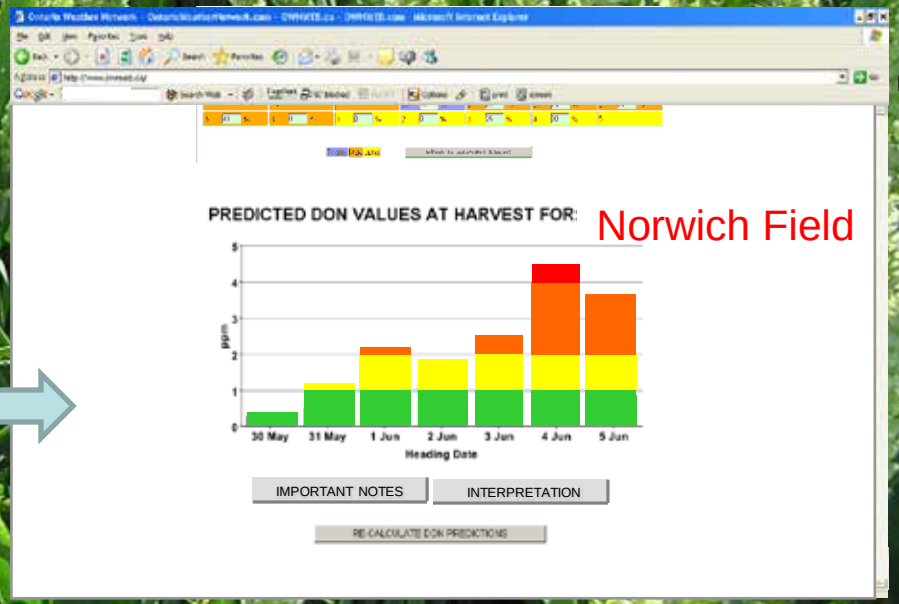
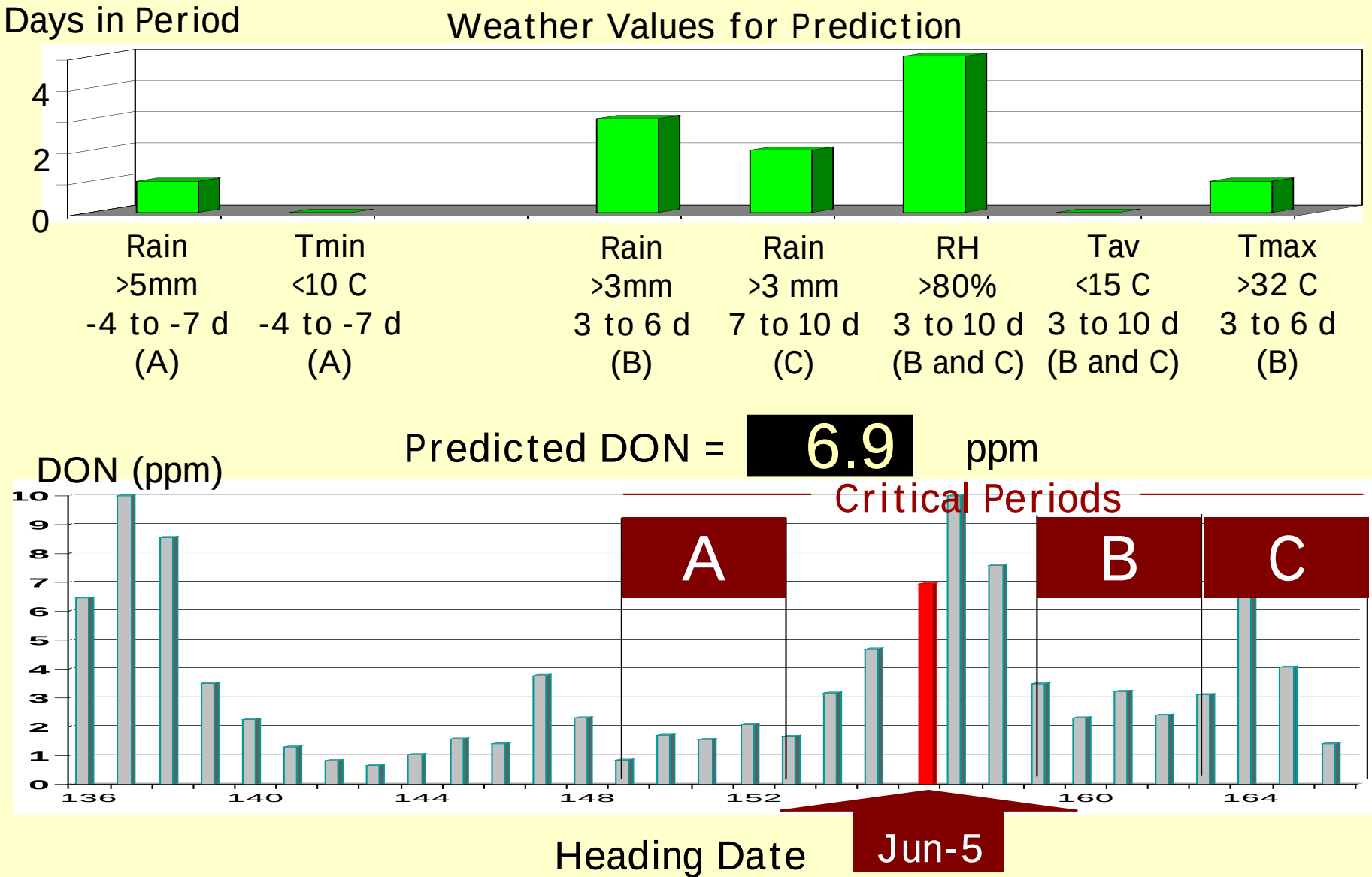
Field-Specific Agronomic Info

