



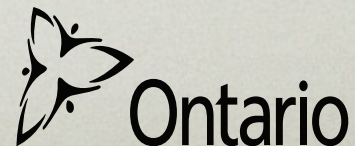
ONTARIO BIOMASS PRODUCERS
CO-OPERATIVE INC.

for a cleaner tomorrow

Growing Switchgrass in Grey County

Urs Eggimann

Switchgrass Information Session Markdale,
February 6, 2015



PRESENTATION OUTLINE

- What is Switchgrass?
- Producing Switchgrass on marginal land:
 - Planting, Maintenance, Harvesting
- Market Opportunities of Biomass
- Economics of Switchgrass Production
- Lessons learned in Field Trials
- Recent Achievements and Future Strategy
- Questions

What is Switchgrass?

Notice the spelling:

Not Twitch or Witch, it is Switch!





CHARACTERISTICS OF SWITCHGRASS

- Grows 4' to 6 ' tall, with deep roots
- Excellent CO₂ sequestration
- Converts solar energy efficiently
- Ideal vegetation for our stressed environment
- Creates rich habitat for wildlife



SG FROM A FARMER'S PERSPECTIVE

- Perennial crop with a life span > 10 years
- Can grow on **marginal** farmland
- Requires minimal nutrients
- No chemicals required after establishment
- Switchgrass rotation can bring marginal crop land back into production

SG FROM A FARMER'S PERSPECTIVE

- Produces 3-4 tons / acre of high quality biomass
- A “farmer friendly” crop from a planting, maintenance and harvesting perspective
- Common Forage Equipment used for entire cycle
- Fits well into a busy farm schedule
- Minimal work required after establishment phase

SWITCHGRASS CYCLE

- Switchgrass is planted 2-3 weeks on either side of corn
- Cut anytime after 1st killing frost
- Baled in late April to early May, the following year
- Weed control needed during 1st and 2nd year
- Fertilizing beneficial 2nd year and later (only N)

SWITCHGRASS CALENDAR

1ST YEAR

2013																				
April							July							October						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
							1	2	3	4	5	6	7							
							8	9	10	11	12	13	14							
29	30																			
May							August							November						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
		1	2	3	4	5														
6	7	8	9	10	11	12														
13	14	15	16	17	18	20														
21	22	23	24	25	26	27														
28	29	30	31																	
June							September							December						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
				1	2	3														
4	5	6	7	8	9	10														
11	12	13	14	15																

