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Canola field in bloom near Johnson, WA.
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Economics of Spring Canola Production in Dryland Eastern Washington

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Demand for oilseed crops for biodiesel production promises to be strong due to recent legislative and commercial developments. This study calculates break-even crop prices for a range of oilseed production levels across a wide region of dryland crop production in eastern Washington. Appendix tables provide detailed costs of production for each crop and rainfall zone. These tables include both variable and fixed machinery costs as well as land rent expenses using a traditional cost-share arrangement. These appendix tables are available as spreadsheets in electronic format, available online from http://www.farm-mgmt.wsu.edu/ (type canola in the search bar) or from http://cff.wsu.edu/Publications/ under Enterprise Budgets. Growers can alter the input prices, yields, and other information to tailor the costs to their operation. Given the recent fluctuations in fertilizer and fuel prices, producers will need to be able to adjust these input costs in their budgets. March 2006 prices in Table 1 were used to conduct this analysis.

Table 1. Input Price Changes for Fertilizer and Fuel, 2003-2006

Input	Sept. 2003	Sept. 2004	Sept. 2005	Mar. 2006
Aqua-Nitrogen	35¢/lb.	40¢/lb.	49¢/lb.	37¢/lb.
Aqua-Sulfur	35¢/lb.	35¢/lb.	38¢/lb.	22¢/lb.
Dry-Nitrogen	34.5¢/lb.	34¢/lb.	50¢/lb.	44¢/lb.
Dry-Phosphorous	29¢/lb.	32¢/lb.	35¢/lb.	32¢/lb.
Dry-Sulfur	26¢/lb.	29¢/lb.	32¢/lb.	17¢/lb.
Off-Road Diesel	$1.19/gal.	$1.50/gal.	$2.50/gal.	$2.23/gal.

BACKGROUND

Alternative crops can provide some benefits for dryland grain growers in the Pacific Northwest. Oilseed crops, such as rapeseed, canola, and mustard, have been used in rotation with wheat and barley in the region since the late 1970s. Including oilseeds in a cereal grain rotation provides a greater choice of herbicide use in the battle against unwanted grasses, thus facilitating weed control. The addition of an oilseed crop also helps loosen hardpan within the soil and it can break

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up disease cycles. Although these alternative crops potentially improve yields of the subsequent wheat or barley crop, the market price for these oilseed crops during the past several years has caused some producers to produce these crops at a loss.

The objective of this project is to help growers learn about canola production and provide a basis for determining the prices and/or yields they must receive to produce canola at a profit. The scope of the project includes various rainfall zones in eastern Washington. Canola budgets were developed for areas with 12 to 15 inches of annual precipitation, 15 to 20 inches of annual precipitation, and over 20 inches of annual precipitation. Returns over variable and total production costs at various canola price levels are presented in Tables 2, 3, and 4. Expected yields were considered reasonable, based on growers' experience and variety trials conducted across the region for the past five years. However, yields are quite variable with this crop, and vary considerably by cultivar for any one region and year. As crop breeding research and variety trials continue, varieties that are better suited to this region will be developed. Growers can expect yield increases and declines in yield variability as we learn more about this crop.

Table 2. Returns over Variable and Total Production Costs for Spring Canola Production by Precipitation Zone (canola price = $0.12/lb).

Precipitation Zone/ Yield (lb/acre)	Returns over Variable Production Costs ($/ac)	Returns over Total Production Costs ($/ac)
12" to 15" annual precipitation (1000 lb)	3	-40
15" to 20" annual precipitation (1300 lb)	19	-32
Over 20" annual precipitation (1600 lb)	54	-6

Table 3. Returns over Variable and Total Production Costs for Spring Canola Production by Precipitation Zone (canola price = $0.10/lb)

Precipitation Zone/ Yield (lb/acre)	Returns over Variable Production Costs ($/ac)	Returns over Total Production Costs ($/ac)
12" to 15" annual precipitation (1000 lb)	-17	-53
15" to 20" annual precipitation (1300 lb)	-7	-49
Over 20" annual precipitation (1600 lb)	22	-28

Table 4. Returns over Variable and Total Production Costs for Spring Canola Production by Precipitation Zone (canola price = $0.08/lb)

Precipitation Zone/ Yield (lb/acre)	Returns over Variable Production Costs ($/ac)	Returns over Total Production Costs ($/ac)
12” to 15” annual precipitation (1000 lb)	-37	-67
15” to 20” annual precipitation (1300 lb)	-33	-66
Over 20” annual precipitation (1600 lb)	-10	-49

Table 5 presents break-even prices for a range of canola yields over the three rainfall zones. The current bid price for canola at this writing is around $9.60 per cwt in North Dakota. This price is similar to delivery bid prices for Canadian processors. See http://www.northerncanola.com/daily_cash/index.asp for updates. Assuming the average price of $0.10 per lb received for canola over the last year and the expected yields used in each rainfall zone, only growers in the highest rainfall zone would cover their variable production costs. None of the producers can cover their total production costs at current market prices. In order for this crop to be economically viable given the production costs we have used, market prices need to rise and/or expected yields need to increase.

