



Guidelines for Estimating Flax Straw Biomass Production Costs 2017

in Manitoba



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Date: January, 2017

The following budgets are estimates of the cost of producing flax straw biomass in Manitoba. General Manitoba Agriculture recommendations are assumed in using fertilizers and chemical inputs. These figures provide an economic evaluation of flax straw biomass and estimated prices required to cover all costs. Costs include labour, investment and depreciation, but do not include management costs, nor do they necessarily represent the average cost of production in Manitoba.

These budgets may be adjusted by putting in your own figures. As a producer you are encouraged to calculate your own costs of production for various crops. On each farm, costs and yields differ due to soil type, climate and agronomic practices.

This tool is available as an Excel worksheet at: www.manitoba.ca/agriculture or at your local [Manitoba Agriculture GO Office](#).

[The Farm Machinery Custom and Rental Rate](#) is also available to help determine machinery costs.

Note: This budget is only a guide and is not intended as an in-depth study of the cost of production of this industry. Interpretation and use of this information is the responsibility of the user. If you need help with a budget, contact your local Manitoba Agriculture GO Office.

Flax Straw Biomass Cost of Production Summary - January, 2017

Based on 600 Acres - 0.65 tons straw per acre

390 Total tons Straw Produced

A. Operating Costs	<u>\$/acre</u>	<u>\$/ton</u>	<u>Your Cost</u>
1.01 Custom Baling ¹	\$13.47	\$20.72	_____
1.02 Custom Field Moving ²	\$3.55	\$5.46	_____
1.03 Custom Hauling ³	\$0.96	\$1.47	_____
1.04 Repairs & Maintenance	\$0.16	\$0.25	_____
1.05 Miscellaneous	<u>\$2.75</u>	<u>\$4.23</u>	_____
Sub-total Operating Cost	\$20.89	\$32.13	_____
1.06 Interest on Operating	<u>\$0.47</u>	<u>\$0.72</u>	_____
Total Operating Costs	\$21.36	\$32.85	_____
B. Fixed Costs			
2.0 Depreciation			
2.01 Storage	\$2.78	\$4.28	_____
3.0 Investment			
3.01 Storage	<u>\$0.17</u>	<u>\$0.26</u>	_____
Total Fixed Costs	\$2.95	\$4.54	_____
Total Cost of Production	\$24.31	\$37.39	_____

Energy Cost Comparison		Per	
		<u>Million Btu</u>	<u>Per kWh</u>
Flax Straw @ \$43.00/ton	4	\$4.43	\$0.0151
Flax Straw cubes @ \$83.00/ton	5	\$8.55	\$0.0292
Coal-lignite @ \$120/ton		\$15.20	\$0.0519
Wood Pellets @ \$250/ton		\$24.69	\$0.0843
Oats - grain @ \$3.25/bu		\$20.39	\$0.0696
MB Hydro @ \$0.08861/kWh		\$25.96	\$0.0886
Natural gas high E @ \$0.4900/cu.meter		\$16.22	\$0.0553
Natural gas low E @ \$0.4900/cu.meter		\$19.89	\$0.0679

Breakeven Biomass Value

	<u>Flax Straw per Ton</u>
Coal-lignite @ \$120/ton	\$147.64
Wood Pellets @ \$250/ton	\$239.75
Oats - grain @ \$3.25/bu	\$198.04
MB Hydro @ \$0.08861/kWh	\$252.15
Natural gas high E @ \$0.4900/cu.meter	\$157.49
Natural gas low E @ \$0.4900/cu.meter	\$193.19

Breakeven flax straw \$/ton = \$ per million Btu x 9.7119 million Btu per ton flax straw.

1. The cost of custom baling is based on \$11.40 per bale.
2. The cost of custom field moving of bales is based on \$3.00 per bale.
3. The cost of custom hauling is based on \$5.50/mile for 5 miles.
4. Total straw Cost of Production (COP) + 15% producer markup (risk, management and profit margin).
5. Total straw COP + 15% producer markup + \$40.00/ton straw cube production cost.

