

REAP-Canada Memo

The Agricultural Watershed Institute, Decatur, Illinois
Agwatershed.org, info@agwatershed.org, (217) 877-5640
Study completed and assembled by Lucas M Kappel

- This memo details the current status of Canadian energy grass production. The majority of the information was gathered from REAP-Canada documentation. Other information was gathered from Canadian Biomass Magazine, the Canadian government, and a Canadian business called Climate Change Solutions. The memo is laid out by year ranging from 2008-2012.

About REAP-Canada

- REAP-Canada is an independent, non-profit organization that started in 1986. This organization works with farmers, scientists, and other organizations to reduce negative environmental impacts of farming systems, while improving sustainability.

Vision

- To help develop rural communities through food, fibre, and fuel production.

Mission

- Build partnerships with communities, individuals, and organizations that help to develop rural food, fibre, and fuel production.

Research

2012

Summary

- I was not able to find significant 2012 documentation from REAP-Canada, so all the information below is from outside sources.

- Two companies called Minas Basin Pulp and Power Co. Ltd of Hansport are developing a 10 mw power plant in Nova Scotia. They are working with Pro Farms Energy Inc. to develop and burn Miscanthus to fuel the 10 mw power plant. This plant is scheduled to be operational by the 4th quarter of 2014. Pro Farms has planned to plant Miscanthus starting in the spring of 2013. Pro Farms Energy Inc. has already dealt with the growing and burning of Miscanthus in Leamington, Ontario. In Leamington the Miscanthus is being used to heat greenhouses.

- Source: [Miscanthus to feed biomass plant in NS](#) (Canadian Biomass Magazine)

- An important motivator for crop energy projects will be a new grant in Manitoba. This grant is called the Manitoba Biomass Energy Support Program. This program offers a consumer grant of up to \$12,000 to help with incremental costs and a \$50,000 capital grant to help with the purchase of equipment or infrastructure needed to burn or process biomass.

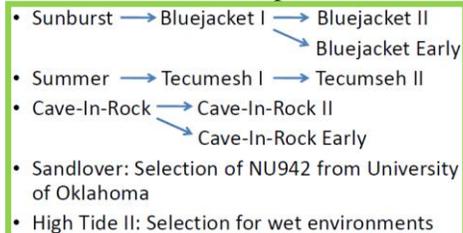
- Source: [Manitoba Biomass Energy Support Program](#) (Manitoba Government)

2011

Summary

- 2011 was a significant year for biomass development in Canada, even though according to REAP-Canada, the government still needs to provide additional funding for the market to continue to grow. (From my research, I gathered it seems that providence governments have stepped in to provide funding while the federal government has not.)

- REAP-Canada compiled research on switchgrass lineages that do well in Canadian environments.



- Source: [Switchgrass in Quebec](#) (REAP-Canada)

- REAP-Canada concludes that more government intervention is needed for biomass energy to thrive. Switchgrass pellets are struggling to compete with fossil fuels. REAP-Canada believes this is due to incentives that have been put on fossil fuel use.

- Source: [Developing Market Opportunities for Warm Season Grasses in Ontario](#) (REAP-Canada)

- Through looking at Canadian Biomass Magazine's and governmental websites, I was able to find information about potential production of energy grasses.

- The Manitoba government believes they have 36.2 million acres of potential land to grow crops for pellet production. These pellets can be developed by companies like Central Grain Company Ltd, who currently manufactures biomass agriculture pellets out of Portage la Prairie, Manitoba.

- Source: [The Manitoba Bioproducts Strategy](#) (Manitoba Government)

- Canadian Biofuels opened a 1,500 tonnes/month (1360.5 tons/month) plant in Springford, Ontario. The plant was partially funded with a \$500,000 governmental grant, and will start by producing waste wood pellets. A local crop supply chain will be set up to include Miscanthus. It is planned that this local crop supply chain will eliminate waste wood as a feedstock within 2-4 years. They estimate they will need 4850-6070 hectares (11979.5-14992.9 acres) of renewable crops to fuel the facility.

- Source: [Ontario pellet plant to start producing soon](#) (Canadian Biomass Magazine)

- Firebox Energy Systems is installing a \$60 mill, 30 mw test plant in Glenevis, Alberta. This plant will be equipped with a Firebox Energy Systems Airboiler that can utilize any biomass feedstock. Once the test facility is completed a 270 mw facility will be built on the same land.