Average yields for the Pacific Northwest Canola Variety Trials, conducted by university and industry sponsors at a number of sites in the Inland Northwest, reveal considerable yearly fluctuation across the dozens of varieties tested. (See http://agweb/ag.uidaho.edu/brassica for detailed trial results.) The overall mean for 27 trial cultivars and five control cultivars at nine locations was 1633 lb per acre in 2005. Most cultivars produced acceptable yields with 75 percent of the lines producing more than 1500 lb per acre when averaged across nine locations. In 2004, the overall average was 1675 lb per acre. The overall mean in 2003 was 1279 lb per acre, due to lower than average rainfall across the region.

Table 5. Estimated Break-Even Prices Covering Total Production Costs for Spring Canola Seed by Rainfall Zone

12” to 15" Rainfall Zone		15" to 20" Rainfall Zone		Greater than 20" Rainfall Zone	
Production Level (lbs.)	2006 B-E Price (¢/lb.)	Production Level (lbs.)	2006 B-E Price (¢/lb.)	Production Level (lbs.)	2006 B-E Price (¢/lb.)
700	20.5	800	20.3	1000	16.8
800	18.3	1000	16.9	1200	14.5
900	16.7	1200	14.6	1400	12.9
1000	15.3	1400	13.0	1600	11.7
1100	14.2	1600	11.8	1800	10.8
1200	13.3	1800	10.9	2000	10.0

The break-even price represents that price needed to cover all costs of production including opportunity costs for the operator in terms of operator labor and investment in machinery and land. In other words, at the break-even price, the farmer can pay for machinery fixed costs, land rent, and operator labor. Returns above this price represent returns to management and risk.

CULTURAL CONSIDERATIONS[1]

Stand establishment can be challenging in canola production. This crop is very sensitive to proper growing conditions, much more so than cereal grains, for example. Stand establishment is affected by nitrogen placement, seed treatment, seeding depth, drought, wind, and frost.

Canola is also susceptible to heat and drought stress during flowering; excessive heat during this stage can decrease yield. Susceptibility will vary by cultivar, so we recommend using varieties that have been adapted for the climate in your region.

Comprehensive agronomic data is available from the Canadian Canola Council's excellent website, http://www.canola-council.org/growing.html. You'll find data on pests, IPM, stress factors, and disease as well as marketing, grading, and storing information.

Damage from Herbicide Residual

Some herbicide residues can damage oilseed crops. Canola is very sensitive to imidazolinone and the sulfyurea-type herbicides such as Glean (chlorsulfuron), Finesse (chlorsulfuron & metsulfuron), Ally (metsulfuron), Maverick (sulfosulfuron), Pursuit (imazethapyr), Pursuit Plus (pendimethalin & imazethapyr) and others.* If chemicals like these have been used, growers are advised to wait for a minimum of 10 months to a maximum of 40 months before planting brassicas and yellow mustard. There are varieties resistant to Pursuit; check with seed sources for further information. A report on field trials with Pursuit-resistant cultivars can be found at http://agweb.ag.uidaho.edu/brassica/Variety-trial-info/Pursuit.PDF.

*Trade names have been used to clarify information. No endorsement of named products is intended nor is criticism implied of similar products not mentioned.

Seed Treatments

The budgets in this publication use treated seed. Prices for treated seed vary by cultivar and treatment. Gaucho is a 45-day systemic insecticide seed treatment for aphid and flea beetle control. Benlate is used to prevent black leg, a seedborne fungal disease that is common in Canada. Treated seed costs considerably more than untreated seed, but studies have shown that the treatments are cost-effective. A report on the effectiveness of various seed treatments based

[1] See EB1919 GROWER EXPERIENCES WITH MUSTARD AND CANOLA IN EASTERN WASHINGTON, 1997–2000, by Norm Herdrich, for more information. Available online at http://cru.cahe.wsu.edu/CEPublications/eb1919/eb1919.pdf

on field trials can be found at http://agweb.ag.uidaho.edu/brassica/Variety-trial-info/CRP-Seedtrt04.PDF. Varieties are available that are resistant to glyphosphate as well as some other herbicides, but growers need to be aware that European markets are closed to GMO products. However, they do accept the oil from GMO canola.

Seeding Rate

When seedbed conditions are optimal, a seeding rate of 4 to 6 lb per acre is recommended for canola. Seed needs to be in firm contact with the soil at a uniform depth of ½ to 1 inch deep. In less than ideal planting conditions, a seeding rate of 6 to 8 lb is recommended. Seed should be placed from ¾ to one inch deep, in rows no wider than 12 inches. An ideal row spacing is from 6 to 7 inches apart.

Fertility for Canola and Mustard Seed Production

Canola requires about 6.5 lb of nitrogen for each 100 lb of seed yield. A 6:1 ratio of nitrogen to sulfur is recommended. More detail on optimum nitrogen use by soil moisture and expected yield can be found on the Canadian Canola Council's extensive website, http://www.canola-council.org/nitrogenintro.aspx. Canola is sensitive to burning from nitrogen placed in the seed row. An effective management strategy is to deep-band fertilizer in the fall, particularly for dry soils. This increases the availability of the nutrients in the root zone, rather than trapping them in the upper layer of dry soil. Again, more detailed information is available at http://www.canola-council.org/nitromgmt.aspx.