Disclaimer: This budget is only a guide and is not intended as an in depth study of the cost of production of this industry. Interpretation and utilization of this information is the responsibility of the user.

Flax Straw Biomass Cost of Production Input Assumptions

Land

Total Acres **600** acres

Producer Markup

(Risk, management, and profit margin) **15%**

Straw Production

straw yield per acre **0.65** tons

Custom Rates

Baling - custom rate (\$/bale) **\$11.40** \$/bale

Pickup, load, unload and stack - (\$/bale) **\$3.00** \$/bale

Average round bale weight (lbs) **1,100** lbs

Average bale moisture content **13** %

Hauling - custom rate per loaded mile **\$5.50** \$/mile

Hauling - average miles per load **5** miles

Hauling - average bales per load **34** bales

Repairs & Maintenance

% rate of investment **2%**

Miscellaneous

Miscellaneous Costs **\$2.75** \$/acre

Flax straw cube production **\$40.00** \$/ton

Average coal moisture content **12** %

Wood pellet moisture content **5** %

Oat grain moisture content **12.5** %

Interest

Interest on Operating **4.50** %

Investment interest rate **2.25** %

Energy Cost Comparisons

	<u>Cost per unit</u>		<u>Btu per unit</u>		<u>Heat Efficiency</u>
Flax straw - dry basis	\$37.39	ton	8,587	lb.	65%
MB Hydro residential rate	\$0.08861	kWhr	3,413	kWh	100%
Coal - lignite	\$120	ton	6,900	lb.	65%
Wood pellets	\$250	ton	8,200	lb.	65%
Oats (grain - 34 lb. bushel)	\$3.25	bushel	8,242	lb.	65%
Natural gas - high efficiency	\$0.490	m ³	32,844	m ³	92%
Natural gas - low efficiency	\$0.490	m ³	32,844	m ³	75%

Capital Costs

<u>Capital Costs</u>	<u>Biomass Cost/Acre</u>	<u>Useful Life</u>	<u>Salvage Value</u>
Storage Investment	\$8	3	0%
	<u>Market Value</u>	<u>% Allocated to Biomass</u>	<u>Allocated Biomass</u>
Storage	\$5,000	100%	\$5,000
Total Capital Investment	\$5,000		\$5,000

Assumptions

1. Assumed a total of 600 acres of flax straw biomass.
2. Assumed an average yield of 0.65 tons per acre.
3. Assumed a 15% producer markup per ton of straw.
4. Machinery and equipment costs for the flax straw biomass enterprise are based on custom rates. Storage facilities were valued at \$5,000 in total.
5. The budget is based on a round bale production system with outside storage.

Flax Straw Biomass Cost of Production Worksheet

A. Operating Costs	<u>Your Cost</u>
Straw Yield	0.65 tons straw per acre
x 600 acres	_____
Total	= 390 tons of straw produced
1.01 Custom Baling Costs	
0.65 tons straw per acre	_____
x 2000 lbs/ton	_____
÷ 1,100 bale weight (lbs)	_____
x \$11.40 \$/bale	_____
= \$13.47 \$ /acre	_____
1.02 Custom Field Moving Costs	
Pick up, load, unload & stack	
0.7 tons straw per acre	_____
x 2000 lbs/ton	_____
÷ 1,100 bale weight (lbs)	_____
x \$3.00 \$/bale	_____
= \$3.55 \$ /acre	_____
1.03 Custom Hauling Costs	
5 miles per load	_____
x \$5.50 \$/mile	_____
= \$27.50 \$/load	_____
34 bales/load	_____
x 1,100 bale weight (lbs)	_____
= 18.7 tons/load	_____
= \$1.47 \$/ton	_____
0.7 tons/acre	_____
x \$1.47 \$/ton	_____
= \$0.96 \$ /acre	_____
1.04 Repairs & Maintenance	
2.0% percentage rate	_____
x \$8 investment/acre	_____
= \$0.16 \$ /acre	_____
*Investment in straw biomass includes storage.	
1.05 Miscellaneous	
= \$2.75 \$/acre	_____
1.06 Interest on operating costs	
\$20.89 subtotal operating	_____
÷ 2 average	_____
x 4.5% interest rate	_____
= \$0.47 \$/acre	_____