Heading date input

Forecast weather tweak (in addition to actual weather)







Schaafsma and Hooker, 2005

DONcast for **June 5th** Heading Date

6. NOW: spreading risk through heading date

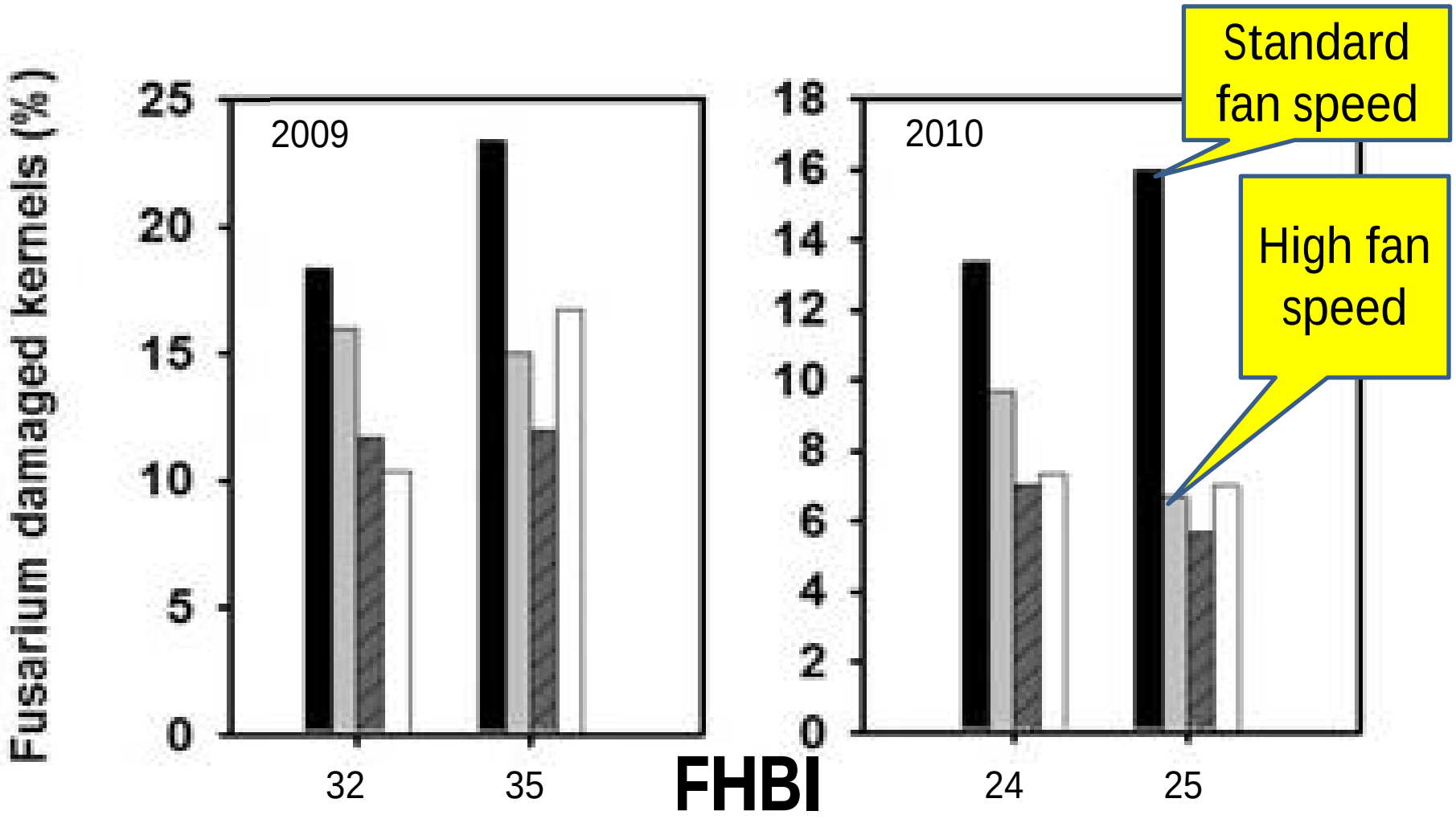
#OntAg heading date distribution in 2015 performance trials (Area I)

