

Guidelines For Estimating **Canola Biodiesel Production Costs** Based on 10 Million Litres per year

Date: **May, 2011**

This guide is designed to provide you with planning information and a format for calculating costs of production of a biodiesel enterprise. Adjustments will be necessary when applying these figures to your own enterprise.

The budget estimates are based on a number of assumptions which are clearly defined in the supporting pages. Input costs are based on industry information. Proper plant management in the production process, marketing, compliance to all applicable environmental requirements, provincial and federal incentive programs is assumed.

Disclaimer: This budget is only a guide and is not intended as an in depth study of the cost of production of the Manitoba biodiesel industry. Interpretation and utilization of this information is the responsibility of the user. If you require assistance with developing your individual budget, please contact your local MAFRI Business Development Specialist.

Canola Biodiesel Production Costs - May, 2011 Based on 10 Million Litres

A. Operating Costs	<u>Cost/Litre</u>	<u>Total Cost</u>	<u>Your Cost</u>
1. Input Costs			
1.01 Feedstock - canola oil	\$1.0136	\$10,135,592	_____
1.02 Methanol	\$0.0551	\$550,521	_____
1.03 Catalyst	\$0.0088	\$88,181	_____
Subtotal Input Cost	\$1.0774	\$10,774,294	_____
2. Other Operating Costs			
2.01 Electricity	\$0.0338	\$338,409	_____
2.02 Biodiesel Quality Testing	\$0.0029	\$28,800	_____
2.03 Maintenance	\$0.0084	\$83,750	_____
2.04 Misc. Administration	\$0.0012	\$12,000	_____
2.05 Insurance	\$0.0017	\$16,750	_____
2.06 Property Taxes	\$0.0006	\$6,000	_____
2.07 Miscellaneous expense	\$0.0150	\$150,000	_____
Subtotal Operating Costs	\$0.0636	\$635,709	_____
2.08 Operating Interest	\$0.0018	\$18,277	_____
Total Operating Costs	\$1.1428	\$11,428,280	_____
B. Fixed Costs			
3. Depreciation			
3.01 Buildings	\$0.0016	\$15,750	_____
3.02 Machinery & Equipment	\$0.0270	\$270,000	_____
4. Investment			
4.01 Buildings	\$0.0003	\$3,369	_____
4.02 Machinery & Equipment	\$0.0029	\$28,875	_____
4.03 Land	\$0.0001	\$875	_____
Total Fixed Costs	\$0.0319	\$318,869	_____
Total Operating and Fixed Costs	\$1.1747	\$11,747,148	_____
C. Labour			
	\$0.0514	\$513,800	_____
Total Cost of Production	\$1.2261	\$12,260,948	_____
D. Income			
5. Biodiesel			
5.01 Estimated Biodiesel Sales	\$0.9461	\$9,461,210	_____
5.02 Estimated Provincial Incentive	\$0.1400	\$1,400,000	_____
5.03 Estimated Federal Incentive	\$0.1800	\$1,800,000	_____
5.03 Glycerol sales	\$0.0000	\$0	_____
Total Income	\$1.2661	\$12,661,210	_____
Net Income	\$0.0400	\$400,262	_____
Breakeven price			
	<u>\$/Litre</u>	<u>\$/Bushel</u>	
A. Operating Costs	\$0.8228	\$13.2369	_____
B. Operating & Labour Costs	\$0.8742	\$12.8257	_____
C. Operating & Fixed Costs	\$0.8547	\$12.9817	_____
D. Operating, Fixed & Labour Costs	\$0.9061	\$12.5704	_____

Breakeven Price \$/Litre = (Cost - (Total Income - Est. Biodiesel sales)) ÷ 10 million litres

Breakeven Price \$/Bushel = Total Income - Cost ÷ 1249249 bu. of canola + \$12.25 per bu. (with canola meal = \$262.15 per tonne)

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. No liability for decisions based on this publication is assumed.

Biodiesel Production Costs - Input

Assumptions

1. This budget outlines the cost of production for a biodiesel operation.
2. Buildings and equipment are valued at new cost.
3. All canola feedstock is purchased.
4. All Biodiesel produced is sold in the Manitoba market.

