

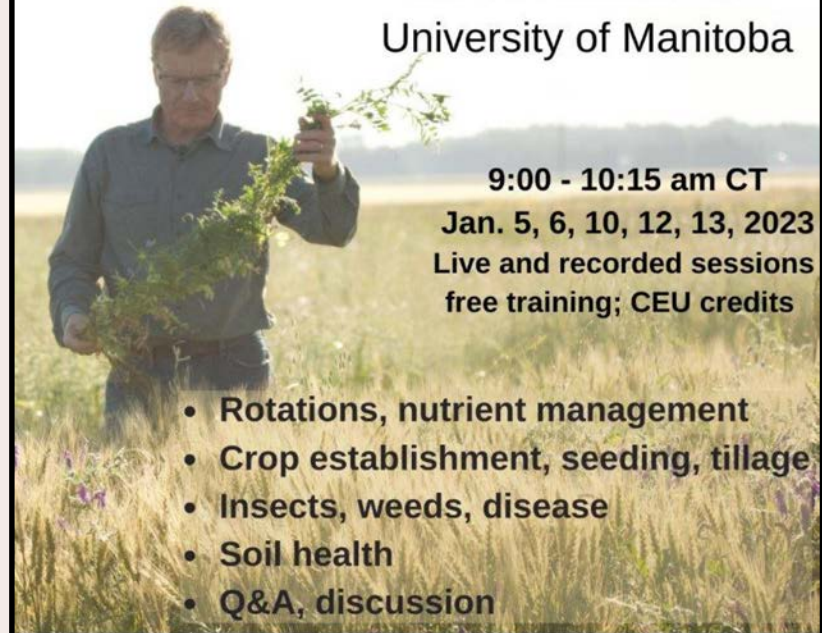


## MODULE 2 January 6, 2023

# CROP ESTABLISHMENT, SEEDING & TILLAGE

## ORGANIC AGRONOMY TRAINING

with Dr. Martin Entz  
University of Manitoba



9:00 - 10:15 am CT

Jan. 5, 6, 10, 12, 13, 2023

Live and recorded sessions  
free training; CEU credits

- Rotations, nutrient management
- Crop establishment, seeding, tillage
- Insects, weeds, disease
- Soil health
- Q&A, discussion

Register now:

[www.organicdevelopmentfund.org](http://www.organicdevelopmentfund.org)





## The Prairie Organic Development Fund

- Investment platform established to develop organic agriculture and marketing in the Canadian Prairies
- Builds resilience in the sector by investing in
  - organic provincial associations (Capacity Fund); and
  - high impact programs (Innovation Fund) related to marketing, research, policy, education and capacity development that have broad public benefit to the organic sector.

[www.organicdevelopmentfund.org](http://www.organicdevelopmentfund.org)



#### Platinum Sponsors



GRAIN MILLERS



#### Silver Sponsors



#### Friend



The Canadian Organic Ingredient Strategy is funded by



## The Prairie Organic Development Fund is grateful for the support of:

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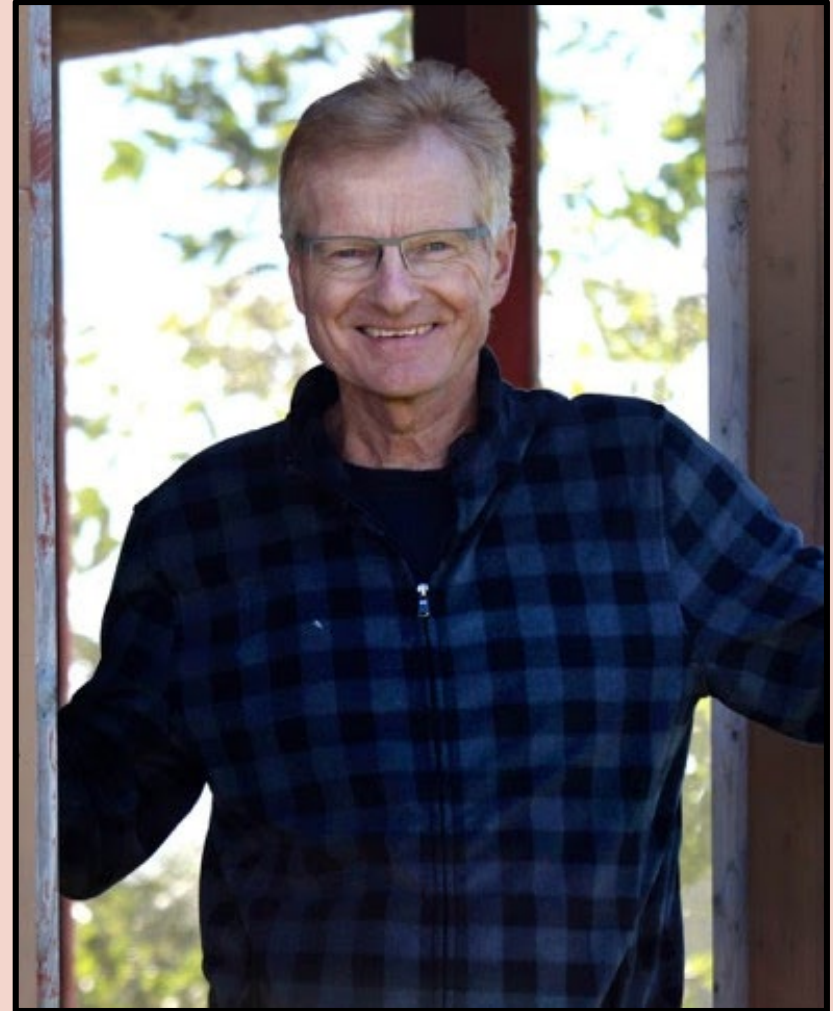
Friend: F.W. Cobs Company

We gratefully acknowledge funding from the Canadian Agricultural Partnership.

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**Martin Entz, Ph.D.**  
**Department of Plant Science**  
**Natural Systems Agriculture Lab**  
**University of Manitoba**