Recommendations for phosphorus will depend on field history. There should be about 10 lb available phosphate per acre, and at least 10 lb of available sulfur. Soil testing of the entire soil profile is recommended. The Canadian Canola Council has excellent information on nutrient needs at http://www.canola-council.org/soilfertandnut.aspx.

Preparation for Harvesting

In the budgets for this publication, we assume that all of the oilseeds are directly harvested with a combine. However, some producers swath canola before combining. Swathing is expensive and time-consuming, but can prevent excessive shattering with canola. Polymer sprays are also available to counteract shatter problems. The cost of the spray is typically about $10 to $11 per acre plus the cost of aerial application (usually $6 per acre). The sprays are more commonly used on winter canola varieties.

One of the growers interviewed in 2006 uses the Yield Shield, a new product from Canada, as an alternative to swathing. He finds that more seed will be ripe at the same time, and combining the "pushed" canola is about three times faster than direct combining. As shown below in Figure 1, a curved blade similar to a snowplow bends the canola stalks while green, allowing the crop to dry without danger of blowing away. Further information can be found on the company's website,

http://www.agshield.com/yield.html. No endorsement is intended; this information is simply provided to present a comprehensive examination of current production practices.

Winter Canola

Winter canola is planted in the fall, either on summer fallow or recropped ground. Planting following summer fallow produces higher yields than recropping, but recropped winter canola generally outyields spring canola. However, winter kill and establishment problems when soil moisture is inadequate can be problematic with winter canola. Plant breeder Jack Brown at the University of Idaho is developing varieties suited to our region. Average yields in field trials have ranged from a low of 2608 lb in 2004 to a high of 3292 lb in 2003. Extensive trial data for winter canola trials extending from northern Idaho to central Washington and northeastern Oregon can be viewed at http://agweb/ag.uidaho.edu/brassica.

Figure 1. The Yield Shield from AgShield of Canada is used to bend canola stalks while green, which the company claims encourages a more uniform ripening of seed without cutting the plant. Note: The steering mechanism on the tractor swivels, so it is actually driven backwards!

DISCUSSION OF BUDGET INFORMATION

Enterprise costs and returns vary from one location to the next and over time for any particular farming operation. Variability stems from differences in the following:

- Capital, labor, and natural resources
- Type and size of machinery complement
- Cultural practices
- Size of farm enterprise
- Crop yields
- Input prices
- Commodity prices
- Management skill

Costs can also be calculated differently depending on the intended use of the cost estimate. To avoid drawing unwarranted conclusions for any particular farm, the reader must closely examine the assumptions used. If they are not appropriate, adjustments should be made.

Machinery Costs

The machinery complement used for this study was derived from interviews with 15 canola producers across the study area. A detailed list of machinery and data for each machine in the complement are presented in Tables D1 and D2.

Machinery fixed costs include depreciation, interest on the investment, property taxes, insurance, and housing. For the overall farm operation, these costs do not vary by crop, given the ownership of a specific machinery complement, and are incurred whether or not crops are grown. Machinery fixed costs for a specific field operation are determined by multiplying the machine hours per acre times per hour fixed cost (Table D2). Per hour fixed costs are determined by dividing the total fixed cost by the annual hours of machinery use for the representative firm.

Machinery interest costs are calculated on the average annual investment in the machine. The formula used to calculate the average machine investment is:

(Purchase Cost + Salvage Value)/2

The 8.5% interest charge made against this average investment represents an opportunity cost (returns forgone by investing in a given machine implement rather than in an alternative investment) or interest paid on money borrowed to finance machine purchases, or both. Machinery interest cost for one acre of the crop enterprise being analyzed is determined by multiplying the respective machine hours per acre times the per hour interest costs shown in Table D2.

Land Costs

Costs of production among producers tend to be somewhat similar for any particular production system, regardless of production level, when land costs are not taken into consideration. Since the net land rental value is based on production level, land cost varies directly with production level, which in turn directly affects total cost. Land costs, included either as real or as opportunity costs, are based on the share rental arrangement typical in the area. In our study, net land rental cost was calculated as:

1/3 Crop Value – (1/3 Fertilizer Cost + 1/3 Chemical Cost + 1/3 Crop Insurance + Land Taxes)

The typical lease agreement in the areas surveyed is a one-third land owner and two-third tenant crop share, with the landowner paying land taxes, one-third of the fertilizer cost, one-third of the chemical cost, and one-third of the crop insurance. The owner pays the land tax. The tenant covers all other production expenses.