7. NOW: Alter heading dates further by planting earliest heading cultivars first

RULE: one week = one day heading

Source: Ontario Cereal Crop Committee
www.gocereals.ca

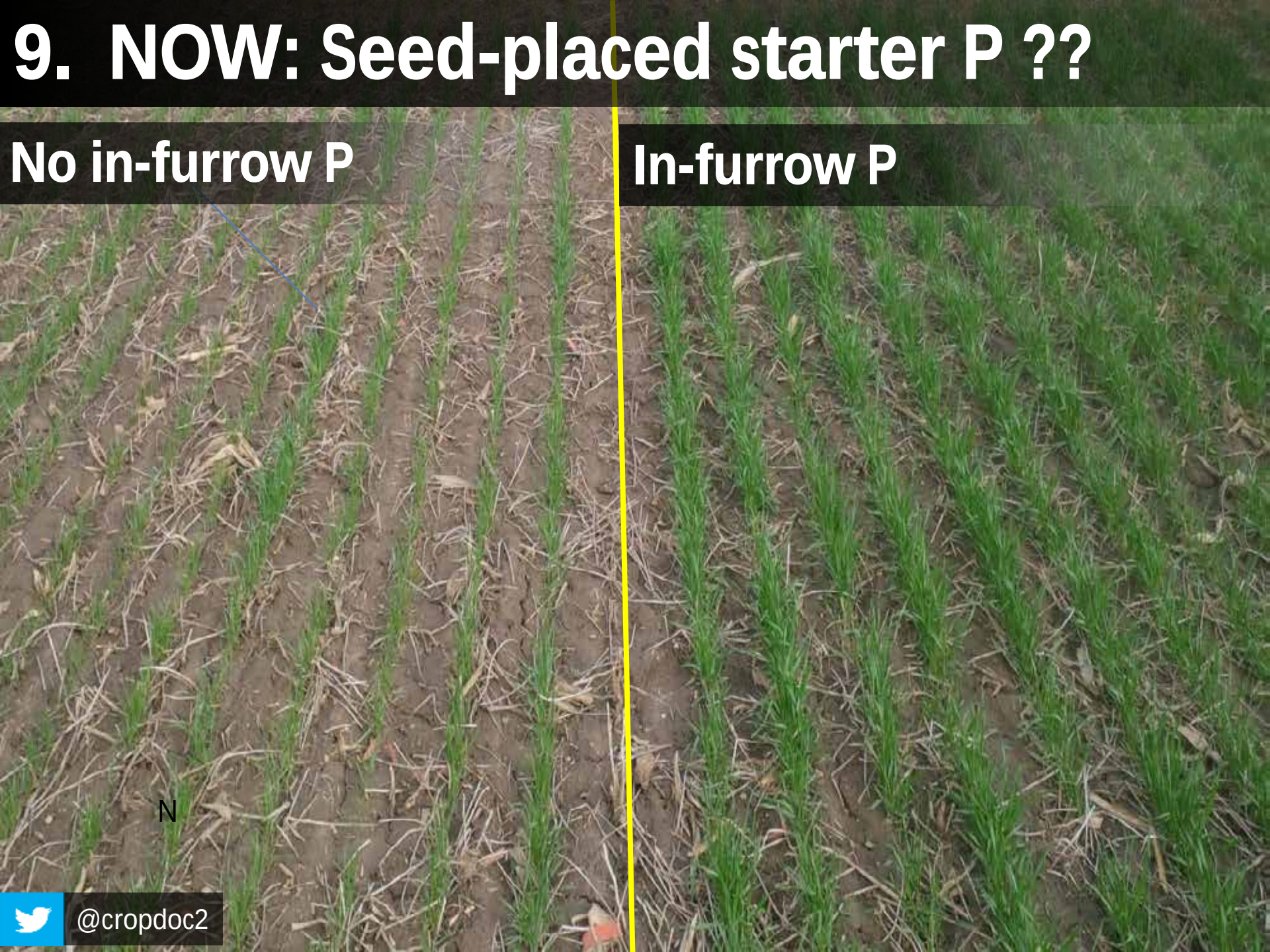
8. NOW: Combine cleanout



Ohio State Univ.

Modified from Salgado et al. 2011. Plant Dis. 95:1448-1457.