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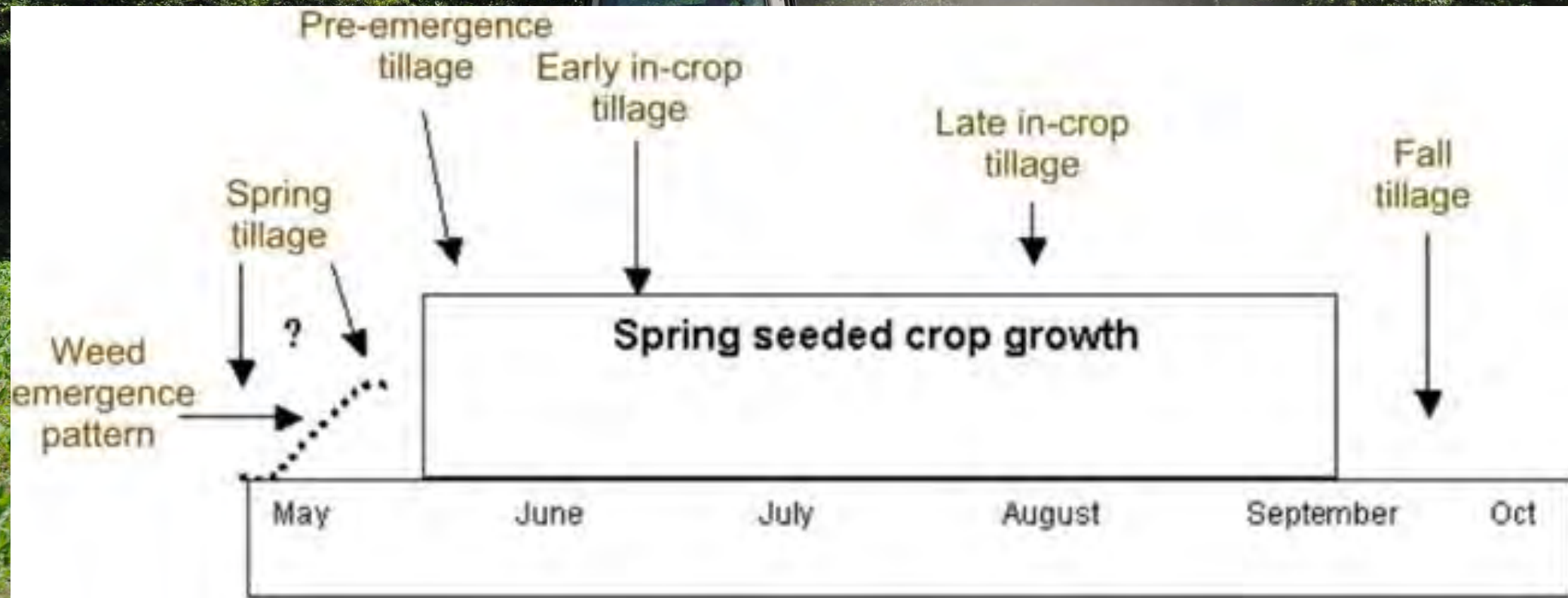
## Lesson 2. Part 2. Tillage and Weed Control





# Tillage for Weed Control

- Organic agriculture is very challenging without tillage





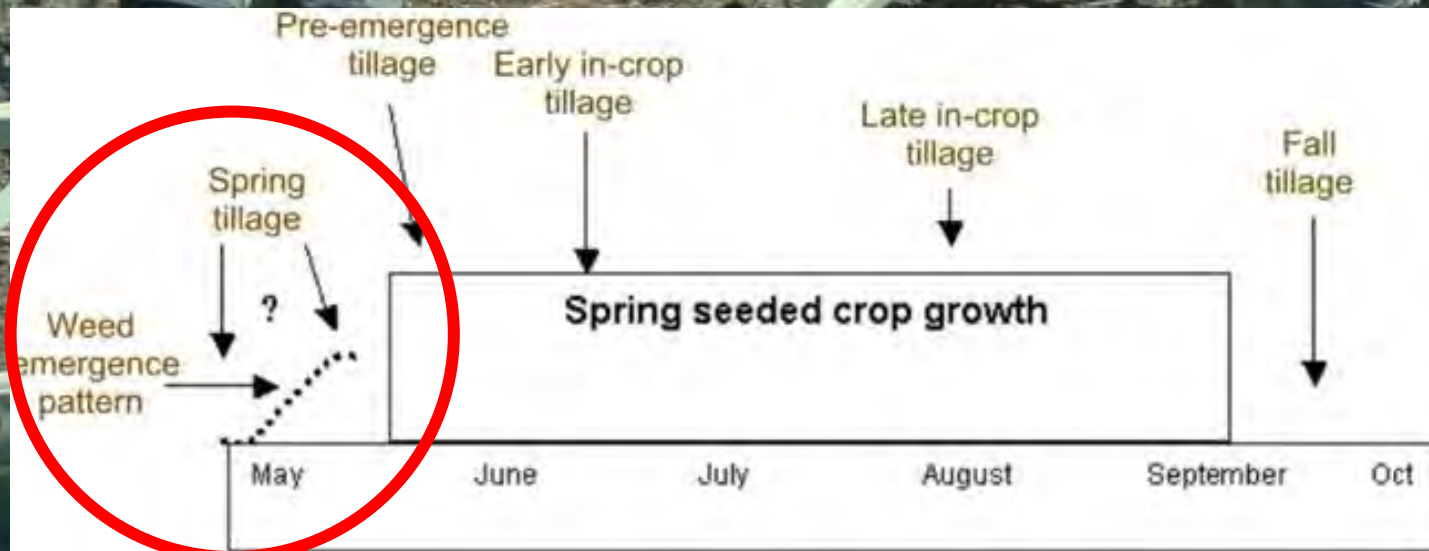
Pre-plant tillage/false seedbed/stale seedbed