While the owner-operator will not actually experience a land rental cost, this cost represents the minimum return owner-operators must realize to justify growing the crop themselves. This net rent return represents the income the owner-operator forgoes by producing the crop rather than renting to a tenant. As a result of owning land, the farmer receives both current returns from the farming operation and any long-term appreciation in land value. However, the farmer would continue to realize land value appreciation even if the land is rented out. Consequently, the appropriate land charge for growing the crop is only the forgone net rent. As used in this publication, for land that is owned and not rented, land cost is termed an opportunity cost to indicate that it is not an out-of-pocket expense, but rather a return that is forgone as a result of choosing to use the land to grow this crop. To determine the profitability of crop production relative to other activities, the owner-operator may want to consider these forgone returns, or opportunity costs, along with the usual production expenses.

Detailed Results

Spreadsheets with itemized production costs for each crop and rainfall zone are presented in the appendix. These spreadsheets are also available in an electronic format so that producers can adjust inputs and production levels, then determine break-even prices for their individual situations. The spreadsheets are available from http://www.farm-mgmt.wsu.edu/ (type canola in the search bar) or from http://cff.wsu.edu/Publications/ under Enterprise Budgets. You may also contact one of the authors for an electronic copy of the spreadsheets.

A budget for the driest region, with annual precipitation ranging from 12” to 15" is presented in Table A1. A brief description of field operations and inputs used is presented in Table A2. A budget for the 15” to 20” annual precipitation region can be found in Table B1, and the description of field operations and inputs used in Table B2. Table C1 presents the budget for the greater than 20” rainfall area and Table C2 describes field operations and inputs used. Tables D1 and D2 contain information about the machinery complement used in this study.

In the itemized budgets, costs of production are divided into variable and fixed costs. Variable costs vary directly with the crop grown and the number of acres produced. These costs include fuel, oil, repairs, fertilizer, chemicals, custom work, overhead, and interest on operating capital. Labor, including that provided by the owner-operator, is also included as a variable cost. Fixed costs occur whether or not a crop is grown, such as land and machinery taxes, machinery depreciation and interest, and land rent.

The itemized budgets can be tailored to individual producers' situations to some degree without changing the underlying cost assumptions. Increasing or decreasing input usage such as fertilizer levels and seed price or quantity will not change machinery usage costs or the fixed costs of production, such as machinery depreciation. Adjusting variable costs impacts the interest on operating costs and overhead costs, as these are calculated as a percentage of variable costs, but these adjustments are fairly minor.

Rotational Considerations

When looking at the economics of any one crop, it needs to be examined in the context of a cropping system or rotation. The inclusion of oilseeds in a rotation may have a positive, neutral, or negative effect on the production of other crops in the rotation. Positive effects include the potential to help with control of disease and grassy weeds. Large taproots and considerable plant residue can also be beneficial. However, oilseed crops are more difficult to establish and may require more moisture than most other rotational crops. Producers in the lower rainfall areas sometimes have difficulty establishing a stand due to drought and/or frost conditions in the area.

SUMMARY AND CONCLUSIONS

The objective of this project is to help growers evaluate the potential of growing canola as a rotational crop in the dryland eastern Washington grain region. The term "profit" as used in this publication is defined as making a return over all costs, including the opportunity cost of operator labor and capital invested. Assumptions made regarding the machinery complement determine the fixed costs of production. Each grower has a unique machinery complement, so these per-acre costs will vary. Land costs will also vary depending on whether land is owned or rented, and the type of crop-share or rental arrangement on leased land. Growers may find comparisons of variable costs and returns more useful than total production costs, given the nature of fixed costs.

In order for canola to be economically viable in the eastern Washington production area, prices received by producers will need to increase over current market levels. Since over half of all farmland is rented, landlords will also play an important role in the adoption of new rotational crops. Under the assumptions of this study, net rent is lower than for most other rotational crops in this region, so landlords may be unwilling to forego this reduction in rent. Policymakers may need to create positive incentives for widespread adoption of oilseed crops in the dryland region of eastern Washington.

FURTHER READING:

Effect of Varying Soil Residues of Pursuit® (Imazethapyr) Herbicide on the Performance of Clearwater Spring Canola and Gem Spring Rapeseed. 2005. Jack Brown and Jim B. Davis. University of Idaho. http://www.ag.uidaho.edu/brassica/.

EB1919 Grower Experiences with Mustard and Canola in Eastern Washington, 1997–2000. 2001. Norm Herdrich. Washington State University and Western Region SARE Program #USU 99-057. Available online at http://cru.cahe.wsu.edu/CEPublications/eb1919/eb1919.pdf

Effects of Swathing on Yield and Quality of Spring Canola in Northern Idaho. Jack Brown, Jim B. Davis, Donna Erickson, and Angela P. Brown. *Journal of Production Agriculture*, v.12, no. 1:33-37.