9. NOW: Seed-placed starter P ??



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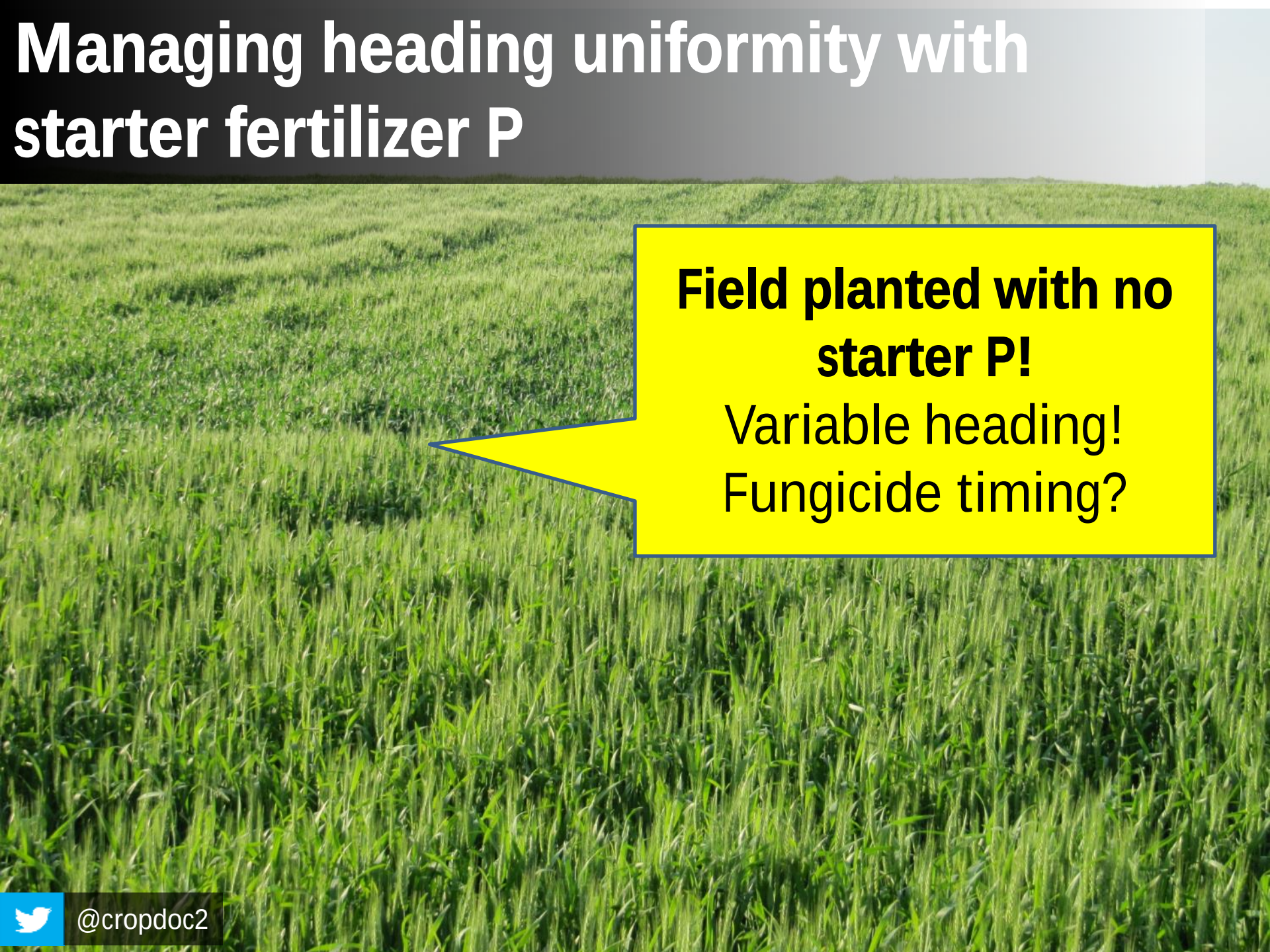
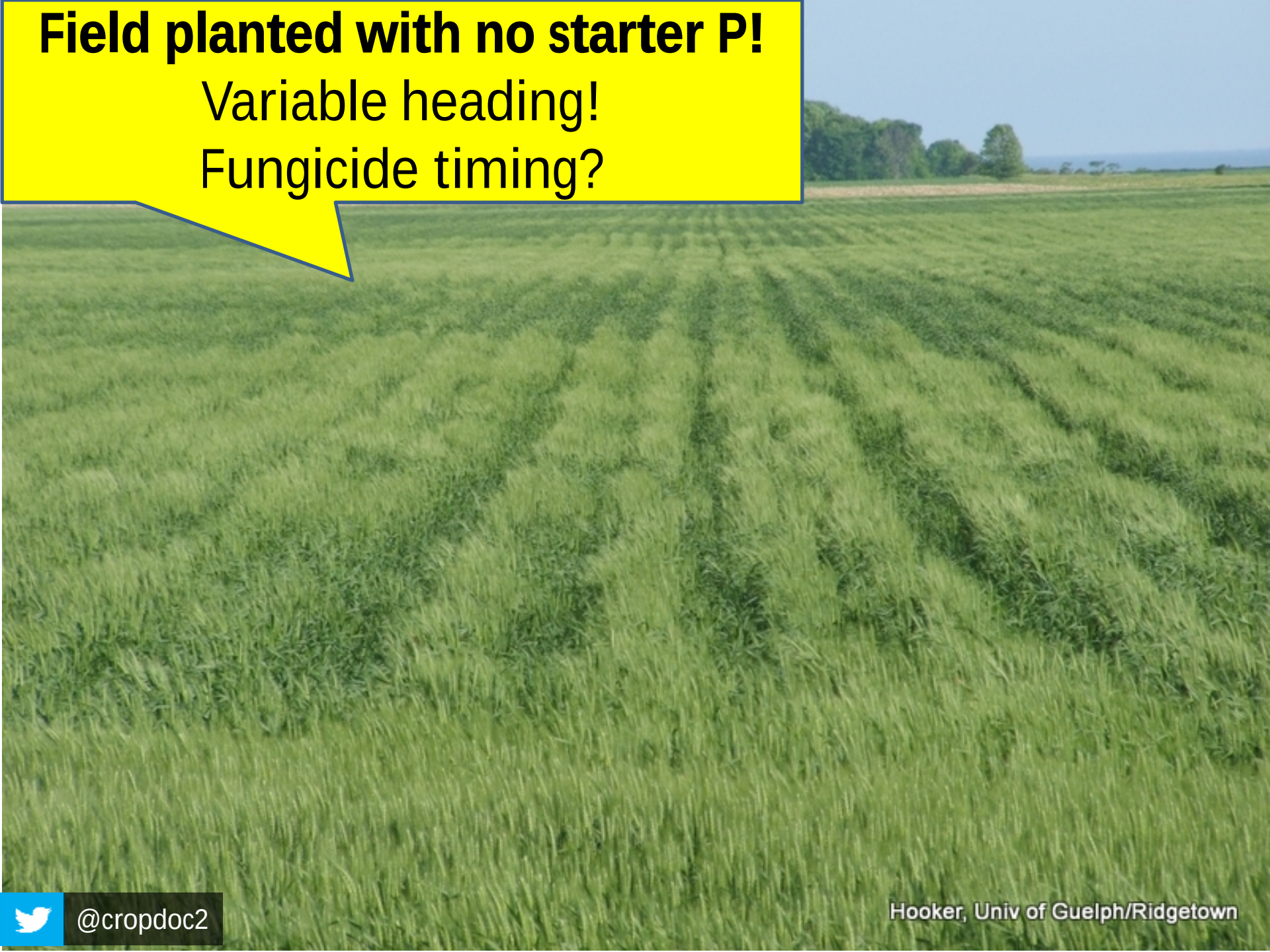
Managing heading uniformity with starter fertilizer P