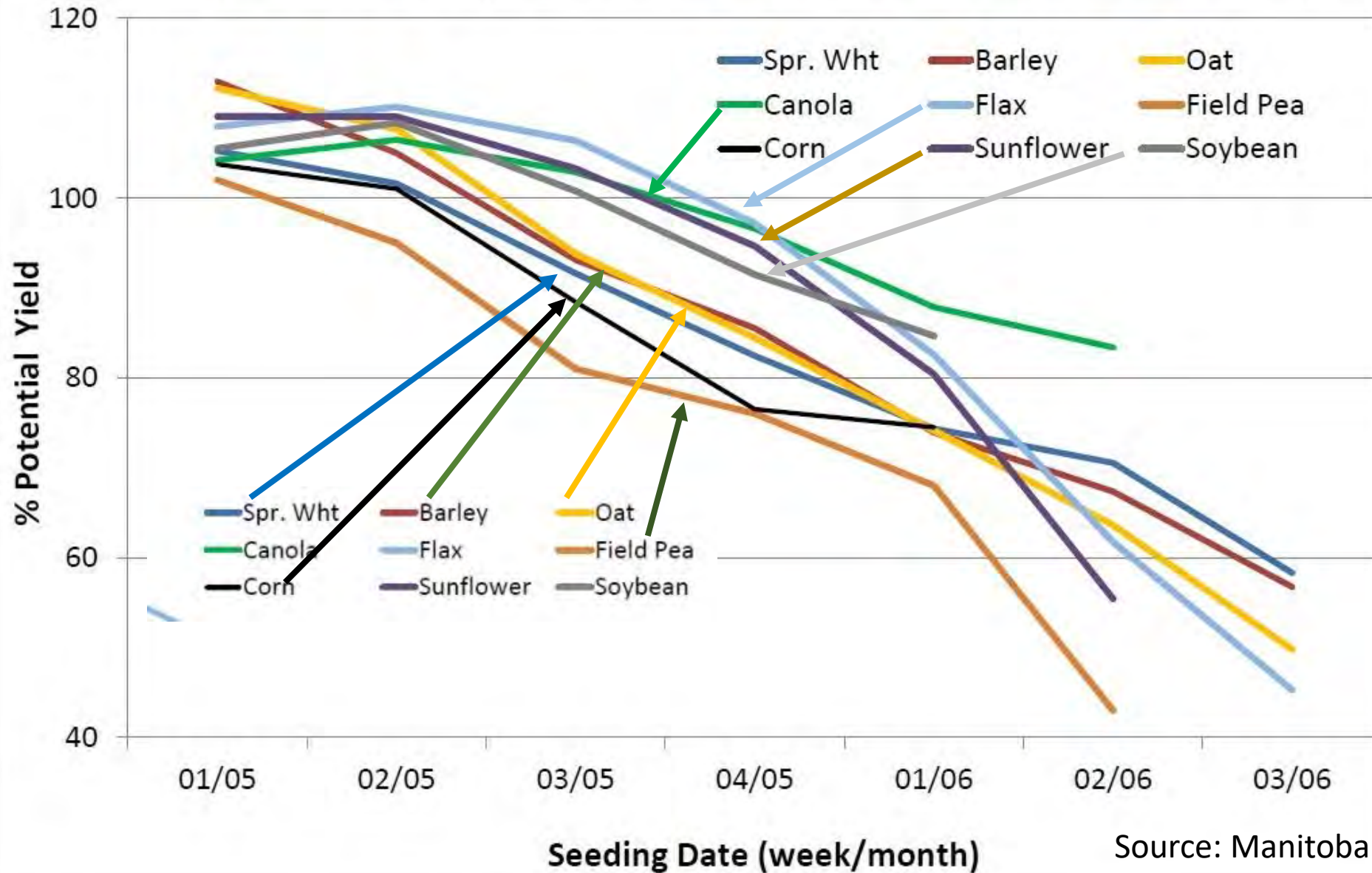


# Seeding Dates?

“Should seeding be done early, before the flush of weeds in the spring, or should it be done after most weeds have germinated?”



# Crop Yield Response to Seeding Date (2005-2013)





Thanks to Matthew Dewavrin, agr.  
Les Fermes Longprés (2009) Ltée.



Cultivator to terminate red clover cover crops. Shanks firmly mounted on machine to promote effective undercutting of clover



Pre-emergent tillage/blind harrowing







Abb. 122: Ganzflächige Bearbeitung mit dem Striegel



**Rotary Hoe**



For edible beans

**Tine Harrow**



Small grains pre emerge





Lely harrowing soybeans



Damage to crop at hook stage



Timing is important

**White Thread Stage**



# Post Emergence Tillage



Credit: Jason Peters





- Preemergence harrowing increased the average crop yield by 6.2%, post-emergence harrowing by 4.0% and the combined effect was 10%.
- Crop yield was mainly increased on hard-packed soils.
- Weed and crop responses varied strongly among experiments, but the efficacy of pre- and post-emergence weed harrowing was positively correlated across experiments.
- Weed species composition was of minor importance regarding weed control.
- The study indicates that one aggressive postemergence cultivation may be as good as one preemergence and one less aggressive post-emergence cultivation

Brandsæter, L.O., Mangerud, K. and Rasmussen, J., 2012. Interactions between pre-and post-emergence weed harrowing in spring cereals. *Weed Research*, 52(4), pp.338-347.



Some of the machines and tillage systems for Organic soybean weed control in Minnesota









## Dry beans tolerant to rotation harrow.



Crop biomass and yield response to rotary weeder applications at different stages of crop growth in pinto bean, black bean and navy bean production in 2018 in Carman, Manitoba. Stanley and Entz. 2022. New tools for mechanical weed control in low-input dry bean (*Phaseolus vulgaris*) production. Can. J. Plant Science. <https://doi.org/10.1139/CJPS-2021-0282>.

Stage	Crop biomass	Yield <sup>a</sup>
	kg ha <sup>-1</sup>	
<b>Pinto Bean</b>		
Ground crack/hook	5379.2	1408.4a
VC	4298.2	1267.6ab
V1-V2	4443.0	1232.9ab
V3-V5	4763.8	1311ab
V8	3509.3	1115.2b
R1	4143.2	715.1c
Weed-free	4471.8	1262.2ab
P value	NS	P=0.0011
<b>Black Bean</b>		
Ground crack/hook	4670.7	1394.7
VC	4419.3	1197.3
V1	5014.4	1381.8
V2-V3	4291.2	1374.5
V5	4527.1	1223
R1	4343.7	1162.7
Weed-free	4694.4	1254.8
P value	NS	NS
<b>Navy Bean</b>		
VE-VC	5708.3	1454.0ab
VC-V1	6490.3	1578.9a
V2-V3	6824.3	1439.5ab
V4-V5	5468.5	1141.2c
R1	5654.4	1299.0bc
Weed-free	5825.5	1372.27b
P value	NS	P=0.0069

<sup>a</sup> Within a column, means followed by different letters are significantly different at the 0.05 probability level according Fisher LSD<sub>0.05</sub>



Broadcast seeded, then  
harrowed using Phoenix  
harrow

Phoenix harrow





## Flaming soybeans on-row in Minnesota



A weed control option  
when fields are too wet  
for tillage





# Inter-row cultivation/scuffling



Interrow tillage guided  
by human operator

Germany, 1949

Abb. 123: Schlepperhackmaschine Bilder: Heller, Dethlingen





Organic dry beans, Manitoba







**Inter-row cultivation  
in organic, narrow-  
row dry beans**



Not tilled

Tilled







Tillage has limits

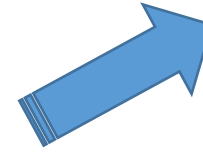
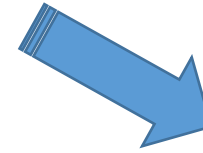
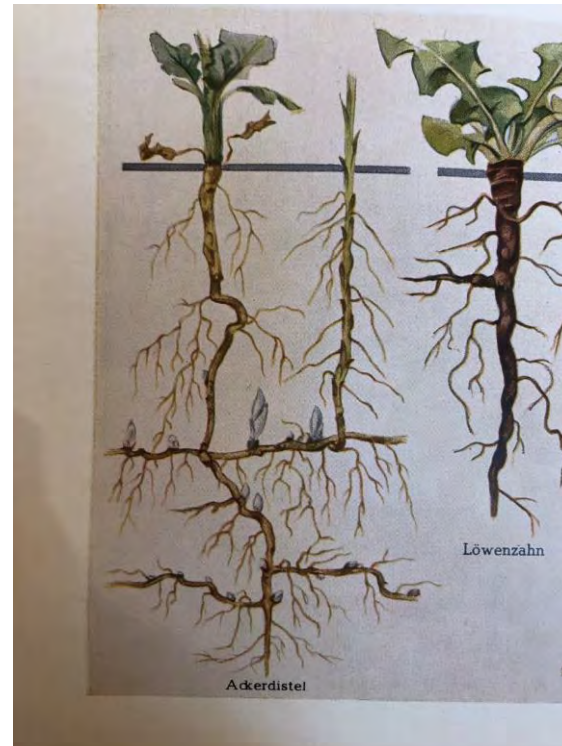




