

# Guidelines for Estimating Flax Straw Biomass Production Costs 2017

in Manitoba





## Guidelines for Estimating Flax Straw Biomass Production Costs

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](http://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**

<b>A. Operating Costs</b>	<u>\$/acre</u>	<u>\$/ton</u>	<u>Your Cost</u>
1.01 Custom Baling <sup>1</sup>	\$13.47	\$20.72	_____
1.02 Custom Field Moving <sup>2</sup>	\$3.55	\$5.46	_____
1.03 Custom Hauling <sup>3</sup>	\$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>	_____
<b>Total Operating Costs</b>	<b>\$21.36</b>	<b>\$32.85</b>	_____
<b>B. Fixed Costs</b>			
<b>2.0 Depreciation</b>			
2.01 Storage	\$2.78	\$4.28	_____
<b>3.0 Investment</b>			
3.01 Storage	<u>\$0.17</u>	<u>\$0.26</u>	_____
<b>Total Fixed Costs</b>	<b>\$2.95</b>	<b>\$4.54</b>	_____
<b>Total Cost of Production</b>	<b>\$24.31</b>	<b>\$37.39</b>	_____

<b>Energy Cost Comparison</b>		<b>Per</b>	
		<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	<b>\$0.08861</b>	kWhr	3,413	kWh	100%
Coal - lignite	<b>\$120</b>	ton	6,900	lb.	65%
Wood pellets	<b>\$250</b>	ton	8,200	lb.	65%
Oats (grain - 34 lb. bushel)	<b>\$3.25</b>	bushel	8,242	lb.	65%
Natural gas - high efficiency	<b>\$0.490</b>	m <sup>3</sup>	32,844	m <sup>3</sup>	92%
Natural gas - low efficiency	<b>\$0.490</b>	m <sup>3</sup>	32,844	m <sup>3</sup>	75%

### Capital Costs

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

## 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

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

### Capital Costs

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

### B. Fixed Costs

#### 2. Depreciation

##### 2.01 Storage

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

#### 3. Investment

##### 3.01 Storage

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

### 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>	_____
=	<b>9,711,897</b>	<b>Net Btu per ton</b>	_____

	\$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>	_____
=	<b>\$4.43</b>	<b>per Million Btu</b>	_____

	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>	_____
=	<b>\$0.0151</b>	<b>per kWh</b>	_____

#### 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>	_____
=	<b>9,711,897</b>	<b>Net Btu per ton</b>	_____

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

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

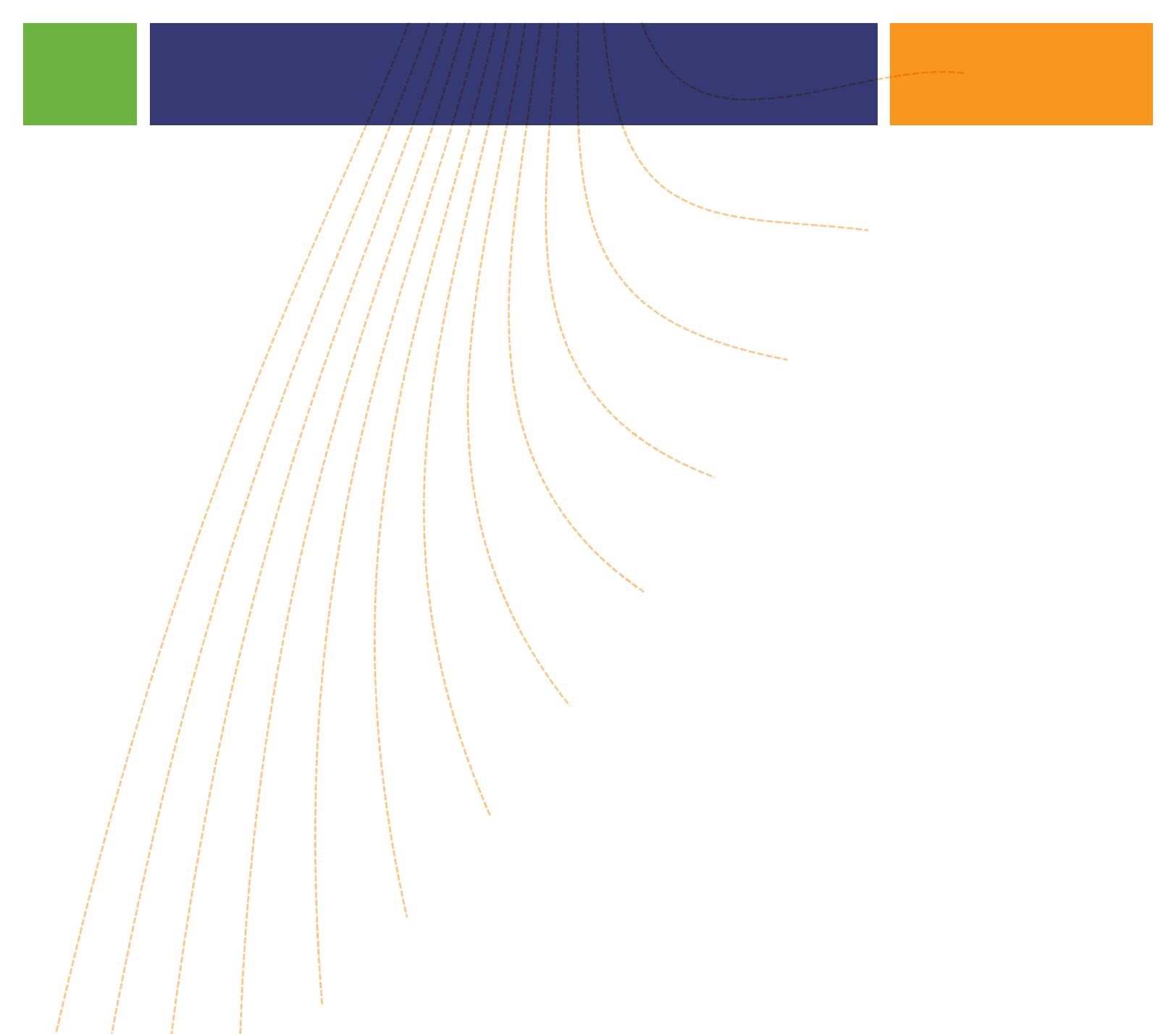
		\$191.18	Cost per ton	_____
	÷	<u>9.3753</u>	<u>Million Btu per ton</u>	_____
	=	<b>\$20.39</b>	<b>per Million Btu</b>	_____
		9,375,275	Net Btu per ton	_____
	÷	<u>3,413</u>	<u>Btu per kWh</u>	_____
	=	2,746.93	kWh per ton	_____
		\$191.18	Cost per ton	_____
	÷	<u>2,746.93</u>	<u>kWh per ton</u>	_____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

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

[Roy Arnott](#)

Farm Management Specialist

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**For more information**

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