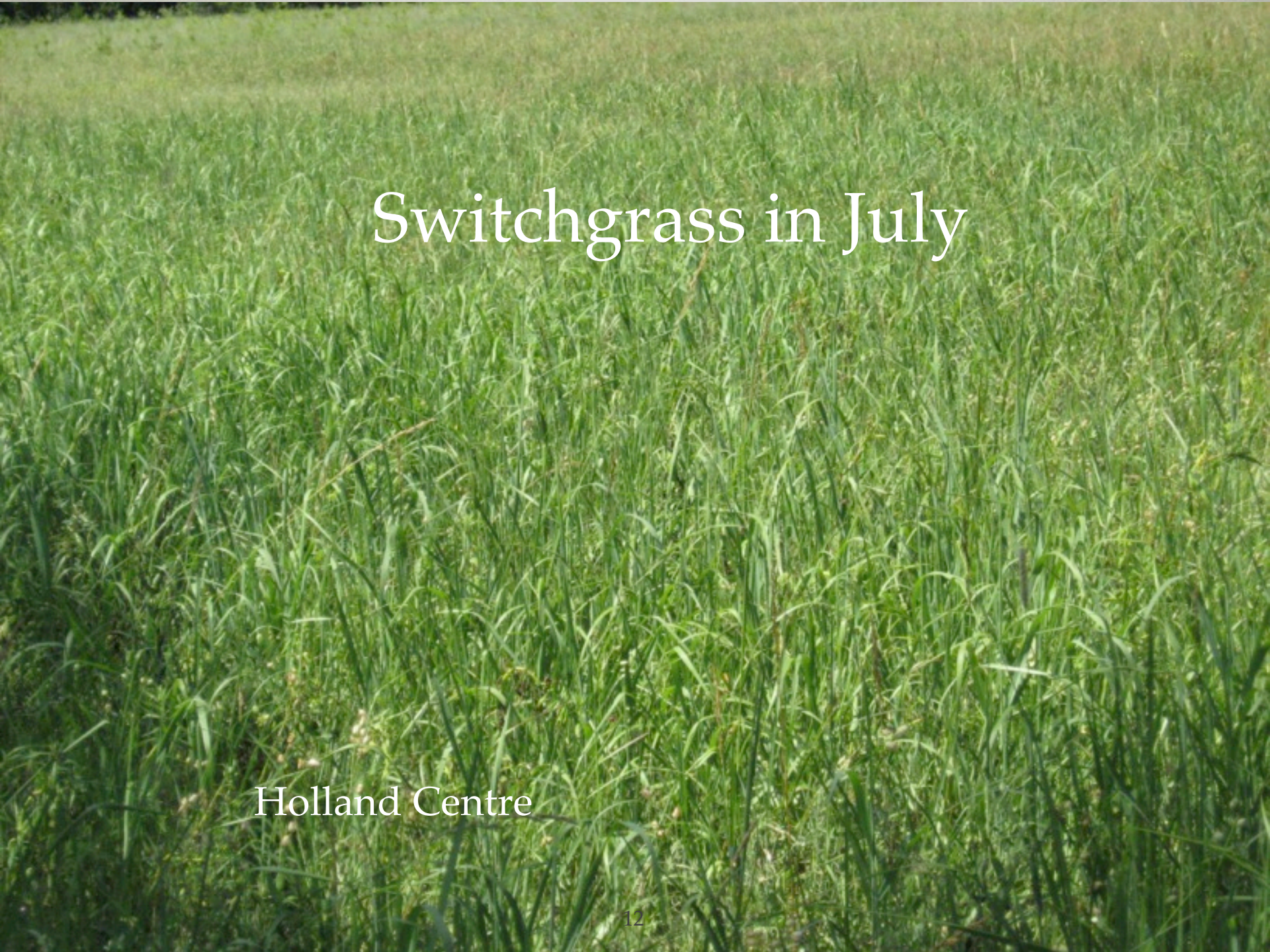
Planting

Broadleaf App

Bailing

N Application

Cutting

A photograph of a dense field of green switchgrass. The grass is tall and lush, with many thin, upright blades. The background shows a slightly different texture, possibly a different type of vegetation or a distant field.

Switchgrass in July

Holland Centre

A photograph of a field of tall switchgrass in September. The grass is a mix of green and brown, indicating it is mature. In the background, there is a line of trees with some autumn-colored foliage. The sky is overcast.

3rd Year Switchgrass in September

Holland Centre

Switchgrass in mid July

Nott Farms, Clinton

Switchgrass in late August

A wide-angle photograph of a field of mature switchgrass in late August. The grass is tall and golden-brown, with some green still visible at the base. A dark, shadowed area on the left side of the frame suggests a path or a change in grass type. In the background, a dense line of trees stretches across the horizon under a clear, bright blue sky. The sun is high, creating a strong light across the field.

Nott Farms, Clinton

ESTABLISHING SWITCHGRASS

- Establishing Switchgrass is the toughest part of the production cycle!
- Highest costs in year of establishment:
 - Often no harvest in 1st year
 - 50% yield in 2nd year
 - 90% yield in 3rd year
 - Expect worse with marginal land

ESTABLISHING SWITCHGRASS

- Effective weed management is crucial.
 - Weeds should be controlled **before** planting.
 - Weed growth in 1st year is often depressing!
- No fertilizing (Nitrogen) in 1st year as N promotes weed growth.

PLANTING OF SWITCHGRASS

- Possible Switchgrass Planting Methods:
 - Regular till and planting using seed drill with grass seed box
 - Broadcasting
 - No-till seeding
- 7" rows with seed drill

PLANTING OF SWITCHGRASS

- Good results in Grey with seed rate of 10-12 lb / acre
Consider:
 - High dormancy rate
 - Re-seeding is costly
- Dormant seeds often germinate only in 2nd year

Note: 2 vigorous plants per sq./foot can form a successful switchgrass stand

My Seed Sources: Nott Farms, Ernst Seeds, REAP-Canada (Ferme Norac)

REGULAR TILL AND PLANTING

- Low impact till, e.g. disking
- Ordinary seed drill with grass seed box works well for regular till planting method
- Seed depth:
 - $\frac{1}{4}$ - $\frac{1}{2}$ “ is optimal (don't burry small seeds!)
 - broadcasting is better than excessive seeding depth

Solid packing is essential, before and after seeding!

