



Agricultural Crop Residues for Energy

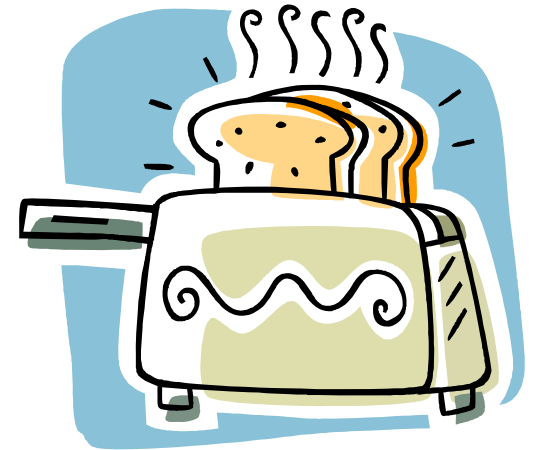
**Ian McDonald
Greg Stewart
Field Crops Unit
OMAFRA**

Dollars & Sense

Theory vs Practice

Its All About Value Added!

- The loaf of bread dilemma

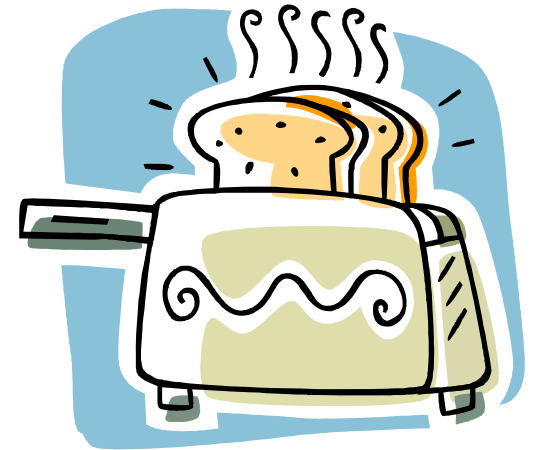


\$0.06 wheat

\$2.00 loaf

Its All About Value Added!

- The loaf of bread dilemma



\$0.06 wheat



Farmers Share

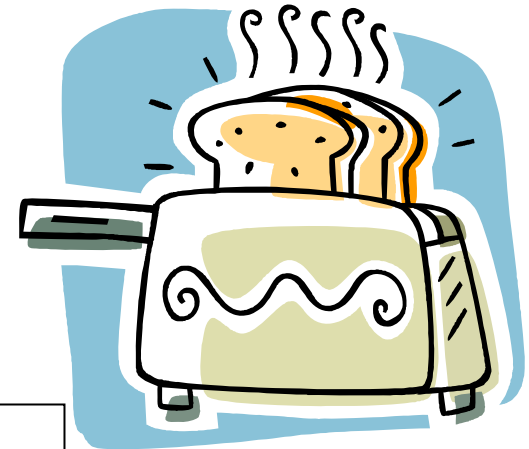
\$2.00 loaf



Consumers Cost

Its All About Value Added!

- The loaf of bread dilemma



\$0.06 wheat

The Value Chain!

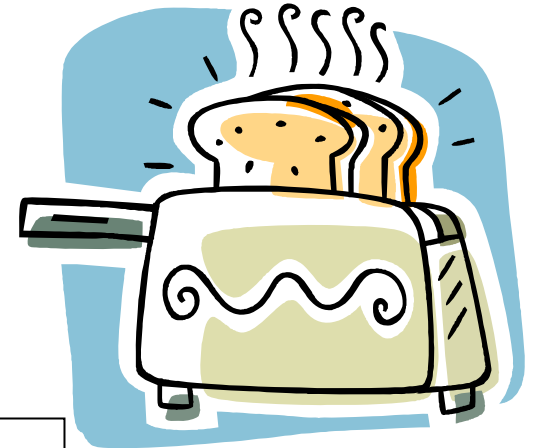
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Farmers Share

Consumers Cost

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\$0.06 wheat

The Value Chain!