Field planted with no starter P!
Variable heading!
Fungicide timing?
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10. NOW: Harvest early, pay for drying

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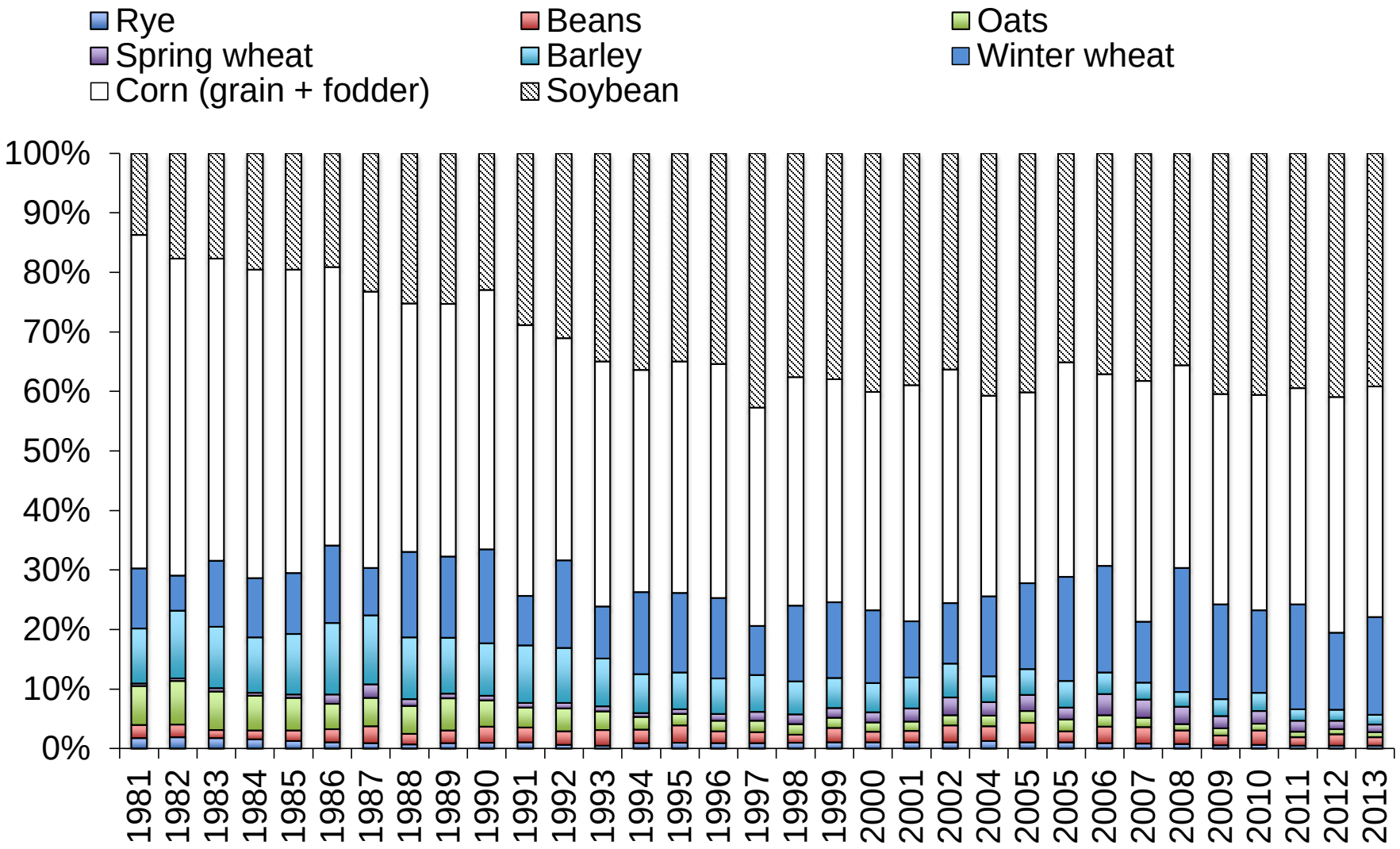
Other NOW vs. 1996

11. Dry wet grain quickly to 13%
12. On-farm storage of contaminated grain; ship during the off-season
13. Sliding grade discount scale for FDK/DON

- Future: premium for ultra low DON grain?
- Future: better detection technologies
- **Future of small grain cereals?**