Biodiesel Plant Production

Plant size - millions of litres	10	
Days per year	360	
Hours operation per day	24	
General Manager	\$65,000	/ year
Portion of full time	100%	
Administrative Assistant	\$30,000	/ year
Portion of full time	100%	
Employees per shift - biodiesel production	1	
Labour Rate	\$25.00	/ hour
Vegetable oil required per litre biodiesel	0.99088	litres
Biodiesel B100 full specification quality testing	\$1,200	/ test
Feedstock - Canola #1 grade	95	%
Feedstock - Canola off grade	5	%
Feedstock - Vegetable oil	0	%
Methanol	\$460	/ tonne
Methanol recovery	40	%
Catalyst - potassium hydroxide	\$600	/ tonne
Glycerol	\$0	/ tonne
Diesel wholesale fuel - #1 ULSD	\$0.8200	/ litre
B100 biodiesel wholesale fuel - Iowa	\$4.2500	/ US gallon
Manitoba biodiesel incentive rate	\$0.140	/ litre
Federal ecoEnergy incentive rate	\$0.18	/ litre

Canola Oil Production

Canola price - #1	\$12.25	/ bushel
Canola meal - 34% protein	\$262	/ tonne
Off grade canola discount	25	%
CBOT Soybean oil value	\$0.5750	/ pound
US Dollar	\$0.9950	CDN
Days per year	360	
Hours operation per day	24	
Oilseed Crush Manager	\$60,000	/ year
Portion of full time	50%	

Guidelines: Biodiesel Production Costs

Employees per shift - canola oil production	1
Labour Rate	\$20.00 / hour
Canola seed oil content	42.0 %
Residual oil in canola meal	10.0 %
Shrinkage in oilseed processing	1.0 %
Residual oil in canola meal (solvent extraction)	3.5 %
Barley price - 76% Total Digestible Nutrients	\$2.82 / bushel
Extra oil meal premium	0 %
Canola oil bulk density	0.915 kg / L
Soybean oil bulk density	0.920 kg / L

Other Operating Costs

Electricity	\$0.06899 / kWhr
Maintenance	2.5 %
Misc. Administration	\$12,000 / year
Miscellaneous expense	\$0.015 / litre
Insurance	0.5 %
Property taxes	1.5 %
Investment Rate	1.75 %
Operating Interest Rate	5.75 %

Capital Costs

Buildings	<u>Original Value</u>	<u>Salvage Value</u>	<u>Useful Life</u>
Biodiesel plant	\$175,000	10 %	20 years
Canola oil plant	\$175,000	10 %	20 years
Total	<u>\$350,000</u>	<u>10.0 %</u>	<u>20.0 years</u>

Machinery & Equipment

Biodiesel plant	\$1,250,000	10 %	10 years
Canola oil plant	\$1,750,000	10 %	10 years
Total	<u>\$3,000,000</u>	<u>10.0 %</u>	<u>10.0 years</u>

Total Bldg., Mach. & Equip \$3,350,000

Total Land Value \$50,000

Total Capital Investment \$3,400,000

Assumptions

Assumptions

1. This budget outlines the cost of production for a biodiesel operation.
2. Buildings and equipment are valued at new cost.
3. All canola feedstock is purchased.
4. Feedstock cost (vegetable oil) includes the market value of canola meal produced.
5. All Biodiesel produced is sold in the Manitoba market.

Biodiesel Production Worksheet

A. Operating Costs

1. Input Costs

1.01 Feedstock - vegetable oil

	42.0%	canola seed oil content	_____
-	10.0%	residual oil in canola meal	_____
=	32.0%	net oil extraction	_____
-	1.0%	shrinkage in processing	_____
=	67.0%	net canola meal yield	_____
x	1,000	kg per tonne	_____
=	320.0	kg oil per tonne of canola	_____
÷	0.915	Canola oil bulk density kg/L	_____
=	349.73	Litres oil per tonne of canola	_____
	10,000,000	Biodiesel Plant Capacity - litres	_____
x	0.99088	oil required per litre biodiesel	_____
÷	349.73	Litres oil per tonne of canola	_____
x	95	% Feedstock - Canola #1 grade	_____
=	26,916	Tonnes #1 Canola required	_____
	\$12.25	price per bushel	_____
x	\$540.12	price per tonne	_____
=	\$14,538,136	Feedstock - Canola #1 grade	_____
	10,000,000	Biodiesel Plant Capacity - litres	_____
x	0.99088	oil required per litre biodiesel	_____
÷	349.73	Litres oil per tonne of canola	_____
x	5	% Feedstock - Canola off grade	_____
=	1,417	Tonnes off grade Canola req.	_____
	\$9.19	price per bushel	_____
x	\$405.09	price per tonne	_____
=	\$573,874	Feedstock - Canola off grade	_____
	10,000,000	Biodiesel Plant Capacity - litres	_____
x	0.99088	oil required per litre biodiesel	_____
x	0.920	oil bulk density kg/L	_____
÷	1,000	kg per tonne	_____
x	0	% Feedstock - vegetable oil	_____
=	0	Tonnes vegetable oil	_____
x	\$1,311.30	price per tonne	_____
=	\$0	Feedstock - vegetable oil	_____
=	\$15,112,009	Subtotal Feedstock	_____
	26,916	Tonnes of #1 Canola required	_____
+	1,417	Tonnes of off grade Canola req.	_____
	28,333	Total Tonnes of Canola	_____
	1,249,249	Total Bushels of Canola	_____
	67%	net canola meal yield	_____
=	18,983	Tonnes canola meal	_____