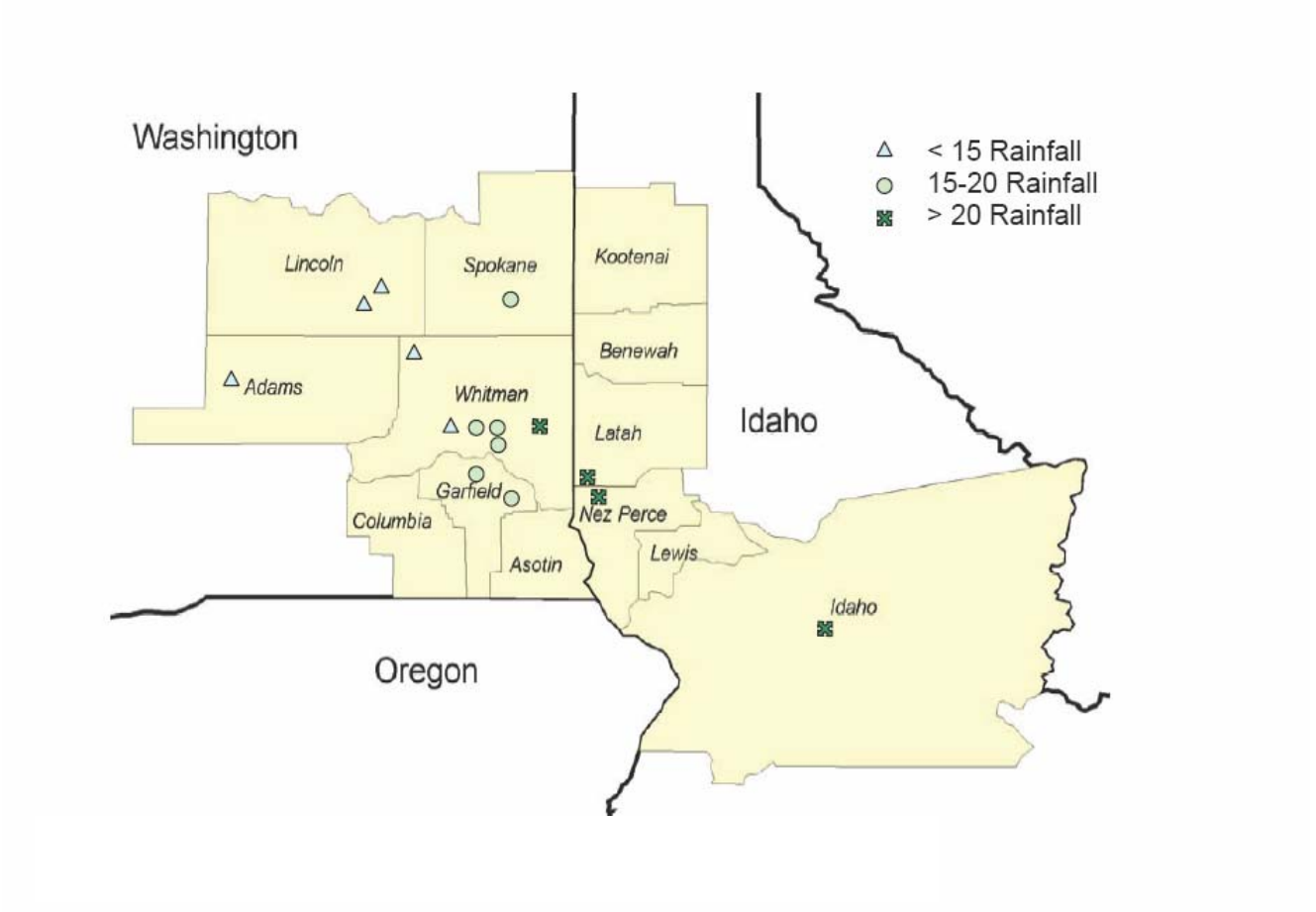
New Canola Growers Manual. This three-ring binder contains 14 chapters exploring the most effective soil preparation methods, how to test seed vigor, the best methods for ideal seed placement, what's important and new in soil fertility, how to better identify the various pests of canola, the latest techniques for swathing and combining, how to safely store canola, and the most recent recommendations on marketing the crop, $59.95. This publication and more are available from their website, http://www.canola-council.org.

APPENDIX:

ITEMIZED COSTS OF PRODUCTION FOR

CANOLA PRODUCTION

BY ANNUAL PRECIPITATION ZONE



NOTE: Symbols represent locations of the 15 canola growers who participated in the 2002 survey of oilseed growers. Information provided by these growers was critical to determining typical machinery complements and cultural practices. We would like to thank them once again for their cooperation. Original project sponsored by the Whitman Conservation District and funded by Whitman County and the Washington Oilseed Commission.

Trade Names: To simplify information, trade names have been used. No endorsement of named products is intended nor is criticism implied of similar products not mentioned.

Table A1. Itemized Cost per Acre for Canola Using Direct Seeding Practices in the Under 15" Rainfall Zone, Eastern Washington State (March 2006 prices).