Wild oats



Canada thistle



Alfalfa hay depletes

- Wild oat soil seedbank
- Thistle root reserves



# In-crop weed clipping

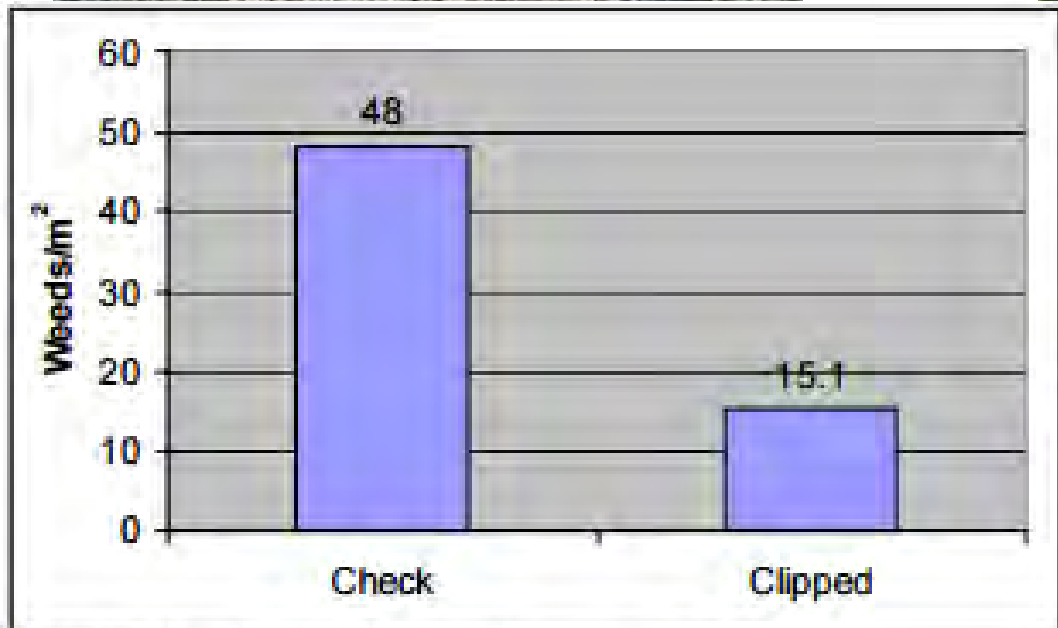
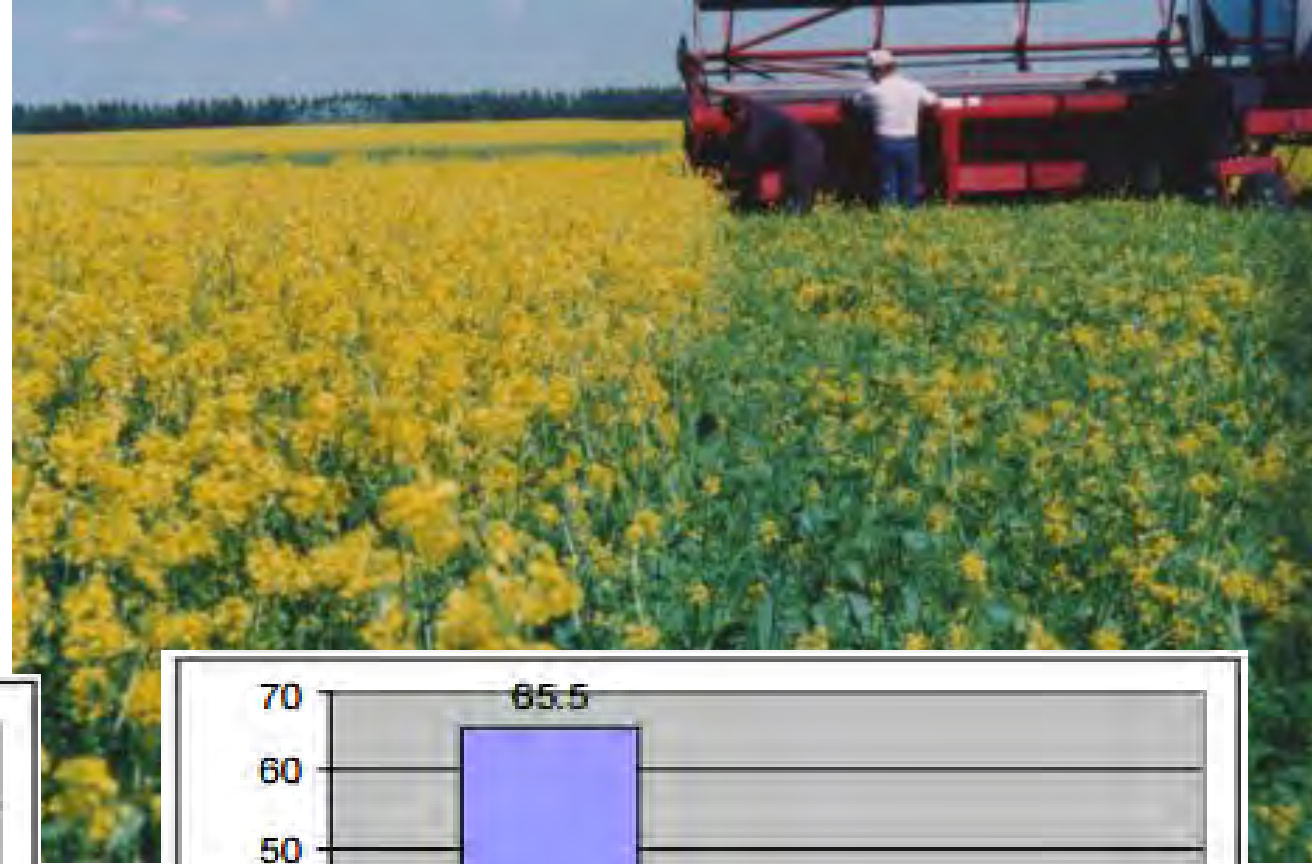


Figure 12. Effect of Weed Clipping on Weed Population 2001 - Site #1.



n Agr.