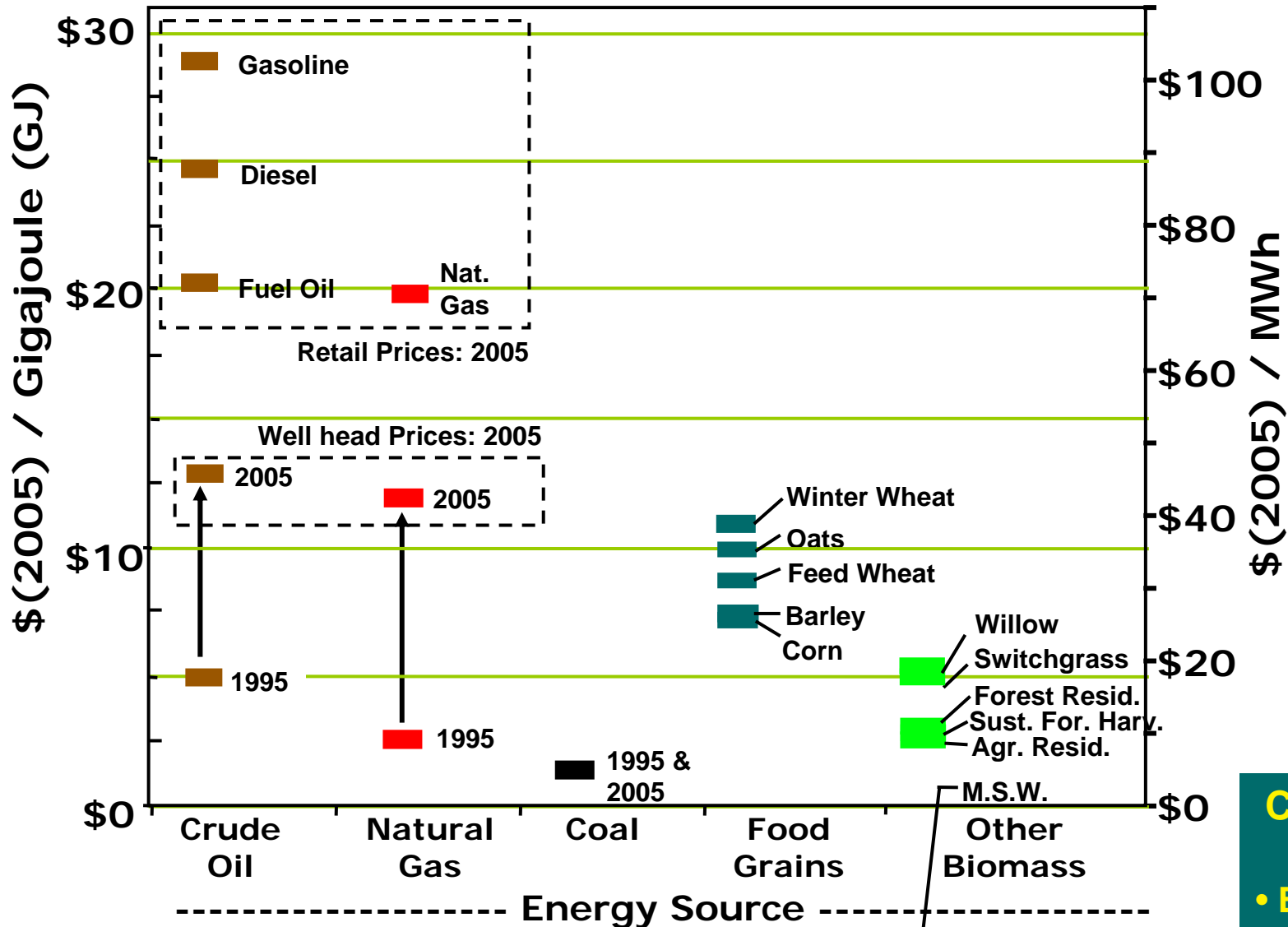
\$2.00 loaf

Farmers Share

Consumers Cost