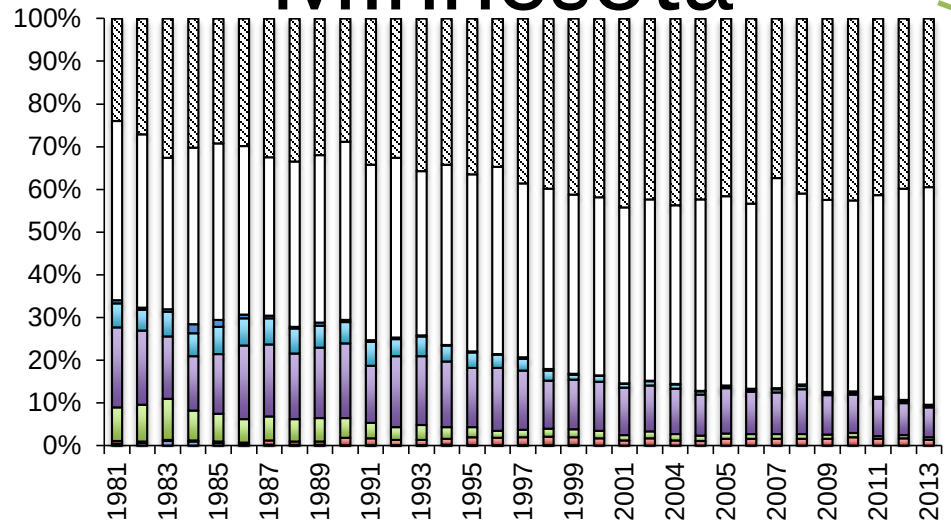
Declining Crop Diversity in Ontario, 1981-2013

(Ontario Ministry of Agriculture, Food and Rural Affairs, Field statistics 2014)

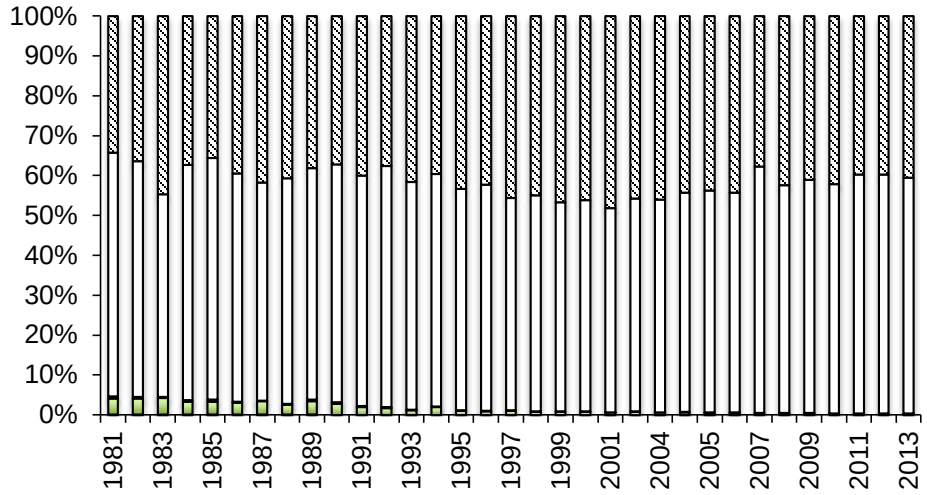


Gaudin A *et al.*, PLOS one (2014) DOI 10.1371/journal.pone.0113261

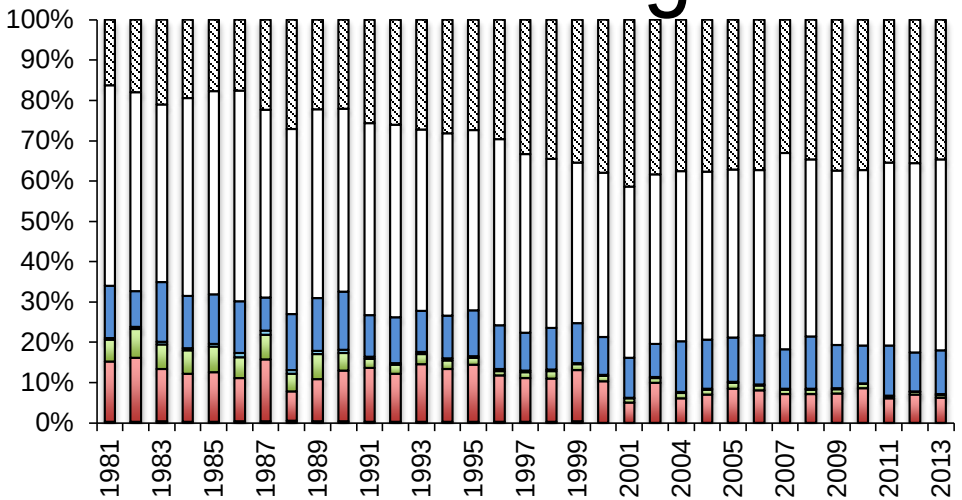
Minnesota



Iowa



Michigan



% total harvested areas USDA-NASS, 2014

CROP ROTATION TRENDS: PAST , PRESENT AND FUTURE BENEFITS AND DRIVERS

William Deen[1], *Ralph C. Martin*[1], *David C. Hooker*[1], *Amélie Gaudin*[2]

[1] University of Guelph, Department of Plant Agriculture, 50 Stone Rd, Guelph, ON, N1G 2W1
University of Guelph, Department of Plant Agriculture, Ridgetown Campus, 120 Main St., Ridgetown, ON N0P 2C0