		Yield:	1,000	lbs. per acre	
	Unit	Cost/Unit	Quantity	Total Cost	Your Farm
Variable Costs		$		$	
Glyphosate*	Qt.	4.50	0.50	2.25	_____
Ammonia Sulfate	Oz.	0.015	50.00	0.75	_____
M-90	Oz.	0.01	1.50	0.02	_____
Canola Seed	Lb.	4.00	6.00	24.00	_____
Liquid Nitrogen	Lb.	0.37	60.00	22.20	_____
Liquid Sulfur	Lb.	0.22	15.00	3.30	_____
Liquid Phosphorous	Lb.	0.34	-	-	_____
Assure II	Oz.	1.20	10.00	12.00	_____
Custom Aerial	Acre	6.00	1.00	6.00	_____
Capture	Acre	10.17	1.00	10.17	_____
Crop Insurance	Acre	2.50	1.00	2.50	_____
Hauling Cost	Cwt.	0.15	10.00	1.50	_____
Machinery Repairs	Acre	5.78	1.00	5.78	_____
Machinery Fuel	Gal.	2.23	1.54	3.43	_____
Machinery Lube	Acre	0.59	1.00	0.60	_____
Labor	Hour	14.00	0.87	12.22	_____
Interest on Op. Capital	Acre	4.78	1.00	4.78	_____
Overhead	Acre	5.58	1.00	5.58	_____

Total Variable Costs				117.08	_____
Fixed Costs					
Machine Depreciation	Acre	9.97	1.00	9.97	_____
Machine Interest	Acre	5.94	1.00	5.94	_____
Machine Insurance	Acre	0.47	1.00	0.47	_____
Machine Taxes	Acre	1.43	1.00	1.43	_____
Machine Housing	Acre	0.80	1.00	0.80	_____
Land Taxes	Acre	3.50	1.00	3.50	_____
Land Rent**	Acre	14.11	1.00	14.11	_____

				36.22	_____
Total Cost	Acre			153.30	_____

Average Yield	1,000.00		
Average Price/Lb.	0.100		
Average cost per pound	0.153	Profit/Lb.	(0.053)
		Profit/Cwt.	(5.33)

* Glyphosate comes in many formulations, from 3 lb to 5 lb acid equivalent (ae) per gallon. In this budget, a 3 lb ae/gal (4 lb ai/gal) product is assumed, such as Roundup Original, Glyphosate 4, or Glyphosate 41%.

** Land Rent = 1/3 (Yield x Price) - 1/3 Fertilizer Cost - 1/3 Chemical Cost - 1/3 Crop Insurance Cost - Land Taxes

Returns over Variable Production Costs ($ per acre)	(17.08)
Returns over Total Production Costs ($ per acre)	(53.30)

Table A2. Schedule of Operations for Canola Using Direct Seeding Practices in the Under 15" Rainfall Zone.

Month	Operation	Machinery Used
October	Fertilize/chisel [1]	250HP-WT with 30' chisel
October	Haul water	2-ton truck with slip tank
October	Spray weeds if needed [2]	250HP-WT with 80' sprayer
March	Haul water	2-ton truck with slip tank
April	Haul seed	3/4 Ton Pickup
April	Plant canola [3]	250HP-WT with 35' GP box drill
May	Spray insects if needed [4]	Custom aerial @ $6/ac
May	Haul water	2-ton truck with slip tank
May	Spray weeds if needed [5]	250HP-WT with 80' sprayer
August	Harvest	25' combine
August	Haul canola	Hauling cost calculated on a per cwt basis ($0.15/cwt)

[1] 60 lb N, 10 lb S (liquid fertilizer applied with chisel)

[2] 1 pt. Roundup (4 lb material), 50 oz ammonium sulfate, 1.5 oz M-90

NOTE: Weed spray may be needed in spring rather than fall.

[3] 6 lb treated canola seed @ $4 per lb

[4] Capture @ $10.17 per acre

[5] 10 oz Assure II @ $1.20 per oz

NOTE: For Roundup Ready canola seed, Roundup will replace Assure II.

Table B1. Itemized Cost Per Acre for Canola Using Direct Seeding Practices in the 15" to 20" Rainfall Zone Eastern Washington State. (March 2006 prices)

Yield: 1,300 lbs. per acre

	Unit	Cost/Unit	Quantity	Total Cost	Your Farm
Variable Costs		$		$	
Glyphosate*	Qt.	4.50	0.50	2.25	_____
Ammonia Sulfate	Oz.	0.015	50.00	0.75	_____
M-90	Oz.	0.01	1.50	0.02	_____
Canola Seed	Lb.	4.00	6.00	24.00	_____
Liquid Nitrogen	Lb.	0.37	90.00	33.30	_____
Liquid Sulfur	Lb.	0.22	20.00	4.40	_____
Liquid Phosphorous	Lb.	0.34	15.00	5.10	_____
Assure II	Oz.	1.20	10.00	12.00	_____
Custom Aerial	Acre	6.00	1.00	6.00	_____
Capture	Acre	10.17	1.00	10.17	_____
Crop Insurance	Acre	2.50	1.00	2.50	_____
Hauling Cost	Cwt.	0.15	13.00	1.95	_____
Machinery Repairs	Acre	5.73	1.00	5.73	_____
Machinery Fuel	Gal.	2.23	1.51	3.37	_____
Machinery Lube	Acre	0.59	1.00	0.59	_____
Labor	Hour	14.00	0.85	11.94	_____
Interest on Op. Capital	Acre	6.11	1.00	6.11	_____
Overhead	Acre	6.49	1.00	6.49	_____