NO-TILL PLANTING

- **No-till is optimal method** for planting of switchgrass
- Major no-till advantages:
 - Least labour intensive and most economical
 - Minimal disturbance of soil, → lower germination of weed seeds
 - Ideal on marginal, stony fields
 - Reduces soil erosion
 - Precise seeding depth and consistent seeding rate

Switchgrass planted with no-till drill in field with soybean history



Veterans Rd S., May 2013

PLANTING WITH NURSE CROP

Spring wheat as nurse crop using no-till seed drill:

- 2 seeding passes required with my equipment
- Full wheat seeding rate is possible
- Planting in late April / early May
- Combining wheat mid August, cutting height 10-12“ (above switchgrass!)

Benefits:

- Great way to minimize unwanted weed growth
- **Revenue** during year of switchgrass establishment



Spring wheat with nurse crop
close before harvest (50% seeding
rate)

Grey Road 12, September 2011



Switchgrass after harvesting of Spring Wheat

Grey Rd 12, September 2011



Spring Wheat as Nurse Crop (90% seeding rate)

Nott Farms, Clinton



Spring Wheat with Switchgrass

Nott Farms, Clinton, Aug 2011

WEED CONTROL

- Weeds are major challenge!
- Switchgrass starts growing only at $> 55^{\circ}\text{F}$ (12°C) soil temperatures
 - $\Rightarrow$ **Advantage weeds!**
- Weed Control:
 - Mechanical, i.e. clipping weeds
 - Using herbicides
- Switchgrass will ultimately shade out most weeds in 3rd year and later

MECHANICAL WEED CONTROL

- Clip weeds above Switchgrass heads
(most weeds are taller than switchgrass at the beginning of growing season)
- Mechanical weed control useful in 1st & 2nd year
- 1st mowing in June, 2nd time in late July
- Timing is critical, you can do more harm than good!

Mechanical weed control is more art than science!

WEED CONTROL WITH HERBICIDES

- No registered herbicide for Switchgrass available in Ontario
- Paramount™ from BASF is used successfully in U.S. as pre- and post-emergence herbicide (grasses and broadleaves)
- Very difficult to eradicate weed grasses
- Herbicides are normally only needed during 1st & 2nd year

WEED CONTROL WITH HERBICIDES

- Broadleaf herbicides are currently the only practical options in Ontario for post emergence SG
- Timing for broadleaf applications is at 4-leaf switchgrass stage and later
- Glyphosate can be used with **perfect timing** to combat cold season grasses when SG is dormant
- Glyphosate is only effective herbicide option to combat perennial grasses in a SG field in Ontario



Switchgrass in early July, 2 days after
broadleaf herbicide application

Holland Centre



Weedy switchgrass field in 1st year

WEED CONTROL WISDOM

1st year switchgrass fields should
not be used as showcase!

FERTILIZING

- Bring P and K nutrients up to normal levels before planting
- Recommended Nitrogen rate, starting in 3rd year, is 15-20 lb for every ton of removed biomass (approximately 60 lb / acre)
- Switchgrass grows quite well without added nutrients
- N application requires adequate moisture (June is often too late in Grey due to dry conditions).

SWITCHGRASS HARVESTING

- Cutting in late fall, once SG goes dormant (leave 4-5" stubble)
- Overwintering in swaths
- Baling in Spring, once a moisture level of 8-12% is reached
- Discbine is implement of choice; haybine possible if SG is not lodged
- Swathers have been used successfully in US Mid-West US field trials

SWITCHGRASS HARVESTING

- SG can be cut with discbine even during adverse weather conditions
- Round or square bailer used, depending on market
- High density 3'x4'x7.5' bales are ideal for long distance transportation, reaching legal truck limit
- Alternative to indoor storage and handling
→ bail wrapping or stacking with cover
- Outdoor stacked square bales need tarp coverage
- Wrapping and stacking research done in 2014 under OFC/OFIP grant