		65	Kg extra oil content in meal	_____
		\$336.22	Canola oil feed value equivalent per tonne (167.28 TDN)	_____
		\$21.85	Residual oil canola meal premium	_____
x		0%	Oil premium payable	_____
=		\$0.00	Oil premium per tonne	_____
+		\$262.15	Canola meal - 34% protein	_____
=		\$262.15	Canola meal price per tonne	_____
x		18,983	Tonnes Canola meal	_____
=		\$4,976,418	Canola meal income	_____
		\$15,112,009	Subtotal Feedstock	_____
-		\$4,976,418	Canola meal income	_____
Total	=	\$10,135,592	Net Feedstock	_____
1.02 Methanol				
		10,000,000	Biodiesel Plant Capacity - litres	_____
x		0.99088	oil required per litre biodiesel	_____
x		0.915	Canola oil bulk density kg/L	_____
x		22%	Methanol required	_____
x		60%	Methanol recovery = 40%	_____
÷		1,000	kg per tonne	_____
x		\$460.00	Methanol per tonne	_____
Total	=	\$550,521	Methanol	_____
1.03 Catalyst				
		10,000,000	Biodiesel Plant Capacity - litres	_____
x		0.99088	oil required per litre biodiesel	_____
x		0.915	Canola oil bulk density kg/L	_____
÷		1,000	kg per tonne	_____
x		16.21	kg potassium hydroxide /tonne	_____
÷		1,000	kg per tonne	_____
x		\$600.00	Catalyst per tonne	_____
Total	=	\$88,181	Catalyst	_____
2. Other Operating Costs				
2.01 Electricity				
		28,333	Total Tonnes of Canola	_____
÷		360	Days per year - crush	_____
		78.7	Tonnes canola per day	_____
÷		24	Hours operation per day - crush	_____
		3.3	Tonnes canola per hour	_____
x		78.7	Tonnes canola per day	_____
x		8.5	HP per tonne	_____
x		0.75	HP to kilowatts	_____
x		\$0.069	Electricity rate - kWhr	_____
x		360	Days per year - crush	_____
x		24	Hours operation per day - crush	_____
=		\$299,068	Subtotal Electricity - crush	_____
		10	Biodiesel Plant Capacity - million litres	_____
x		360	Days per year - biodiesel	_____
x		24	Hours per day - biodiesel	_____
x		6.6	kWhr per million litre	_____
x		\$0.069	Electricity rate - kWhr	_____
=		\$39,341	Subtotal Electricity - biodiesel	_____
Total	=	\$338,409	Electricity	_____

2.02 Biodiesel Quality Testing

	\$1,200	B100 Full Spec ASTM D6751 test	_____
x	12	tests per year	_____
=	<u>\$14,400</u>	B100 Full Spec ASTM D6751 test	_____
	\$360	B100 Critical Specification test	_____
x	40	tests per year	_____
=	<u>\$14,400</u>	B100 Critical Specification test	_____
=	\$28,800	Subtotal Biodiesel Quality Testing	_____

2.03 Maintenance

	\$350,000	capital cost - buildings	_____
+	\$3,000,000	capital cost - equipment	_____
=	<u>\$3,350,000</u>	Total bldg. & equipment	_____
x	2.5%	Maintenance rate	_____
=	<u>\$83,750</u>	Total Maintenance	_____

2.04 Misc. Administration

\$12,000 misc. administration

2.05 Insurance

	\$350,000	capital cost - buildings	_____
+	\$3,000,000	capital cost - equipment	_____
=	<u>\$3,350,000</u>	Total bldg. & equipment	_____
x	0.5%	Insurance rate	_____
=	<u>\$16,750</u>	Total Insurance	_____

2.06 Property Taxes

	\$350,000	capital cost - buildings	_____
+	\$50,000	capital cost - land	_____
=	<u>\$400,000</u>	Total bldg. & land	_____
x	1.5%	Property tax rate	_____
=	<u>\$6,000</u>	Total Property tax	_____

2.07 Miscellaneous Expense

	\$0.015	Miscellaneous expense / litre	_____
x	10,000,000	Biodiesel Plant Capacity - litres	_____
=	<u>\$150,000</u>	Total Miscellaneous Expense	_____

2.08 Operating Interest

(Operating interest is charged on one half of the subtotal operating costs)

	\$635,709	subtotal operating costs	_____
÷	2.00	average	_____
x	5.75	% operating interest rate	_____
=	<u>\$18,277</u>	Operating Interest	_____