Total Variable Costs				136.66	_____
Fixed Costs					
Machine Depreciation	Acre	9.89	1.00	9.89	_____
Machine Interest	Acre	5.89	1.00	5.89	_____
Machine Insurance	Acre	0.47	1.00	0.47	_____
Machine Taxes	Acre	1.41	1.00	1.41	_____
Machine Housing	Acre	0.79	1.00	0.79	_____
Land Taxes	Acre	4.50	1.00	4.50	_____
Land Rent**	Acre	19.34	1.00	19.34	_____

				42.29	_____
Total Cost	Acre			178.95	_____

Average Yield	1,300.00		
Average Price/Lb.	0.10		
Average cost per pound	0.138	Profit/Lb.	(0.038)
		Profit/Cwt.	(3.77)

* Glyphosate comes in many formulations, from 3 lb to 5 lb acid equivalent (ae) per gallon. In this budget, a 3 lb ae/gal (4 lb ai/gal) product is assumed, such as Roundup Original, Glyphosate 4, or Glyphosate 41%.

** Land Rent = 1/3 (Yield x Price) - 1/3 Fertilizer Cost - 1/3 Chemical Cost - 1/3 Crop Insurance Cost - Land Taxes

Returns over Variable Production Costs ($ per acre)	(6.66)
Returns over Total Production Costs ($ per acre)	(48.95)

Table B2. Schedule of Operations for Canola Using Direct Seeding Practices in the 15" to 20" Rainfall Zone.

Month	Operation	Machinery Used
October	Chisel/fertilize [1]	250HP-WT with 24' chisel
March	Haul water	2-ton truck with slip tank
March	Spray weeds if needed [2]	250HP-WT with 80' sprayer
April	Haul seed	3/4 ton pickup
April	Plant [3]	250HP-WT with 35' GP box drill
May	Haul water	2-ton truck with slip tank
May	Spray weeds [4]	250HP-WT with 80' sprayer
May	Spray insects if needed [5]	Custom aerial @ $6/ac
August	Harvest	25' combine
August	Haul canola	Hauling cost calculated on a per lb basis ($0.15/cwt)

[1] 90 lb N, 15 lb P, 20 lb S

[2] 1 pt. Roundup (4 lb material), 50 oz ammonium sulfate, 1.5 oz M-90

[3] 6 lb treated seed

[4] 10 oz Assure II @ $1.20 per oz

[5] Capture @ $10.27 per acre

NOTE: For Roundup Ready canola seed, Roundup will replace Assure II.

Table C1. Itemized Cost Per Acre for Canola Using Direct Seeding Practices in the Greater than 20" Rainfall Zone Eastern Washington State (March 2006 prices).

Yield: 1,600 lbs. per acre

	Unit	Cost/Unit	Quantity	Total Cost	Your Farm
Variable Costs		$		$	
Glyphosate*	Qt.	4.50	0.50	2.25	_____
Ammonia Sulfate	Oz.	0.015	50.00	0.75	_____
M-90	Oz.	0.01	1.50	0.02	_____
Canola Seed	Lb.	4.00	6.00	24.00	_____
Liquid Nitrogen	Lb.	0.37	100.00	37.00	_____
Liquid Sulfur	Lb.	0.22	15.00	3.30	_____
Liquid Phosphorous	Lb.	0.34	15.00	5.10	_____
Assure II	Oz.	1.20	10.00	12.00	_____
Custom Aerial	Acre	6.00	1.00	6.00	_____
Capture	Acre	10.17	1.00	10.17	_____
Crop Insurance	Acre	2.50	1.00	2.50	_____
Hauling Cost	Cwt.	0.15	16.00	2.40	_____
Machinery Repairs	Acre	5.73	1.00	5.73	_____
Machinery Fuel	Gal.	2.23	1.51	3.37	_____
Machinery Lube	Acre	0.59	1.00	0.59	_____
Labor	Hour	14.00	0.85	11.95	_____
Interest on Oper. Capital	Acre	4.39	1.00	4.39	_____
Overhead	Acre	6.59	1.00	6.59	_____

Total Variable Costs				138.10	_____
Fixed Costs					
Machine Depreciation	Acre	9.89	1.00	9.89	_____
Machine Interest	Acre	5.89	1.00	5.89	_____
Machine Insurance	Acre	0.47	1.00	0.47	_____
Machine Taxes	Acre	1.41	1.00	1.41	_____
Machine Housing	Acre	0.79	1.00	0.79	_____
Land Taxes	Acre	5.50	1.00	5.50	_____
Land Rent**	Acre	25.47	1.00	25.47	_____

				49.42	_____
Total Cost	Acre			187.52	_____

Average Yield	1,600.00		
Average Price/Lb.	0.100		
Average cost per pound	0.117	Profit/Lb.	(0.017)
		Profit/Cwt.	(1.72)

* Glyphosate comes in many formulations, from 3 lb to 5 lb acid equivalent (ae) per gallon. In this budget, a 3 lb ae/gal (4 lb ai/gal) product is assumed, such as Roundup Original, Glyphosate 4, or Glyphosate 41%.