First SG harvest at my farm in 2011 with haybine

Late Fall Switchgrass Harvest

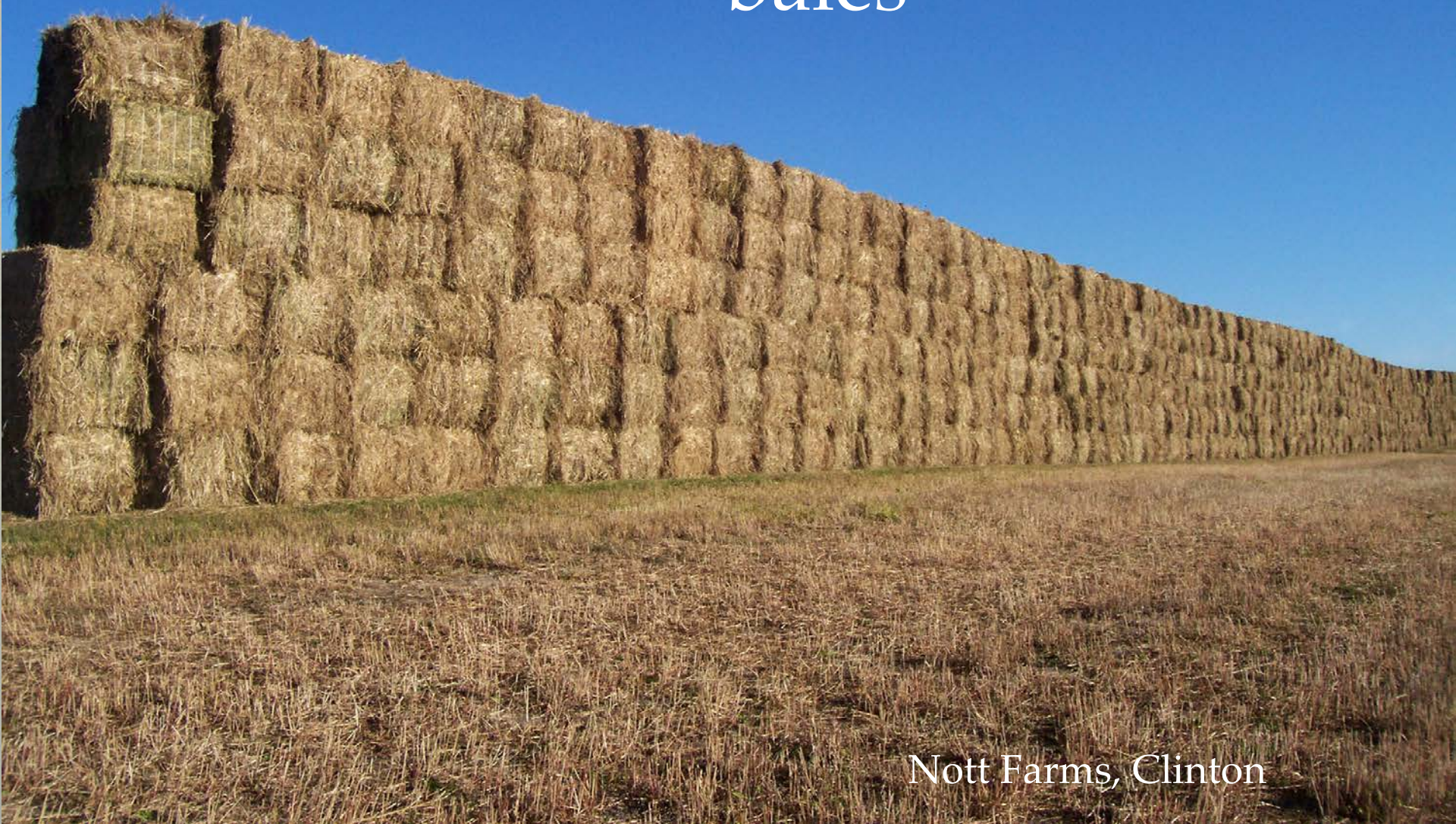


Nott Farms, Clinton

Overwintered Switchgrass in windrows

Nott Farms, Clinton

Spring harvested bales



Nott Farms, Clinton

Switchgrass baling end of April,
2012
(3x3x7.5 Square bales)



Holland Centre



Cutting SG with 10' discbine in early Nov 2012
(already snow on the ground)

Switchgrass windrows to be
overwintered and baled in spring 2013



Switchgrass harvest
Oct. 25, 2014 Robson
Rd, Holland Centre



BIOMASS MARKETS

- Hay and straw prices are an indicator for current switchgrass market opportunities
- Biomass production and markets are still at infancy stage, but growing rapidly
- Chicken and Egg situation, “What comes first”:
 - Production
 - or
 - Market opportunities

BIOMASS MARKETS

- Dilemma:
 - Farmers don't plant biomass without solid markets
 - No Biomass Industry will emerge without guaranteed supply
- We need to build a respectable production base

We need leaders in both camps!