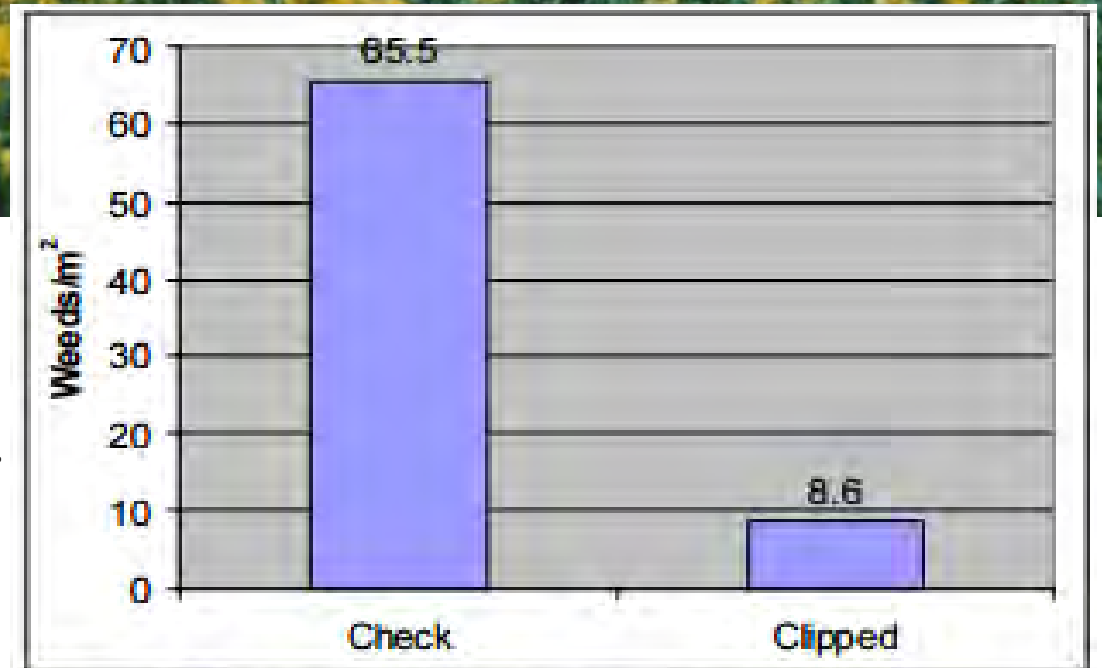


Figure 13. Effect of Weed Clipping on Weed Population 2001 - Site #3.



# The CombCut In-Crop Weed Seed Management









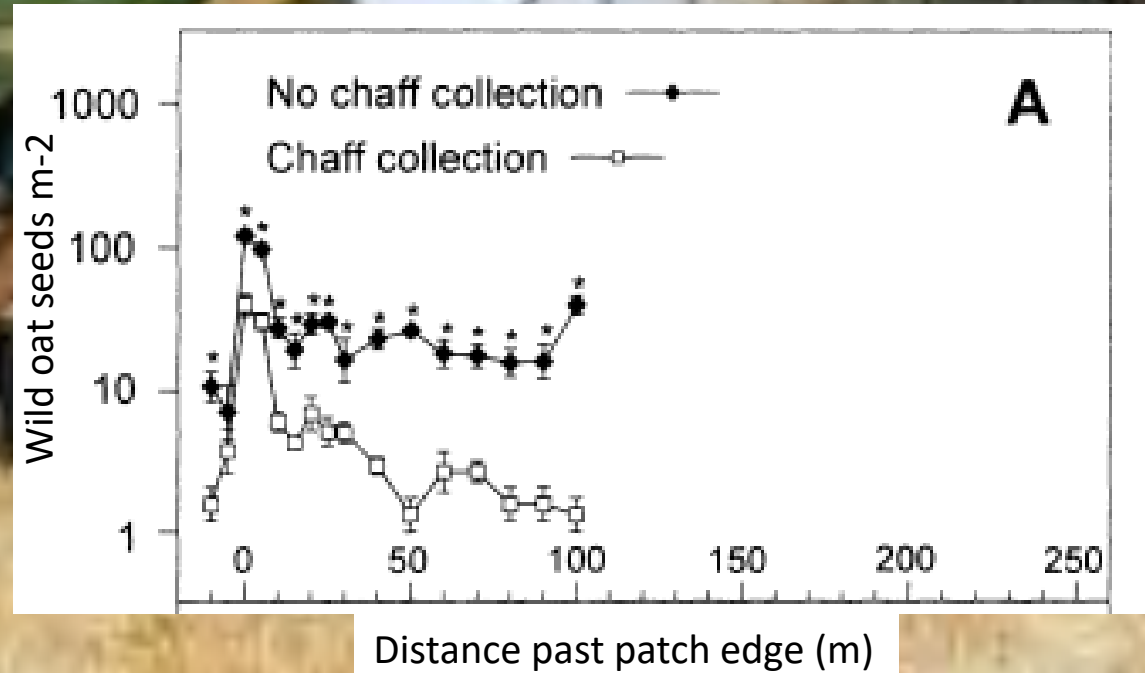
# Weed Control at Harvest





# Weed Control at Harvest

Combine harvester dispersal of wild oat with and without chaff collection



Shirliffe, S.J. and Entz, M.H., 2005. Chaff collection reduces seed dispersal of wild oat (*Avena fatua*) by a combine harvester. *Weed Science*, 53(4), pp.465-470.



# Conservation Tillage for Organic Production





Thanks to Matthew Dewavrin, agr.  
Les Fermes Longprés (2009) Ltée.

