



GLOBAL
RESEARCH
ALLIANCE

ON AGRICULTURAL GREENHOUSE GASES

CROPLANDS RESEARCH GROUP: Canada



Conservation Agriculture Network:
Craig Drury

craig.drury@agr.gc.ca

Conservation Agriculture Membership

- Craig Drury AAFC, Harrow, Ontario, Canada
- Mark Liebig USDA, Mandan, North Dakota, USA
- Diego, Albalos, Aarhus University, Denmark
- Denis Angers AAFC, Quebec city, Quebec, Canada
- Michel Cavigelli USDA, Maryland, USA
- Rene Dechow Inst. Agr. Climate Res., Braunschweig, Germany
- Roberta Farina & Rosa Francaviglia CREA, Rome Italy
- Hero Gollany USDA, Adams, Oregon, USA
- Henry Janzen AAFC, Lethbridge, Alberta, Canada
- Jane Johnson, USDA-ARS-NCSCRL, Minnesota, USA
- Thomas Kätterer Swedish Univ. of Agr. Sciences, Uppsala, Sweden
- Lars Munkholm Aarhus University, Denmark
- Gervasio Piñeiro, Juan Piñeiro, Tomás Della Chiesa, University of Buenos Aires, Argentina
- Charles Rice Kansas State University, Manhattan, Kansas, USA
- Pier Roggero University of Sassari, Italy
- Upendra Sainju USDA, Sidney, Montana, USA
- ... 19 members from 7 countries

Meta-analysis

- - Started with MAGGnet (Mark Leibig)
- - 60 peer reviewed papers (so far)
- - 18 countries
- - 5 BMP's
 - ✓ crop rotation
 - ✓ conservation tillage
 - ✓ cover crops
 - ✓ irrigation
 - ✓ residue management (enough comparisons?)

Studies used in the Conservation Agriculture meta-analysis

No.	Reference	Rotation	Tillage	Cover crop	Irrigation
1.	Abdalla et al., 2009		×		
2.	Badagliacca et al., 2018a	×	×		
3.	Badagliacca et al., 2018b		×		
4.	Barton et al., 2013	×			
5.	Behnke et al., 2018	×	×	×	
6.	Braun and Bremer, 2018				×
7.	Carolina et al., 2012	×	×		
8.	Chen et al., 2018		×		
9.	Cuello et al., 2015			×	
10.	Drury et al., 2006		×		
11.	Drury et al., 2008	×			
12.	Drury et al., 2012		×		
13.	Drury et al., 2014	×			
14.	Edwards et al., 2018				×
15.	Fangueiro et al., 2017		×		×
16.	Forte et al., 2017		×		
17.	Garcia-Marco et al., 2016		×		
18.	Gregorich et al., 2008		×		
19.	Haque et al., 2014			×	
20.	Hwang et al., 2017			×	
21.	Koga et al., 2004		×		
22.	Krauss et al., 2017		×		
23.	Marques et al., 2018		×		
24.	Mosier et al., 2006	×	×		
25.	Nouchi and Yonemura, 2005		×		

Effect of management practices on N₂O & CO₂

Effect of management practices on N₂O and CO₂

Practices		Range (%)		Mean	Sample size
Rotation	N ₂ O	-84	684	24	66
	CO ₂	-67	98	-4	68
Tillage	N ₂ O	-84	835	0	175
	CO ₂	-67	103	0	99
Cover crop	N ₂ O	-86	175	22	90
	CO ₂	-39	520	67	18
Irrigation	N ₂ O	-86	150	-2	41
	CO ₂	-25	113	6	28

Effect of tillage on N₂O and CO₂ as related to soil pH and soil texture

Effect of tillage on N₂O and CO₂ depending on pH

pH		Range (%)		Mean	Sample size
<6	N ₂ O	-57	835	40	17
	CO ₂	-42	103	5	17
6-7	N ₂ O	-84	471	0	40
	CO ₂	-84	471	10	40
>7	N ₂ O	-53	139	2	68
	CO ₂	-50	65	0	69

Effect of tillage N₂O and CO₂ depending on soil texture

Soil texture		Range (%)		Mean	Sample size
Fine	N ₂ O	-81	471	-5	112
	CO ₂	-67	82	2	53
Medium	N ₂ O	-84	835	25	26
	CO ₂	-50	103	-7	39
Coarse	N ₂ O	-84	131	-4	37
	CO ₂	-26	70	11	8

Effect of cover crop on N₂O and CO₂ as a function of soil pH and texture

Effect of cover crop on N₂O and CO₂ depending on pH

pH		Range (%)		Mean	Sample size
<6	N ₂ O	-86	166	76	20
	CO ₂	-39	10	-19	4
6-7	N ₂ O	-74	175	17	28
	CO ₂	-16	520	142	8
>7	N ₂ O	-78	142	-6	26
	CO ₂	10	46	25	6

Effect of cover crop N₂O and CO₂ depending on soil texture

Soil texture		Range (%)		Mean	Sample size
Fine	N ₂ O	-86	166	17	67
	CO ₂	-39	520	105	10
Medium	N ₂ O	-6	142	37	10
	CO ₂	-9	46	19	8
Coarse	N ₂ O	-36	175	36	13
	CO ₂	n/a	n/a	n/a	n/a

Conservation Agriculture Network Activities:

SSSA International Soils Conference with CSSS & MSSS (San Diego January 6-9, 2019).

- Topic Session:
 - Conservation Agriculture Practices and GHG Emissions (Session ID: 18325).
 - We may explore the possibility of a special journal issue if we have enough submissions