Capital Costs

	<u>Market Value</u>	<u>% Allocated to Biomass</u>	<u>Allocated Biomass</u>
Storage	\$5,000	100%	\$5,000 _____
Total Capital Investment	\$5,000		\$5,000 _____

B. Fixed Costs

2. Depreciation

2.01 Storage

	\$5,000	storage investment	_____
-	\$0	salvage value	_____
÷	3	years useful life	_____
÷	600	acres	_____
=	\$2.78	\$/acre	_____

3. Investment

3.01 Storage

	\$5,000	storage investment	_____
+	\$0	salvage value	_____
÷	2	average	_____
÷	600	acres	_____
×	<u>4.0%</u>	<u>investment rate</u>	_____
=	\$0.17	\$/acre	_____

C. Energy Cost Comparison

4.01 Flax Straw

	8,587	Btu per pound	_____
×	<u>0.87</u>	<u>dry matter content</u>	_____
=	7,470.69	Btu per pound (as received)	_____
×	<u>2,000</u>	<u>Pounds per ton</u>	_____
=	14,941,380	Total Btu per ton	_____
×	<u>65%</u>	<u>Heat Efficiency</u>	_____
=	9,711,897	Net Btu per ton	_____

	\$37.39	Cost of Production per ton	_____
×	<u>15%</u>	<u>Producer Margin</u>	_____
=	\$43.00	Cost per ton	_____
÷	<u>9.7119</u>	<u>Million Btu per ton</u>	_____
=	\$4.43	per Million Btu	_____

	9,711,897	Net Btu per ton	_____
÷	<u>3,413</u>	<u>Btu per kWh</u>	_____
=	2,845.56	kWh per ton	_____

	\$43.00	Cost per ton	_____
÷	<u>2,845.56</u>	<u>kWh per ton</u>	_____
=	\$0.0151	per kWh	_____

4.02 Flax Straw Cubes

	8,587	Btu per pound	_____
×	<u>0.87</u>	<u>dry matter content</u>	_____
=	7,470.69	Btu per pound (as received)	_____
×	<u>2,000</u>	<u>Pounds per ton</u>	_____
=	14,941,380	Total Btu per ton	_____
×	<u>65%</u>	<u>Heat Efficiency</u>	_____
=	9,711,897	Net Btu per ton	_____