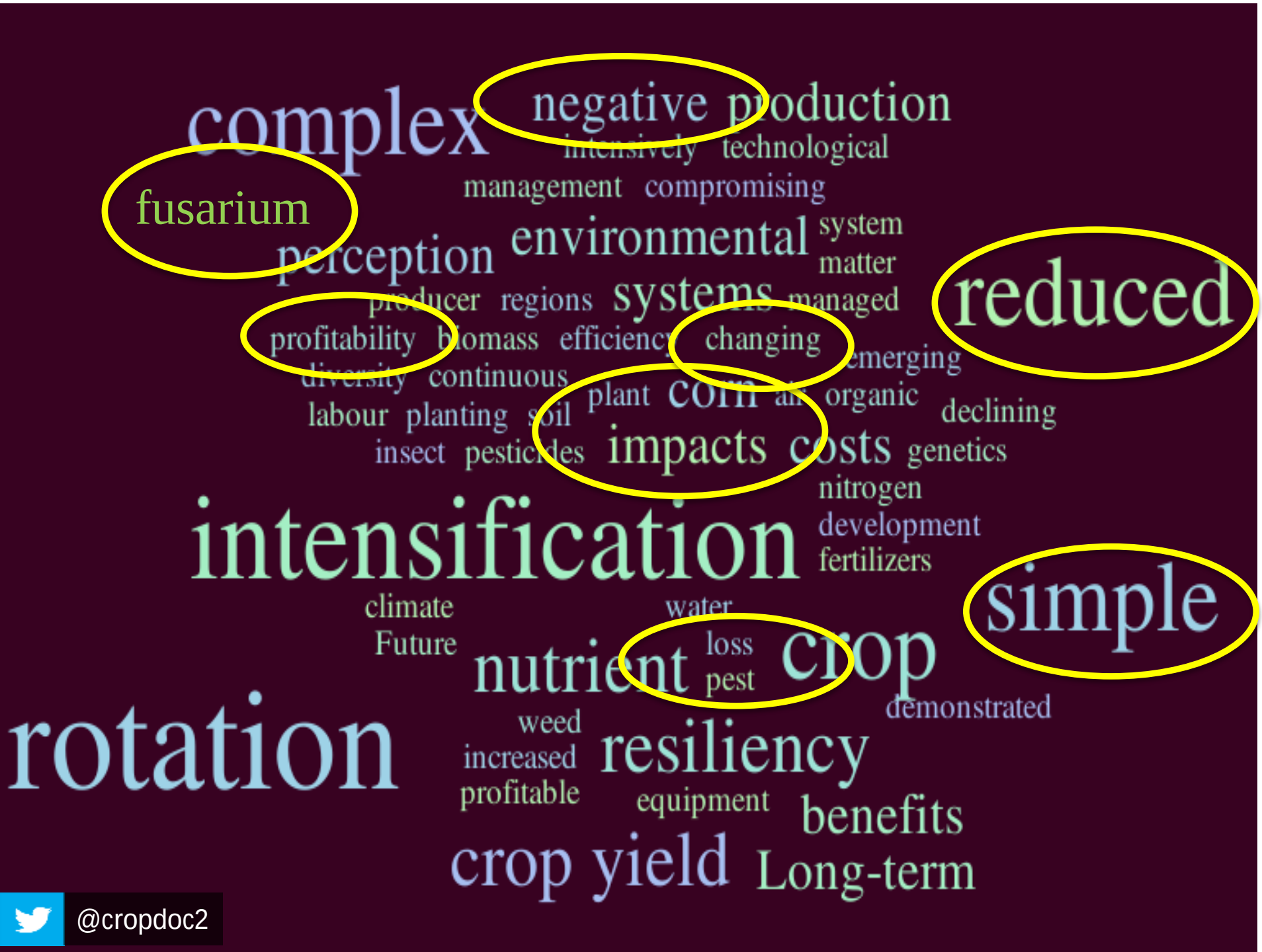
[2] University of California Davis, Department of Plant Sciences, One Shields Ave, Davis, CA 95616

In: Crop Rotations: Farming Practices, Monitoring and Environmental Benefits.

Nova Science Publishers, Inc. Hauppauge, NY 11788 USA; Editor, Baoluo Ma

ABSTRACT

In temperate production regions, crop rotation complexity is
rotations provided such benefits as weed, pest and insect man
distribution. More recently however, technological advancer
genetics and equipment have reduced the apparent need for c
"simple" rotations. These simple rotations have the perceptio
managed and may consist of only two crops or continuous planting of one crop. Long-term rotation


complex
negative
production
intensively
technological
management
compromising
fusarium
perception
environmental
system
matter
reduced
producer
regions
systems
managed
profitability
biomass
efficiency
changing
emerging
diversity
continuous
plant
corn
organic
labour
planting
soil
declining
insect
pesticides
impacts
costs
genetics
nitrogen
intensification
development
fertilizers
simple
climate
Future
water
loss
pest
nutrient
crop
demonstrated
rotation
weed
increased
profitable
resiliency
equipment
benefits
crop yield
Long-term
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Corn/soybean rotation is associated with:

- **Reduced yield and greater yield instability**
- Lowest soil organic matter/poorest soil structure
- **Increased N requirement for corn**
- Reduced input use efficiency
- Increased GHG emission
- **Reduced opportunity to incorporate cover crops**
- **Reduced opportunity for sustainable biomass removal**
- **Reduced profitability**