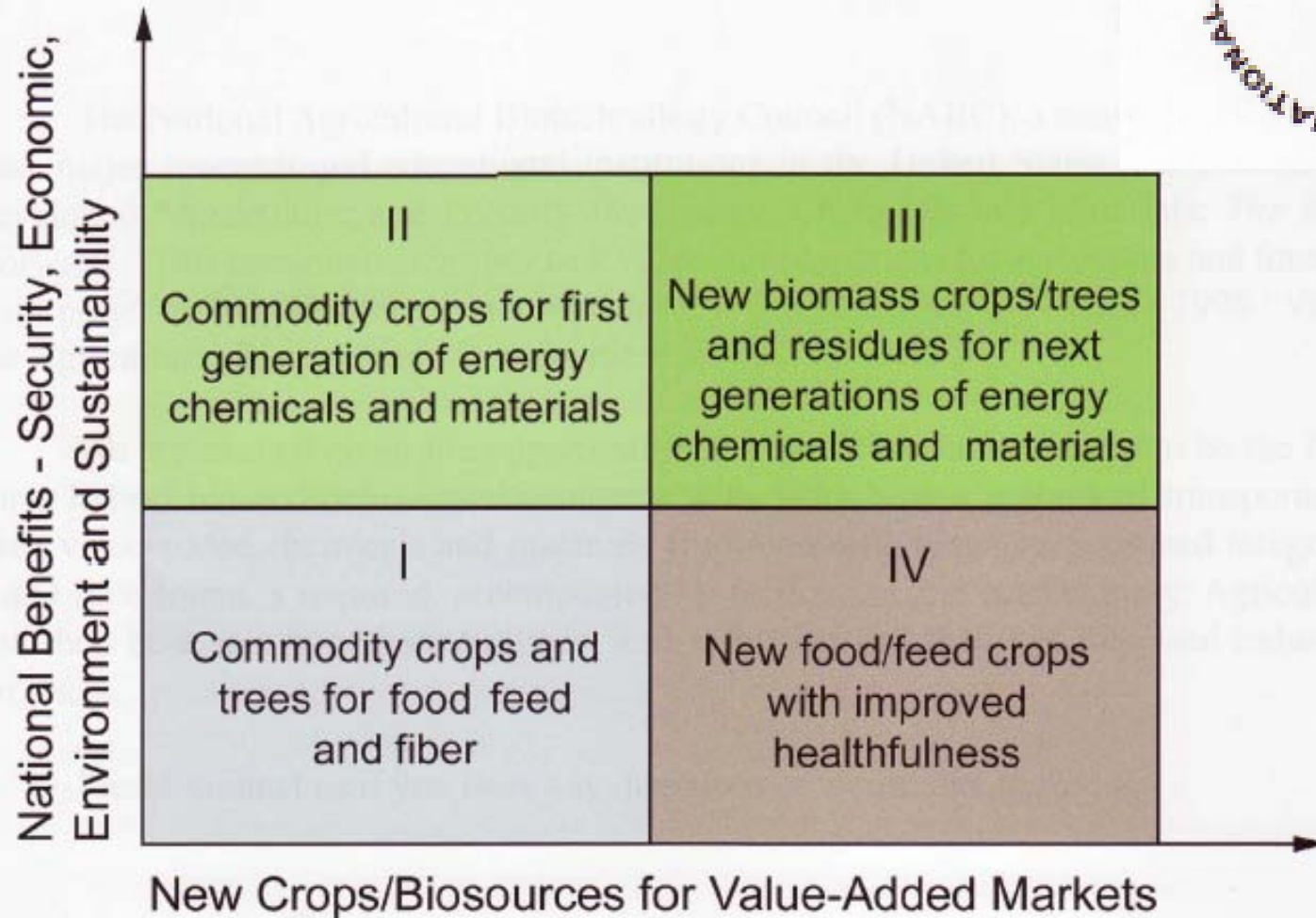
We Need to Capture More of This For Farmers!

Why Now?