Year 1. Late summer  
– seed peas



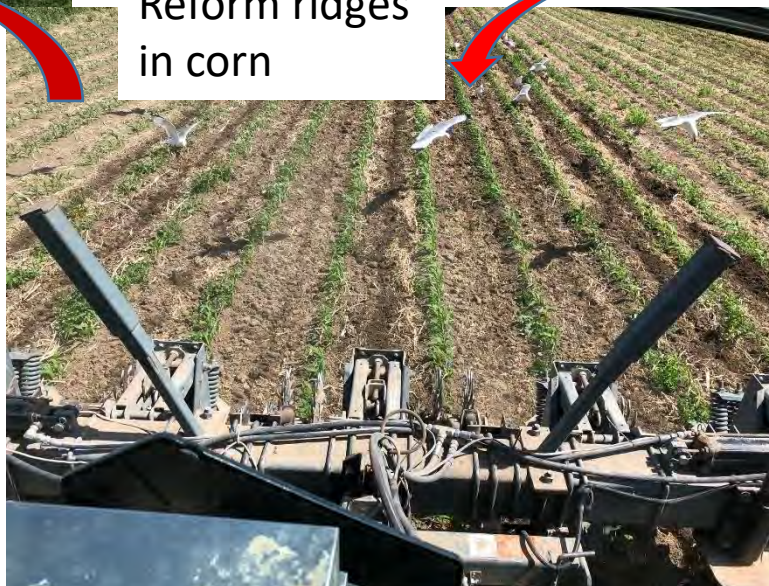
Build ridges



Year 3. Seed soybeans on ridges



Reform ridges  
in corn



Year 2. Seed corn onto ridges





# Conservation Tillage for Organic Production



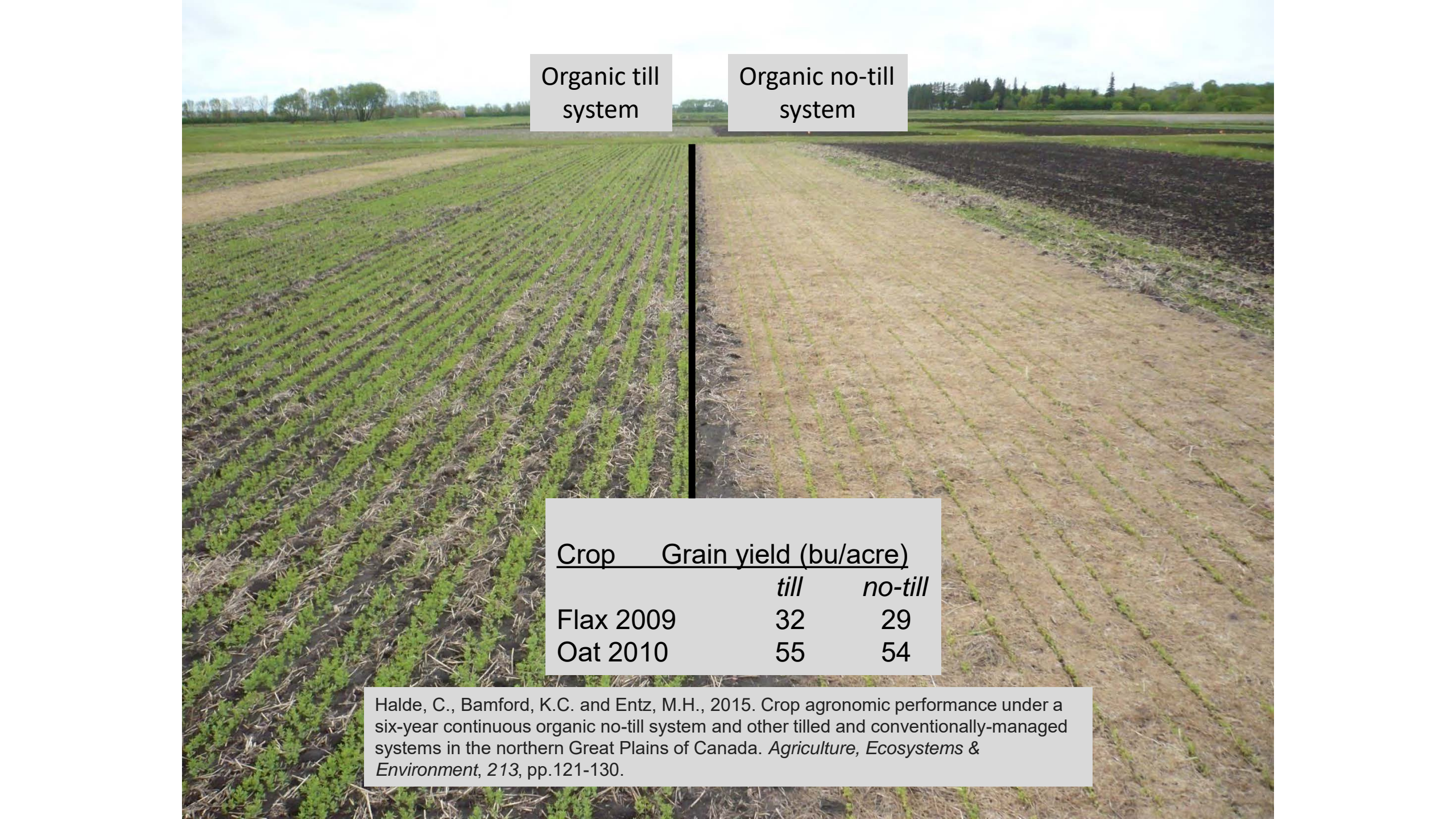




# Organic Rotational No-till







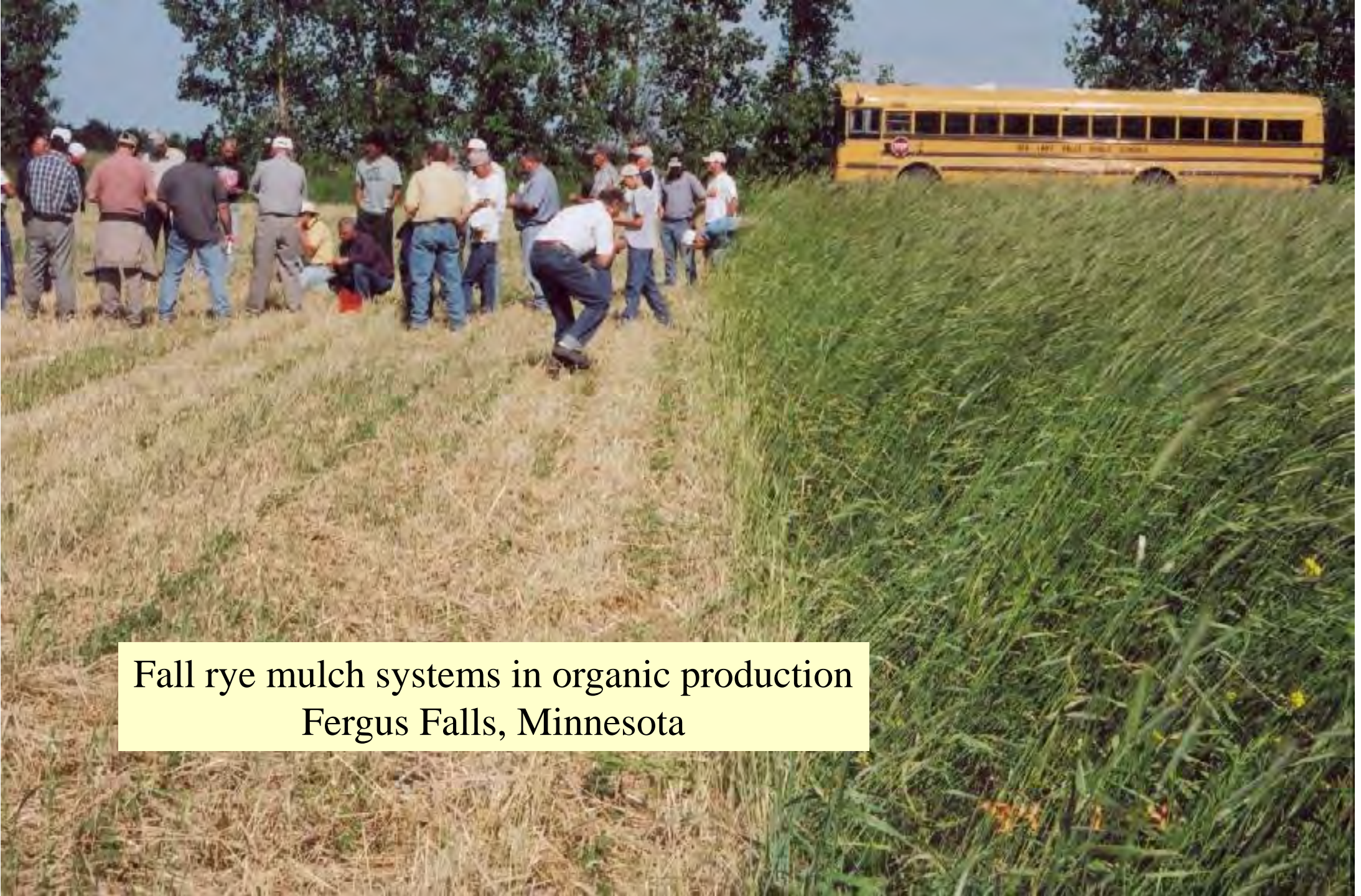
Organic till  
system

Organic no-till  
system

Crop	Grain yield (bu/acre)	
	<i>till</i>	<i>no-till</i>
Flax 2009	32	29
Oat 2010	55	54

Halde, C., Bamford, K.C. and Entz, M.H., 2015. Crop agronomic performance under a six-year continuous organic no-till system and other tilled and conventionally-managed systems in the northern Great Plains of Canada. *Agriculture, Ecosystems & Environment*, 213, pp.121-130.