- Source: [Alberta biomass pilot plant to generate 30 MW](#) (Canadian Biomass Magazine)

2009

Summary

- REAP-Canada documentation for 2009 presents figures dealing with the production of energy grasses. I did not find any beneficial information on energy grass outside of the REAP-Canada documentation for 2009. For a rough analysis, I have run some of these figures through a profit equation. The equation used is as follows...
 Profit = (Cost – Revenue).

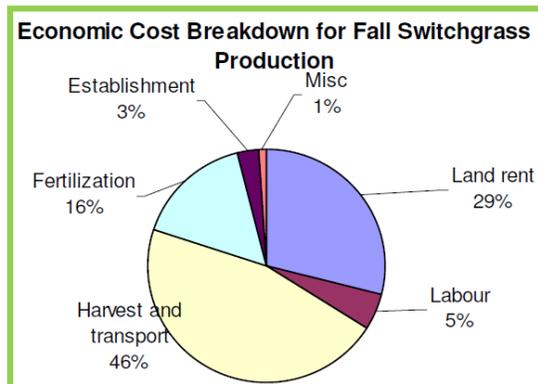
- Profit = Revenue – Costs

- P = (\$150/tonne commercial pellet price) – (\$80/tonne to harvest+\$85/tonne for growing+\$40/tonne for densification+\$125/tonne for on farm fuel use)
 = -\$180/tonne or -\$163.26/ton

- P = (\$225/tonne residential commercial pellet price) – (\$80/tonne to harvest+\$85/tonne for growing+\$40/tonne for densification+\$125/tonne for on farm fuel use)
 = -\$105/tonne or -\$95.23/ton

- I found that the profit was negative according the numbers given in the research. Keep in mind these numbers are from one source of information. Other studies may show different numbers and therefore

results. It is also important to note that the profit analysis equation is only an estimate and may be lacking important figures.



- Source: [An Invitation to Success: Growing Grass for Fuel Pellets](#) (REAP-Canada)

- REAP-Canada has found that even though there is use of native grasses, there is only one 1000 ha (2470 acres) plot in Ontario and Quebec for bioenergy use. The rest are under 50 ha (123.5 acres).

- Source: [Commercial Energy Grass Production and Implications for Invasive Species in Canada](#)

2008

Summary

- 2008 was a busy year for REAP-Canada. Like the year of 2009, their documentation displayed a large amount of numbers which I calculated using the same formulas from the 2009 analysis.

- REAP released documentation that discussed greenhouse emissions from different renewable fuel sources.

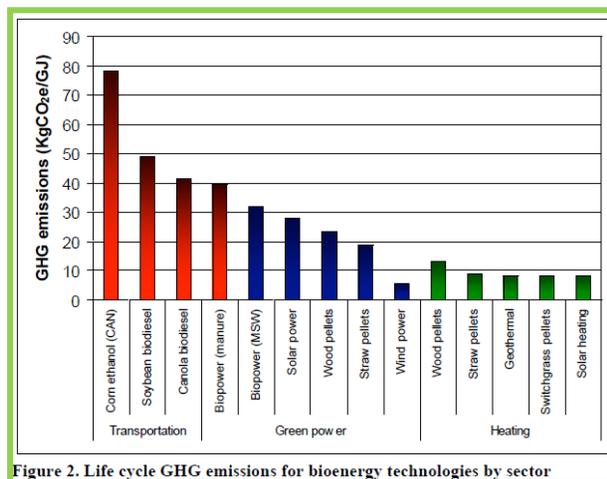


Figure 2. Life cycle GHG emissions for bioenergy technologies by sector

- Sources: [Analysing Ontario Biofuel Options: Greenhouse Gas Mitigation Efficiency and Costs](#)

- REAP estimates that operational costs of a 30,000-100,000 tonne/yr (33,000-110,000 ton/yr) plant costs \$3-10 mill.

- Sources: [Analyzing Biofuel Options: Greenhouse Gas Mitigation Efficiency and Costs](#)

- Pelleting operations in Ontario and Quebec could potentially produce 14.1 million tonnes (15.51 mill tons) of pellets. This would take about 52 plants in Quebec and 89 in Ontario, which would require \$1 bill in capital and would generate about \$1.7 billion in revenue.

- Source: [The Use of Agricultural Residues and Energy Crops in Biomass Combustion Systems](#)

- 800 ha (1976 acres) of warm season grasses were planted from 2006-2007 due to the interest of incorporation into agro-pellets. It has been difficult for the market to grow any larger due to the lack of governmental support.

- Source: [The Emerging Agro-Pellet Industry in Canada](#)

- REAP-Canada conducted research and analysis of two switchgrass production sites, Richard Foley Farms and Nott Farms. Foley has a 6 hectare (14.82 acres) plot of 10 year old cave in rock switchgrass and is located near Kinburn, Ontario. Nott Farms is a 132 hectare (326.04 acres) switchgrass plot.