	\$37.39	Cost of Production per ton	_____
x	15%	Producer Margin	_____

	+	\$40.00	Flax Straw cube production per ton	_____
	=	\$83.00	Cost per ton	_____
	÷	9.7119	Million Btu per ton	_____
	=	\$8.55	per Million Btu	_____
		9,711,897	Net Btu per ton	_____
	÷	3,413	Btu per kWh	_____
	=	2,845.56	kWh per ton	_____
		\$83.00	Cost per ton	_____
	÷	2,845.56	kWh per ton	_____
	=	\$0.0292	per kWh	_____
4.03 Coal - Lignite		6,900	Btu per pound	_____
	×	0.88	dry matter content	_____
	=	6,072.00	Btu per pound (as received)	_____
	×	2,000	Pounds per ton	_____
	=	12,144,000	Total Btu per ton	_____
	×	65%	Heat Efficiency	_____
	=	7,893,600	Net Btu per ton	_____
		\$120.00	Cost per ton	_____
	÷	7.8936	Million Btu per ton	_____
	=	\$15.20	per Million Btu	_____
		7,893,600	Net Btu per ton	_____
	÷	3,413	Btu per kWh	_____
	=	2,312.80	kWh per ton	_____
		\$120.00	Cost per ton	_____
	÷	2,312.80	kWh per ton	_____
	=	\$0.0519	per kWh	_____
4.04 Wood Pellets		8,200	Btu per pound	_____
	×	0.95	dry matter content	_____
	=	7,790.00	Btu per pound (as received)	_____
	×	2,000	Pounds per ton	_____
	=	15,580,000	Total Btu per ton	_____
	×	65%	Heat Efficiency	_____
	=	10,127,000	Net Btu per ton	_____
		\$250.00	Cost per ton	_____
	÷	10.1270	Million Btu per ton	_____
	=	\$24.69	per Million Btu	_____
		10,127,000	Net Btu per ton	_____
	÷	3,413	Btu per kWh	_____
	=	2,967.18	kWh per ton	_____
		\$250.00	Cost per ton	_____
	÷	2,967.18	kWh per ton	_____
	=	\$0.0843	per kWh	_____
4.05 Oats - grain		8,242	Btu per pound	_____
	×	0.875	dry matter content	_____
	=	7,211.75	Btu per pound (as received)	_____
	×	2,000	Pounds per ton	_____
	=	14,423,500	Total Btu per ton	_____
	×	65%	Heat Efficiency	_____
	=	9,375,275	Net Btu per ton	_____

		\$191.18	Cost per ton	_____
	÷	<u>9.3753</u>	<u>Million Btu per ton</u>	_____
	=	\$20.39	per Million Btu	_____
		9,375,275	Net Btu per ton	_____
	÷	<u>3,413</u>	<u>Btu per kWh</u>	_____
	=	2,746.93	kWh per ton	_____
		\$191.18	Cost per ton	_____
	÷	<u>2,746.93</u>	<u>kWh per ton</u>	_____
	=	\$0.0696	per kWh	_____
4.06 Manitoba Hydro		\$0.0886	per kWh	_____
	x	1.00	Million Btu	_____
	÷	<u>3,413</u>	<u>Btu per kWh</u>	_____
	=	\$25.96	per Million Btu	_____
4.07 Natural Gas -High Efficiency		32,844	Btu per cubic meter	_____
	x	<u>92%</u>	<u>Heat Efficiency</u>	_____
	=	30,216	Net Btu per cubic meter	_____
		\$0.490	Cost per cubic meter	_____
	x	1.00	Million Btu	_____
	÷	<u>30,216</u>	<u>Net Btu per cubic meter</u>	_____
	=	\$16.22	per Million Btu	_____
		30,216	Net Btu per cubic meter	_____
	÷	<u>3,413</u>	<u>Btu per kWh</u>	_____
	=	8.85	kWh per cubic meter	_____
		\$0.490	Cost per cubic meter	_____
	÷	<u>8.85</u>	<u>kWh per cubic meter</u>	_____
	=	\$0.0553	per kWh	_____
4.08 Natural Gas -Low Efficiency		32,844	Btu per cubic meter	_____
	x	<u>75%</u>	<u>Heat Efficiency</u>	_____
	=	24,633	Net Btu per cubic meter	_____
		\$0.490	Cost per cubic meter	_____
	x	1.00	Million Btu	_____
	÷	<u>24,633</u>	<u>Net Btu per cubic meter</u>	_____
	=	\$19.89	per Million Btu	_____
		24,633	Net Btu per cubic meter	_____
	÷	<u>3,413</u>	<u>Btu per kWh</u>	_____
	=	7.22	kWh per cubic meter	_____
		\$0.490	Cost per cubic meter	_____
	÷	<u>7.22</u>	<u>kWh per cubic meter</u>	_____
	=	\$0.0679	per kWh	_____

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For more information, contact your local [Manitoba Agriculture GO Office](#) or:

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For more information

- Contact your local Manitoba Agriculture Growing Opportunities (GO) Office.
- Visit us at manitoba.ca/agriculture.