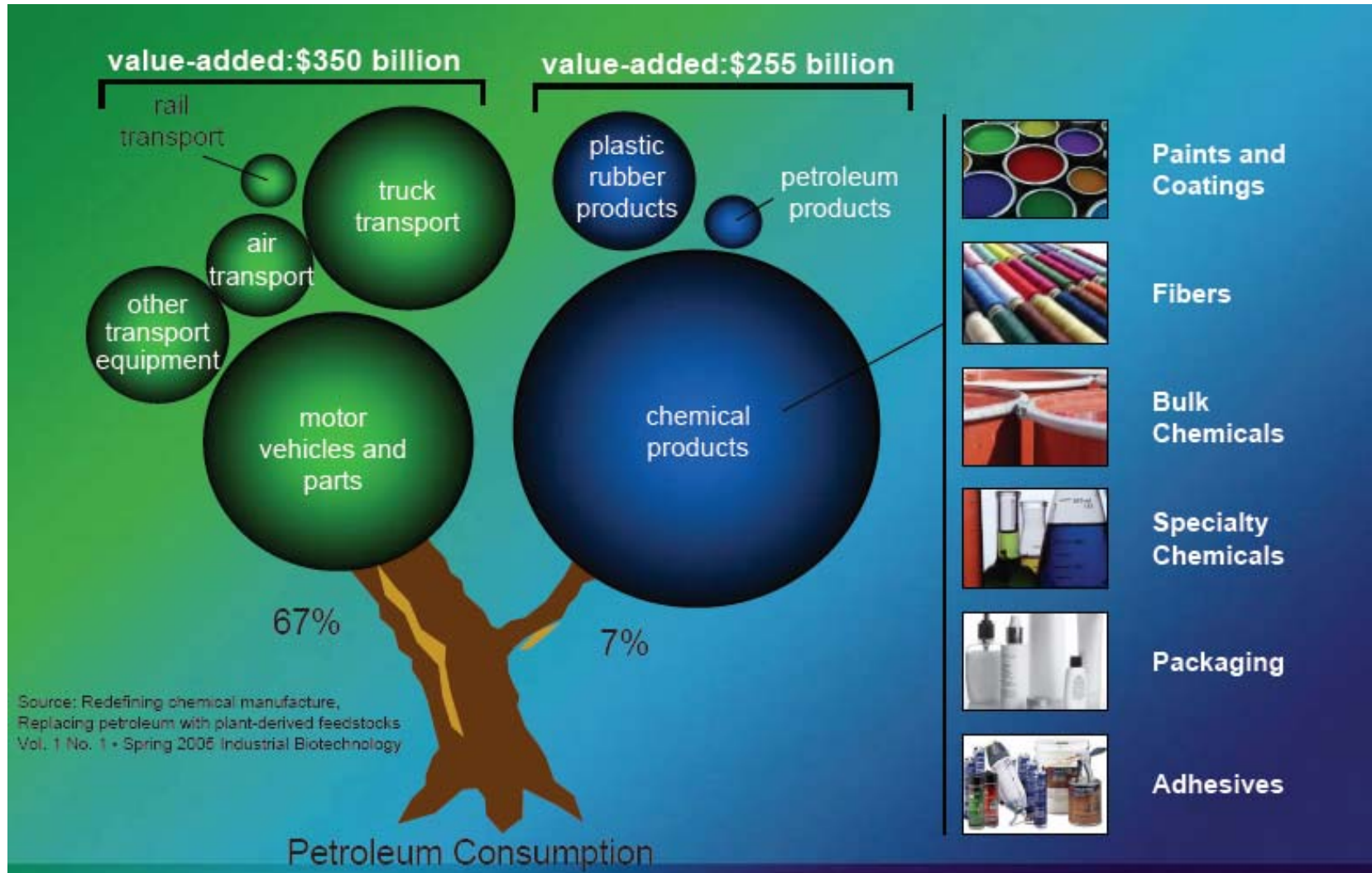


Co-benefits of Biomass:

- Environment
- Rural economy



Where Can Industrial Biotech Play?