Meyer-Aurich et al, 2006a; Meyer-Aurich et al 2006b; Sanscartier et al, 2013; Munkholm et al, 2012; Munkholm et al, 2013; Muellera et al, 2009; Gaudin et al, 2013; Gaudin et al. 2014; Gaudin et al. 2015, Kludze et al. 2013.; Van Eerd et al.. 2014

Intensify wheat – developing the drivers

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Nitrogen x Fungicide Synergy
SMART trials 2008-2010

	90 lbs N	150 lbs N
	---- bu/ac ---	
-Fungicide	90	98
+Fungicide	98	**109**

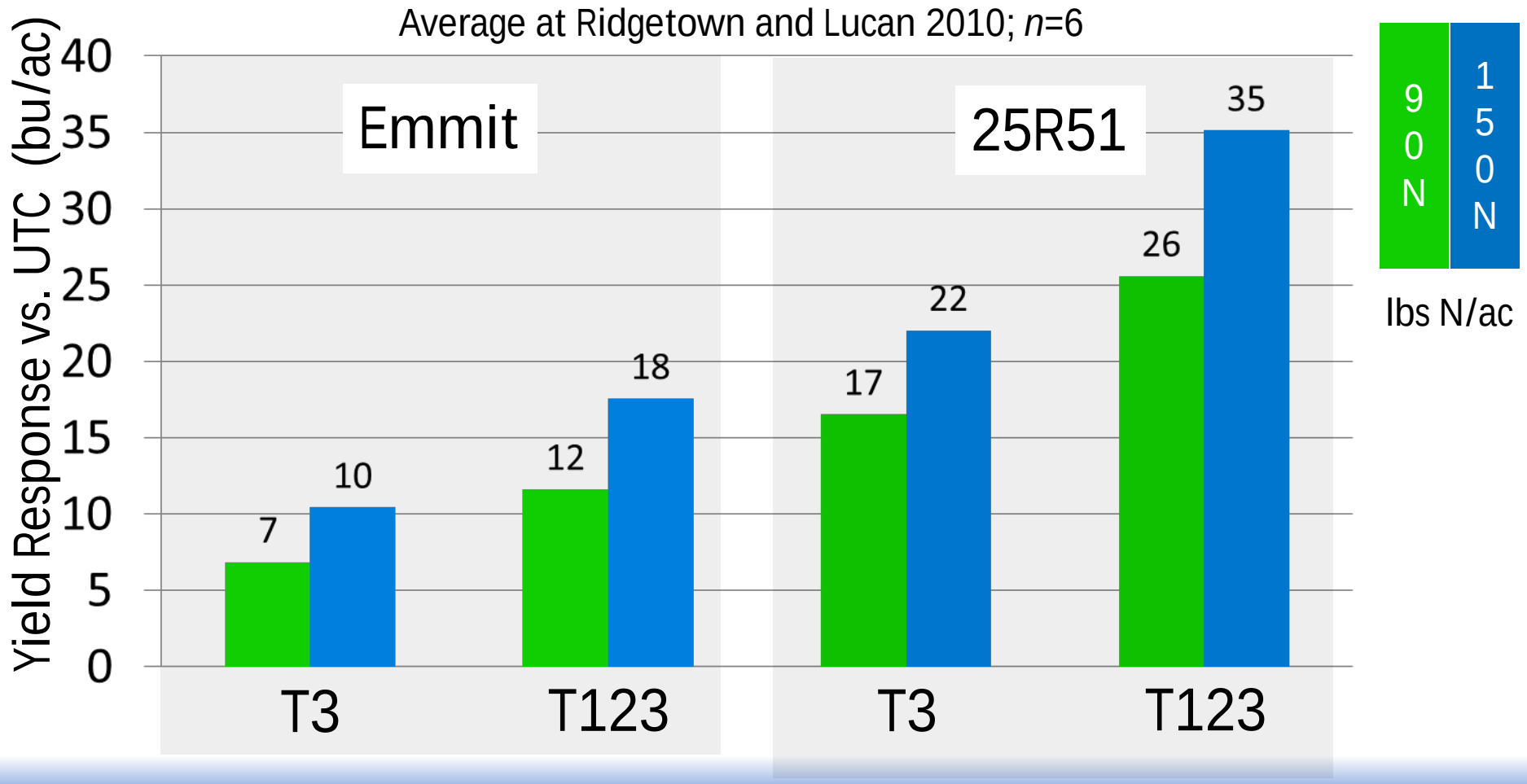
+19 bu/ac response over 90 lbs N/ac Untreated

Fungicide = T2+T3 applications

Brinkman and Hooker, UG (2012)

Sparry (C+M Seeds), 2010

Wheat Response to Fungicide depends on N **(and Variety!)**



Brinkman and Hooker, UG (2012)

20 years of developing BMPs for FHB

Conclusions

- Reduce reliance on fungicides using IPM
- Risk management
  - MS-MR cultivars + fungicides, cultural, harvest timing
- Variety development: Yield is KING!
- Intensification of small grain cereal production for diversity and sustainability

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Hooker, Univ of Guelph/Ridgetown

Questions?

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Email: dhooker@uoguelph.ca
Twitter: @cropdoc2

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Plant Agriculture

Ontario

Grain Farmers of Ontario