Fall rye mulch systems in organic production  
Fergus Falls, Minnesota



# Trying the Fergus Falls, Minnesota system in Carman, Manitoba with soybeans and dry beans



No-till seeding beans into standing rye



Soybeans establish well in rye



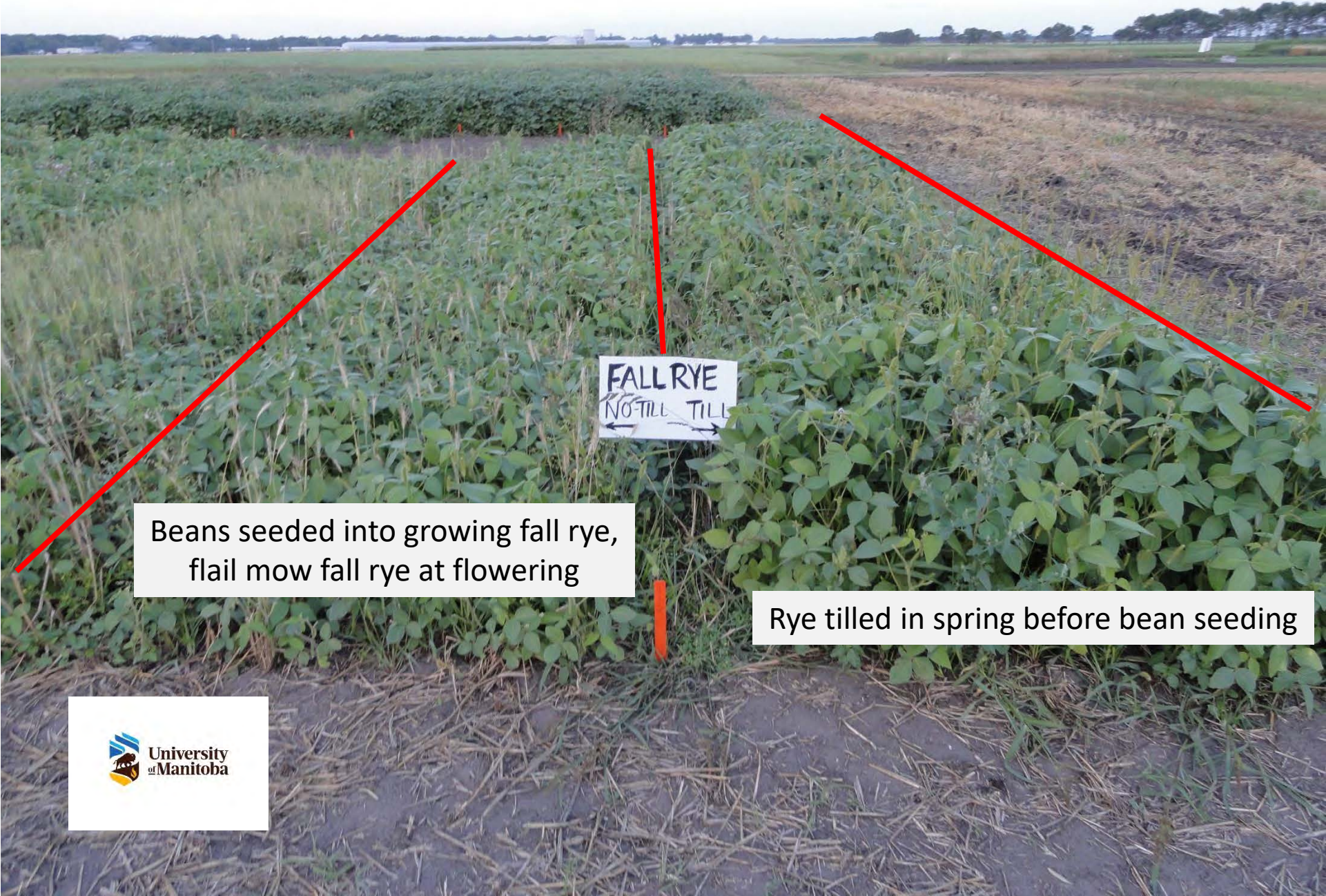


Flail mower used to kill rye once rye flowers





# Rye in organic soybean production

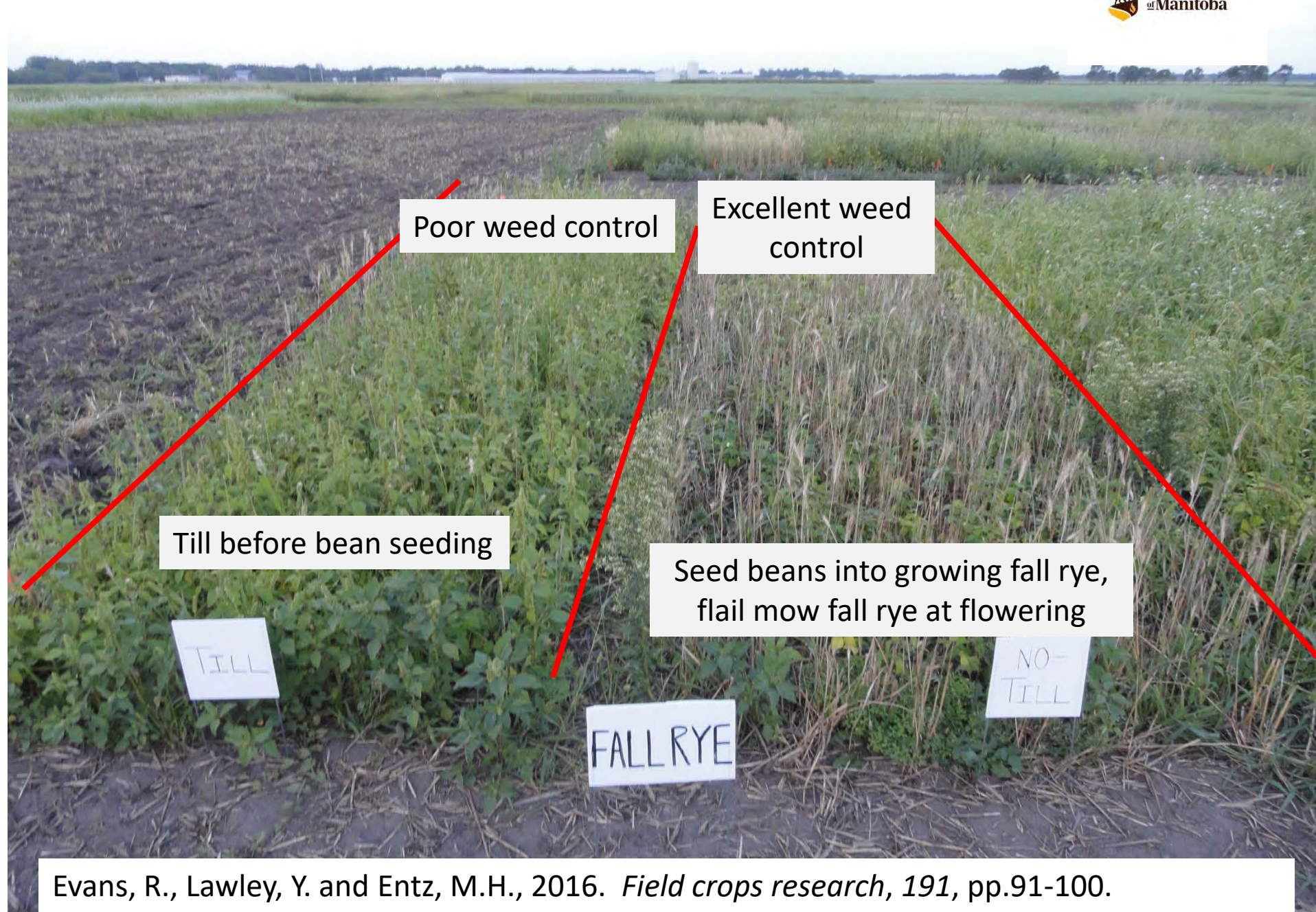


Beans seeded into growing fall rye,  
flail mow fall rye at flowering

Rye tilled in spring before bean seeding



# This system did not work as well in dry beans





### 3 Gen organics near Kitchner, Ontario used same system but roller rye instead of flail mowing.

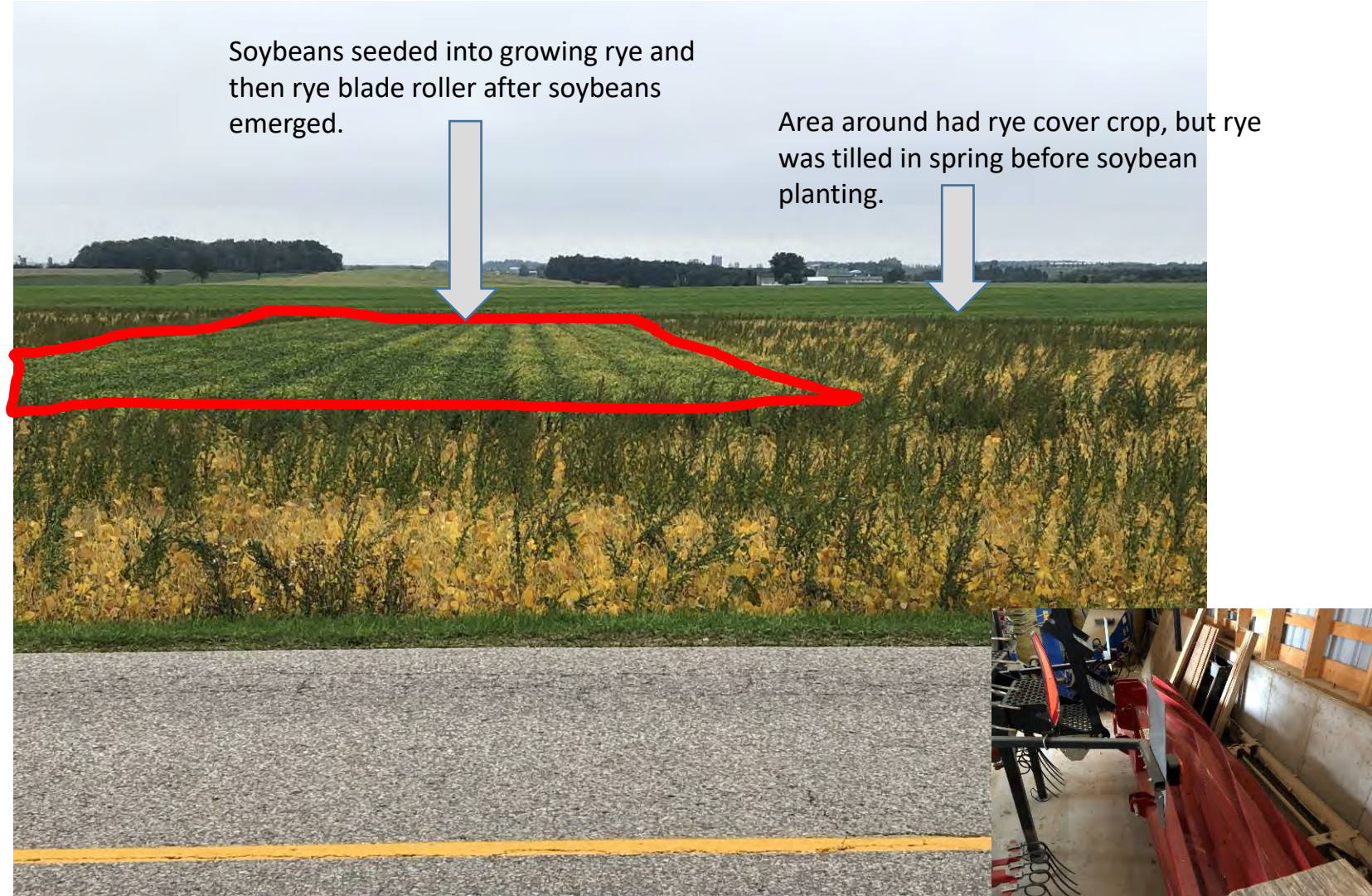
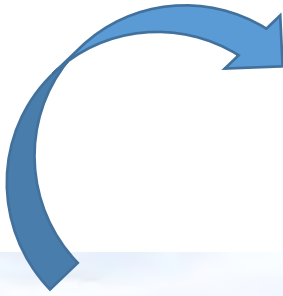


Photo: 2019



Seed fall rye in fall



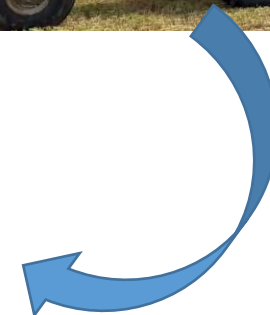
Cut fall rye for  
forage in late May



<https://www.3genorganics.ca/>



Seed soybeans  
In 2022, 72 bu/acre  
organic soybeans





# Conservation Tillage for Organic Production





## Dryland organic grain farming



Photo credit: Vilicus Organic Farm, Montana



Glenbow Museum,  
Calgary





Wide blade cultivator for organic plots at Glenlea, 2022





Perennial grass strips







Broadcast seeded, then  
harrowed using Phoenix  
harrow

Uses in Prairie organics?  
Establishing ryegrass in peas or lentils



Using snowmelt water to establish plants







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[www.pivotandgrow.com](http://www.pivotandgrow.com)





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