25Farmer Network

Prototypical group of 25 farmers in TN performing the following roles:

- Growing & harvesting new crops on 120 acres of test sites in 2008
- Participate in plot tours, field days, industry working groups and conferences.
- Develop new working relationships with companies not traditionally associated with agriculture.
- Explore new technology & scale up university agronomic research.



Corn for Burning

- **400000 BTUs per bushel**
 - = 11 m³ of natural gas @ 40 cents = \$4.40 per bushel**
 - = 10.7 litres of furnace oil @ 72 cents = \$7.70 per bushel**
- Above assumes equal heating efficiency**



Where Does the Money Go!

Transportation Costs

Trucking Transportation Cost	\$0.125	\$/tonne/km	8
Rail Transportation Cost	\$0.023	\$/tonne/km	9
Shipping Transportation Cost	\$0.0079	\$/tonne/km	10,11
Loading/Unloading Costs	\$4 to \$5	\$/tonne	8

Expected Biofuel Yields

Crop	Crop Yield	Biofuel	EtOH or oil/bu	EtOH or oil yield/A
Corn	150 bu/a	EtOH	2.8 gal	420 gal
Corn + Stover	150 bu/a 3.5 ton	EtOH	2.8 gal 72 gal/ton	420 <u>252</u> 672 gal
Switchgrass	8 ton/a	EtOH	72 gal/ton	576 gal
Soybean	40 bu/a	Diesel	1.5 gal	62 gal
Sunflower	50 bu/a	Diesel	1.5 gal	77 gal
Canola	42 bu/a	Diesel	2.9 gal	120 gal

Kurt Thelan, Michigan State University

What Are The Future Energy Crops for Ontario?

Energy Value of Non Traditional Crops				
Substrate	Yield (t/ha)	Methane Yield (m3 H3/ha)	Pass Car Transport (1000 km/ha)	
Cereal Straw	2	600	7	
timothy-clover forage	8-11	2900-4000	36-50	
clover alone	5-7	1400-1900	17-24	
jerusalem artichoke	9-16	3100-5400	38-68	
giant knotweed	15	3800	47	
nettle	6-10	2200-3600	27-45	
rhubarb	2-4	800-1700	11-21	

What's It Take To Get Biomass of The Field?

Price Sensitivity to Crop Residue Leaving the Field

State	<\$30/dry ton		<\$40/dry ton		<\$50/dry ton	
	quantity	%corn	quantity	%corn	quantity	%corn
new york	0	0	129,515	0	129,515	0
michigan	0	0	680,783	0	4,265,671	84
minnesota	0	0	11,935,896	88	11,935,896	88

**150 bu/acre Corn Crop
3.25 tonnes/acre of Residue**

	N	P205	K2O
 lbs/acre		
Total Plant	200	92	185
Grain	125	60	42
Residue	75	32	143
 \$/acre		
Residue Value	37.50	16.64	42.90
Total Residue Value	\$97.04		
Value per tonne	\$29.86		

OMAFRA Business Management Unit

- Wheat straw carryover \$95.00/t
- What is the real number!

Price of Residue Must Reflect

- Cost of collecting residues
- Cost of storage and transportation to use facility
- Loss of nutrients requiring replacement
- Cost to loss of organic material from environment
 - What impact on overall microbial community associated with organic matter removal?
- US premium for loss of nutrients and environmental benefits \$10-15/ton (bedding, particle board, etc)

Growing the Margins:

Energy, Bioproducts and Byproducts
from Farm and Food Sectors
Conference & Exhibition