Table 6.1: Year one establishment costs determined from Site B

Establishment Year 1	\$/hectare	\$/acre	% of Costs
Land Rental	383.01	155.06	42.1%
Direct Seeding Establishment			
Cultivation	74.10	30.00	8.2%
Stone picking	7.41	3.00	0.8%
Seed - 10 kg/ha	132.20	53.52	14.5%
Seeding	29.64	12.00	3.3%
Packing	29.64	12.00	3.3%
Herbicide - burndown & broadleaf control	132.20	53.52	14.5%
Herbicide - application (2x)	34.58	14.00	3.8%
Clipping (2x)	34.58	14.00	3.8%
1 st year operating loan @ 6.0% interest	51.44	20.82	5.7%
Total Establishment Year Expenses	\$ 908.80	\$ 367.93	
Annualized Establishment Cost (over 10 years)	\$ 90.88	\$ 36.79	

Table 6.2: Estimated annual production and baled harvest costs from Nott Farms

Production Years (2-10)	\$/hectare	\$/tonne	% of Costs
<i>Crop Maintenance</i>			
Fertilizer - 50 kg N/ha 46-0-0 ¹	60.00	6.67	6.2%
Custom Work (fertilizer application)	6.00	0.67	0.6%
Land Rental	383.01	42.56	39.9%
Annualized Establishment Cost	90.88	10.10	9.5%
Total Crop Maintenance	\$ 539.89	\$ 59.99	56.2%
<i>Harvest & Delivery (9ODT/ha)²</i>			
Mowing	48.80	5.42	5.1%
Baling	153.85	17.09	16.0%
Stacking	29.04	3.23	3.0%
Storing	45.00	5.00	4.7%
Hauling- to Pellet Plant 140 Km round trip	144.18	16.02	15.0%
Total Harvest & Delivery Expenses	\$ 420.87	\$ 46.76	43.8%
Total Production Costs (ODT)	\$ 960.76	\$ 106.75	
Total Production Costs (12th m.c.)		\$ 94.00	

¹ Molenhuis, 2008; ²(Nott 2008)

Table 6.4: Estimated pellet and briquetting cost of switchgrass using baled and bulk delivered fibre

Production Years (2-10)	Pelleting Plant ¹		Briquetting Plant ²	
	Baled \$/tonne	Bulk \$/tonne	Baled \$/tonne	Bulk \$/tonne
Total crop maintenance	59.99	59.99	59.99	59.99
Total harvest & delivery expenses	46.76	30.75	38.75	25.54
Subtotal Total Production costs (ODT)	106.75	90.74	98.74	85.53
Densification costs	40.00	40.00	20.00 ³	20.00
Total FOB (ODT)	\$ 146.75	\$ 130.74	\$ 118.74	\$ 105.53
Total FOB (7.7th m.c.)	\$ 135.45	\$ 120.67	\$ 109.60	\$ 97.40

¹Travel distance of 140km round trip;²Travel distance of 70km round trip;³Briquetting Systems 2008.

- Profit = Revenue – Costs

- P = (\$150/tonne commercial pellet price) - (\$75.73/tonne for total establishment year expenses+\$80.06/tonne for total field production costs+\$130.74/tonne for pelletization)
= -\$136.53/tonne or -\$123.83/ton

- P = (\$225/tonne residential pellet price) - (\$75.73/tonne for total establishment year expenses+\$80.06/tonne for total field production costs+\$130.74/tonne pelletization)
= -\$61.53/tonne or -\$55.80/ton

- Like the 2008 analysis these number also resulted in a negative profit. It is important to mention that both the 2008 and 2009 equations were calculated from REAP-Canada documentation. Since both numbers could be from a continued study by REAP-Canada I would consider the results of the equations preliminary.

- Source: [Optimization of Switchgrass Management for Commercial Fuel Pellet Production](#)

- A company called Climate Change Solutions published a Canadian biomass study of 2008. They found that Quebec started funding a \$25 mill project through Sherbrooke University to develop two cellulosic ethanol plants. They also found that Canada is a leader in pyrolysis oil production with two major companies, Ensyn Corp in Ottawa and Dynamotive Energy Systems in Vancouver. These organizations produce 100/tonne/day (110/ton/day) and 300/tonne/day (330/ton/day) respectively. This is important because pyrolysis oil is created from a flexible feedstock which is not limited to but includes energy grasses.

- Source: [Canada Report on Bioenergy 2008](#)