** Land Rent = 1/3 (Yield x Price) - 1/3 Fertilizer Cost - 1/3 Chemical Cost - 1/3 Crop Insurance Cost - Land Taxes

Returns over Variable Production Costs ($ per acre)	21.90
Returns over Total Production Costs ($ per acre)	(27.52)

Table C2. Schedule of Operations for Canola Using Direct Seeding Practices in the over 20" Rainfall Zone

Month	Operation	Machinery Used
October	Harrow [1]	250HP-WT with 40' heavy harrow
October	Haul water	2-ton truck with slip tank
October	Spray weeds [2]	250HP-WT with 80' sprayer
April	Haul seed	3/4 ton pickup
April	Plant	250HP-WT with 35' GP box drill
May	Haul water	2-ton truck with slip tank
May	Spray weeds [4]	250HP-WT with 80' sprayer
May	Spray insects [5]	Custom aerial @ $6/ac
August	Harvest	25' combine
August	Haul canola	Hauling cost calculated on a per lb basis ($0.15/cwt)

[1] 50% of producers do not fall harrow. 25% of producers harrow in the spring.

[2] 1 pt. Roundup (4 lb material), 50 oz ammonium sulfate, 1.5 oz M-90

NOTE: Weed spray may be needed in the fall rather than the spring.

[3] 6 lb treated seed, 100 lb N, 15 lb P, 15 lb S

[4] 10 oz Assure II @ $1.20 per oz

NOTE: For Roundup Ready canola seed, Roundup will replace Assure II.

[5] Capture @ $10.17 per acre

Table D1. Machinery Compliment for Producing Spring Canola in Eastern Washington, 2006.

Type of Machine	Replacement Value $	Years of Life	Annual Hours of Use	Salvage Value $	Annual Repairs (Materials & Labor) $	Comments
300HP-WT	60,000	10	500	15,000	2,500	
50HP-WT w/Bucket	15,000	20	150	3,500	150	
35' GP Box Drill	65,000	12	250	15,000	1,000	
25' JD Combine	70,000	10	200	15,000	3,500	
24' Chisel	17,500	15	125	2,000	700	
40' Heavy Harrow	18,000	15	100	2,000	550	
Slip Tank (2000 gal)	1,500	15	50	0	25	
2-Ton Truck	20,000	15	200	3,000	1,000	
Tandem Axle Truck	35,000	15	200	4,500	2,000	
3/4 Ton Pickup	22,000	10	400	7,500	1,500	
4WD-ATV	5,000	10	150	1,500	75	
ATV Sprayer	500	10	50	0	50	

TABLE D2. HOURLY MACHINERY COSTS FOR CANOLA GROWN USING NO-TILL/DIRECT SEEDING IN EASTERN WASHINGTON.

MACHINERY	PURCHASE PRICE	YEARS TO TRADE	ANNUAL HOURS	DEPREC-IATION	INTER-EST	INSUR-ANCE	TAXES	HOUSING	TOTAL FIXED COST	REPAIR	FUEL AND LUBE	TOTAL VARIABLE COST	TOTAL COST
	$			COST PER HOUR									
300HP-WT	60,000.00	10	500	9.00	5.63	.45	1.35	.75	17.18	5.00	10.26	15.26	32.43
50HP-WT W/BUCKET	15,000.00	20	150	3.83	4.63	.37	1.11	.62	10.56	1.00	5.13	6.13	16.68
35' GP BOX DRILL	65,000.00	12	250	16.67	12.00	.96	2.88	1.60	34.11	4.00	.00	4.00	38.11
25'COMBINE	70,000.00	8	250	27.50	12.75	1.02	3.06	1.70	46.03	16.00	.00	16.00	62.03
24' CHISEL	17,500.00	15	125	8.27	5.85	.47	1.40	.78	16.77	5.60	.00	5.60	22.37
40' HEAVY HARROW	18,000.00	15	100	10.67	7.50	.60	1.80	1.00	21.57	5.50	.00	5.50	27.07
2000 GAL SLIP TK	1,500.00	15	50	2.00	1.13	.09	.27	.15	3.64	.50	.00	.50	4.14
80' SPRAYER	3,000.00	10	600	.50	.19	.02	.05	.03	.77	.83	.00	.83	1.61
2-TON TRUCK	20,000.00	15	200	5.67	4.31	.35	1.04	.58	11.93	5.00	6.41	11.41	23.35
TANDEM AXL TRUCK	35,000.00	15	200	10.17	7.41	.59	1.78	.99	20.93	10.00	6.41	16.41	37.34
3/4 PICKUP	22,000.00	10	400	3.62	2.77	.22	.66	.37	7.64	3.75	5.27	9.02	16.66
4WD-ATV	5,000.00	10	150	2.33	1.63	.13	.39	.22	4.70	.50	1.32	1.82	6.51
ATV SPRAYER	600.00	10	50	1.20	.45	.04	.11	.06	1.85	.40	.00	.40	2.25

We wish to thank Curtis Hennings for his careful review and valuable suggestions for canola production. However, the authors assume responsibility for any omissions or errors. We welcome your comments and suggestions.

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