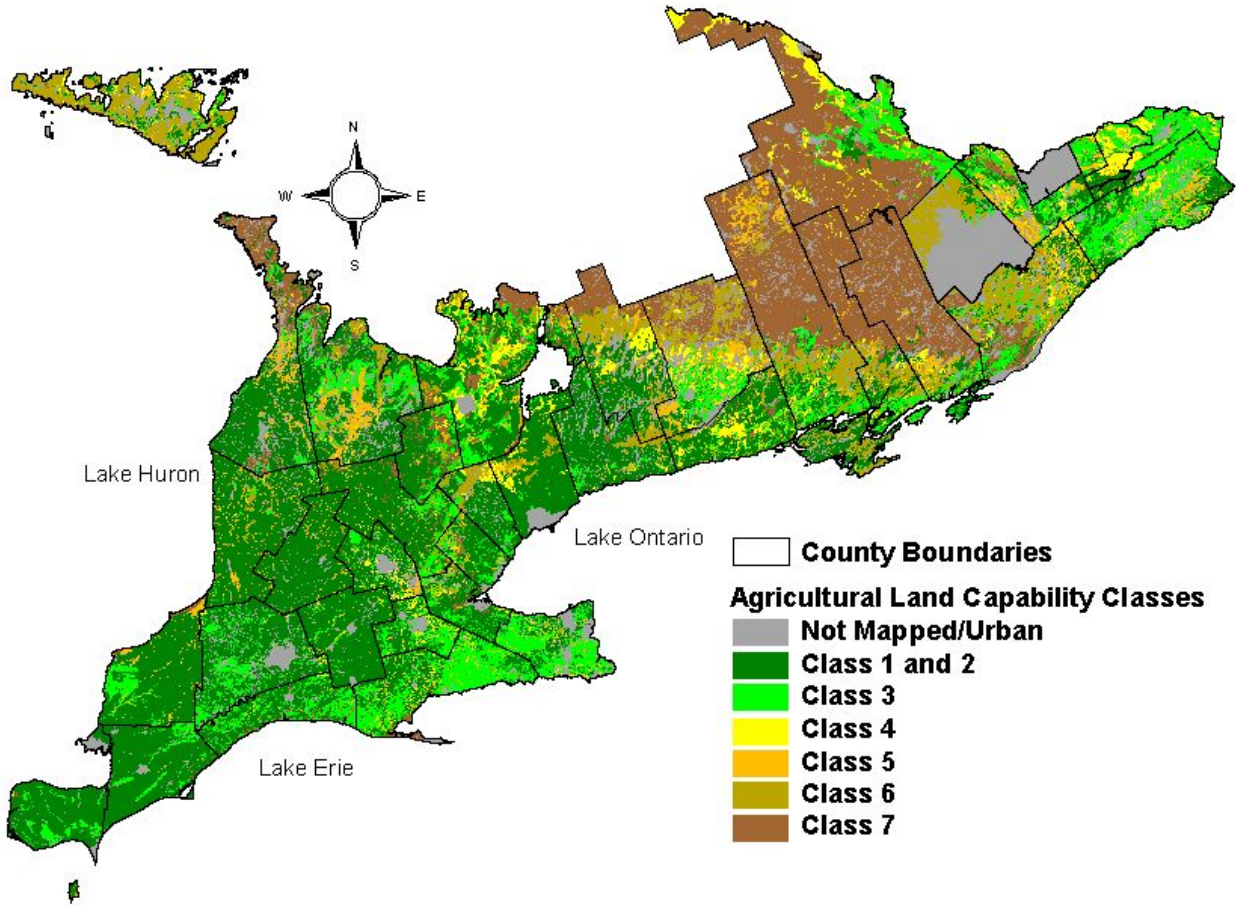
April 2 - 5, 2008
London Convention Centre,
London, Ontario

Conference Information:

enter

**Conference:
April 1-5, 2008
www.gtmconf.ca**

Ontario Agricultural Land Capability Classes



Corn plant components from several high yielding sites in Ontario in 2007 (Oxford-Waterloo Cty)

	Site 1	Site 2	Site 3
Total Dry Matter - (tonnes/acre @ 0%)	9.10	7.46	7.41
Grain (% of total dry matter, Harvest Index)	60	63	58
Grain (tonnes/acre @ 0%)	5.46	4.70	4.30
Grain (bu/acre @ 15.5%)	254	219	200
Husks, Stalks, Leaves (% of total dry matter)	34	30	34
Husks, Stalks, Leaves (tonnes/acre)	3.09	2.24	2.52
Cob (% of total dry matter)	6	7	8
Cob (tonnes/acre)	.55	.52	.59