Capital Costs

Buildings

Biodiesel Plant	\$175,000	_____
Canola Oil Plant	<u>\$175,000</u>	_____
Total Building Cost	\$350,000	_____

Machinery & Equipment

Biodiesel Plant	\$1,250,000	_____
Canola Oil Plant	<u>\$1,750,000</u>	_____
Total Machinery & Equipment Cost	\$3,000,000	_____

Total Bldg., Mach. & Equip. **\$3,350,000** _____

Total Land Value **\$50,000** _____

Total Capital Investment **\$3,400,000** _____

B. Fixed Costs

3. Depreciation

Original Cost - Salvage Value
Useful Life

3.01 Buildings

	\$350,000	original cost	_____
-	\$35,000	salvage value	_____
÷	20.00	years useful life	_____
=	<u>\$15,750</u>		_____

3.02 Machinery & Equipment

	\$3,000,000	original cost	_____
-	\$300,000	salvage value	_____
÷	10.00	years useful life	_____
=	<u>\$270,000</u>		_____

4. Investment

Original Cost + Salvage Value x Investment Rate
2

4.01 Buildings

	\$350,000	original cost	_____
+	\$35,000	salvage value	_____
÷	2.00	average	_____
x	1.75	% investment rate	_____
=	<u>\$3,369</u>		_____

4.02 Machinery & Equipment

	\$3,000,000	original cost	_____
+	\$300,000	salvage value	_____
÷	2.00	average	_____
x	1.75	% investment rate	_____
=	<u>\$28,875</u>		_____

4.03 Land

	\$50,000	land	_____
x	1.75	% investment rate	_____
=	<u>\$875</u>		_____

C. Labour

Canola oil

		1	Employees per shift	_____
x		360	Days per year	_____
x		24	Hours operation per day	_____
x		\$20.00	Labour Rate per hour	_____
		<u>\$172,800</u>	Subtotal Labour Cost	_____
+		\$30,000	Oilseed Crush Manager	_____
Total	=	\$202,800	Canola oil labour	_____
		5.0	Full time job positions	_____

Biodiesel

		1	Employees per shift	_____
x		360	Days per year	_____
x		24	Hours operation per day	_____
x		\$25.00	Labour Rate per hour	_____
		<u>\$216,000</u>	Subtotal Labour Cost	_____
		\$30,000	Administrative Assistant	_____
+		\$65,000	General Manager	_____
Total	=	\$311,000	Biodiesel labour	_____
		6.5	Full time job positions	_____

Total	=	\$513,800	Labour	_____
Total	=	11.5	Full time job positions	_____

5. Income

5.01 Estimated Biodiesel Sales

		\$4.2500	B100 biodiesel wholesale/gallon - Iowa	_____
x		\$0.9950	US Dollar exchange	_____
÷		<u>3.7854</u>	litres per US gallon	_____
=		\$1.1171	B100 wholesale per litre	_____
-		<u>\$0.1710</u>	95% of Federal ecoEnergy incentive rate	_____
		\$0.9461	Est. Manitoba B100 value /L	_____
			or (if less than)	_____
		\$0.8200	Wholesale #1 ULSD / litre	_____
		\$0.9461	Est. Manitoba B100 value /L	_____
x		10,000,000	Biodiesel Plant Capacity - litres	_____
Total	=	\$9,461,210	Biodiesel	_____

5.02 Estimated Provincial Incentive

		\$0.1400	Manitoba incentive rate	_____
x		10,000,000	Biodiesel Plant Capacity - litres	_____
Total	=	\$1,400,000	Manitoba Incentive	_____

5.03 Estimated Federal Incentive

			= ecoEnergy Incentive (Eligible sales (L) x Incentive Rate (\$/L))	
			ecoEnergy incentive rate \$0.180 per litre for April 2010 to March 2011	
=		\$0.1800	Federal Incentive per litre	_____
x		10,000,000	Biodiesel Plant Capacity - litres	_____
Total	=	\$1,800,000	Federal Incentive	_____

5.04 Glycerol Sales

		935.9	Tonnes glycerol produced	
	x	\$0	glycerol per tonne	
Total	=	\$0	Glycerol	

For further information contact your local MAFRI office.

Prepared by:

Roy Arnott, P.Ag.
 Business Development Specialist
 Killarney GO Centre 204-523-6424

Bob Gwyer, P.Ag.
 Business Development Specialist
 Minnedosa GO Office 204-868-5322

Marc Boulanger, P.Ag.
 Business Development Specialist
 Souris GO Centre 204-483-0458

Grant Palmer
 Policy Economist
 Policy Analysis Winnipeg 204-391-7512