APPLICATIONS OF SWITCHGRASS

- CO₂ neutral Heat Energy (pellets, briquettes, loose, entire bales)
- Combined Heat and Power
- Fuel, i.e. ethanol or biodiesel,
- Other chemicals derived from cellulosic biomass
- Bio-composite consumer products
 - Plastic products with up to 30% biomass content
 - Fibre boards for construction and furniture (> 80% biomass content)
- Organic insulation material

APPLICATIONS OF SWITCHGRASS

- **Livestock bedding** (very absorbent, high quality compost)
- **Feed Rations** (low on potassium)
- **Substrate for mushroom production**
- **Landscaping** (fertilizer, mulch, organic matter)

LESSONS LEARNED IN FIELD TRIALS

- Effective weed control during establishment year(s) is crucial:
 - Money spent on herbicides is worthwhile investment
 - Shortcuts or impatience with field preparations don't pay
 - Fields with Roundup ready crop history are ideal for switchgrass planting (e.g. soybeans)

LESSONS LEARNED IN FIELD TRIALS

- Use high quality seeds from a reliable source
- Nurse crop revenue reduces establishment costs significantly
- Handling and transportation need to be optimized
- Growers' experience and expertise do matter

Yield is key to lower production costs!

Switchgrass Economics

- 1st year nurse crop improves switchgrass economics
- Switchgrass inputs are very low after establishment
- Lower inputs, less work → lower risks
- Switchgrass is less vulnerable to adverse weather conditions
- Long term improvements of soil quality translates into higher yields of future crops
- One day we might even get some financial rewards for positive contributions to the environment!

	Switchgrass 10-Year Projected Income				Per acre		Yield in tonnes			
Income	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Switchgrass Yield	0	2	4	4	4	4	4	4	4	4
Spring Wheat Yield	1.5									
Price per tonne	238	154	154	154	154	154	154	154	154	154
Spring wheat straw	35									
Per acre Income	392	308	616	616	616	616	616	616	616	616
Expenses										
Wheat seeds	60									
Switchgrass seeds	54									
Fertilizer applied	62	62	62	62	62	62	62	62	62	62
Herbicides	7	12								
Fungicides										
Land preparation	25									
Planting	20									
Spraying	8	8								
Baling										
Trucking straw										
Harvesting	42	88	176	176	176	176	176	176	176	176
Trucking grain										
Fall tillage										
Drying										
Storage cost		10	20	20	20	20	20	20	20	20
Crop insurance										
Cost of land (insert number)										
Per acre Expense	278	180	258	258	258	258	258	258	258	258
Net Income	114	128	358	358	358	358	358	358	358	358
10-year avg income per acre	310.6									

Winter Wheat 5-Year Average

Yield/acre	85
Straw/lb	1500
Price/bushel	\$6.60
Price/lb	\$0.07
Total Rev/acre	\$658
Seed	70
Fertilizer applied	100
Herbicide	7
Fungicide	17
Planting no-till	25
Spraying	16
Baling	14
Trucking straw	11
Harvesting	40
Trucking grain	18
Farm tilage	25
Drying	10
Crop insurance	7
Total cost/acre	360
Net per acre	298

Economics of Switchgrass vs. Winter Wheat

Switchgrass	Year 1	Year 2	Year 3	Year 3+	10-Year Average
Income	\$392	\$308	\$616	\$616	\$563
Expenses	\$278	\$180	\$258	\$258	\$252
Net Income	\$114	\$128	\$358	\$358	\$311

Winter Wheat	5-Year Average
Income	\$658
Expenses	\$360
Net Income	\$298

Source:
Nott Farms

Switchgrass 10-yr Projected Income: Grey Cty

Switchgrass 10-Year Projected Income

Grey County scenario: 3 tonnes / acre

Income	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Switchgrass Yield	0	1.5	3	3	3	3	3	3	3	3
Spring Wheat Yield	1.5									
Price per tonne	238	154	154	154	154	154	154	154	154	154
Spring wheat straw	35									
Per acre Income	392	231	462	462	462	462	462	462	462	462
Expenses										
Wheat seeds	60									
Switchgrass seeds	54									
Fertilizer applied	62	62	62	62	62	62	62	62	62	62
Herbicides	7	12								
Fungicides										
Land preparation	25									
Planting	20									
Spraying	8	8								
Baling										
Trucking straw										
Harvesting	42	66	132	132	132	132	132	132	132	132
Trucking grain										
Fall tillage										
Drying										
Storage cost		7.5	15	15	15	15	15	15	15	15
Crop insurance										
Cost of land (insert #)										
Per acre Expense	278	155.5	209	209	209	209	209	209	209	209
Net Income	114	75.5	253	253	253	253	253	253	253	253

10-Year Net Income Average = \$221

REVIEW OF SWITCHGRASS EVOLUTION IN ONTARIO

- Managed to prove viability of growing switchgrass in Ontario:
 - ✓ In nine years of production we have worked out the basic Ag How-To's
 - ✓ Economically attractive with steady profitability
 - ✓ Low risk crop with minimal inputs and work required
 - ✓ Highly beneficial for our environment.
 - Clean water
 - Clean air
 - Erosion control
 - Improved soil health

RECENT PROGRESS AND ACCOMPLISHMENTS

- Improved start-up economics with nurse crop
- Further progress with switchgrass agronomics (OFC / OFIP grant research project)
- Switchgrass has gained acceptance for:
 - ✓ Animal bedding
 - ✓ Mushroom substrate
 - ✓ Feed rations
- Progress with financial programs for producers through ACC
- Promising improved cultivars from REAP-Canada

Our Future Crop...

REAP-Canada Tecumseh at 3lbs seeding rate (1st year)

Nott Farms Clinton, September 2014

1st year Tecumseh ready for Winter!

New cultivars from REAP-Canada look very promising with lower seed dormancy, higher yields.

Nott Farms, Clinton, October 2014

WHERE WE ARE HEADING TO

- Expanded seed breeding program to accomplish:
 - ✓ Much improved yields
 - ✓ Better establishments with lower seed dormancy rate
 - ✓ Improved characteristics to match specific applications
- Switchgrass can become an **attractive future rotation**, improving soil health and **improving yields of follow-up cash crops**
- **We need to expand acreage and OBPC membership base**
- OBPC will assist in providing necessary education for future producers

OUR NEXT GOALS

- With OBPC we have a province wide organization for biomass producers
- Short term we would like to see **many farms with a modest switchgrass acreage**
 - Become more proficient with minimal risks
 - Produce quality bedding for own livestock
- Long term we need extensive switchgrass acreage to meet the needs of new biomass applications
 - ✓ Farmers with biomass experience will be ready for primetime!
 - ✓ New market possibility of up to 10,000 acres by 2018

SUMMARY

- Growing switchgrass in Grey County is feasible.
- Purpose grown biomass, like Switchgrass, could become a **reliable revenue stream** for Grey County farmers.
- Grey County land rental rates favour biomass production in our region.
- With growing of switchgrass we make a valuable environmental contribution and put marginal farmland to good use.

SUMMARY

- Switchgrass improves soil quality.
- A switchgrass rotation can bring marginal crop land back to production
- Switchgrass in a rotation will promote higher yields of successor crops
- Switchgrass fits well into a busy farming schedule
- Switchgrass is very attractive for land owners with reduced farming ambitions
- There is a learning curve with growing of biomass and farmers need to get ready for prime time.

Biomass industry needs
more leaders from the
farming community!

RECOMMENDED SWITCHGRASS REFERENCE MATERIAL

Growers' Package of Ontario Biomass Producers Co-op

Switchgrass Production in Ontario: A Management Guide (REAP-Canada)

http://www.reap-canada.com/online_library/feedstock_biomass/2007%20SG%20production%20guide-FINAL.pdf

Planting & Managing Switchgrass (BLADE Energy Crops)

http://www.bladeenergy.com/Bladepdf/Blade-Switchgrass-Mgmt_2ed.pdf

Native Warm Season Grasses & High Quality Biomass Production (Ernst Seeds)

http://www.ernstseed.com/files/general_images/biomass/nativewarm1.1.16.10.pdf

Switchgrass Enterprise Budget (OMAFRA)

http://www.omafra.gov.on.ca/english/budgetsdev/bear2000/Budgets/Crops/Forages/switchgrass_static.htm

University of Nebraska, Lincoln

<http://digitalcommons.unl.edu/ageconfacpub/37/>

ACKNOWLEDGEMENT

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- REAP-Canada, Sainte-Anne-de-Bellevue, QC
- Nott Farms, Clinton, ON
- Ernst Conservation Seeds, Meadville, PA
- Custom Farmers in my area
- OMAFRA
- OSCIA
- OAFT
- OFC
- Grey Ag Services, Markdale
- University of Guelph
- University of Nebraska
- Numerous Originators of Biomass White Papers



Switchgrass is a native grass

- an old crop with a new life!

Questions?

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Thank you!

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