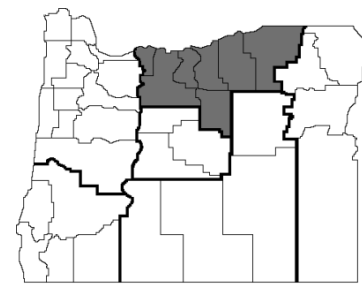


Enterprise Budget

Hemp, CBD Oil, Mechanical Harvest Lower Columbia Basin, North Central Region

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This enterprise budget estimates the typical economic costs and returns to produce hemp for CBD oil in the 2022 crop year. It should be used to calculate actual costs and returns and is not representative of any specific farm. The assumptions used in constructing this budget are discussed below. Assistance provided by area hemp producers and other agribusinesses is much appreciated.

This study's results are based on our current understanding of hemp production, market, and yields. As research advances, we expect these assumptions to change.

Cropping Pattern

This budget is based on a farm with 3,000 acres with 250 acres in hemp, 750 acres in field corn, 500 acres in winter wheat, 375 acres in potatoes, 375 acres in onions, and 750 acres in alfalfa hay. Most crops are grown under center pivot irrigation in 125-acre fields, except for the drip irrigation system used in hemp production. Typical hemp dry matter yield in this budget is 4,000 pounds per acre.

Labor

Tractor driver labor costs \$22 per hour, and all other labor costs are \$16 per hour; both rates include social security, workers' compensation, unemployment insurance, and other labor overhead expenses. For this study, owner labor is valued at the same rate as tractor driver rates, and all work is assumed to be a cash cost. Tractor labor hours are calculated based on machinery hours, plus ten percent.

Capital

Interest on operating capital for production inputs, machinery labor, repairs, and maintenance (six percent) is a cash expense borrowed for six months. An opportunity cost for machinery and land ownership is six and three percent, respectively. The market value for land is \$15,000 per acre.

Machinery and Equipment

The machinery and equipment used in this budget are sufficient for a 3,000-acre farm with the crops described above. The machinery and equipment hours reflect growing hemp, field corn, winter wheat, potatoes, onions, and alfalfa hay. A detailed breakdown of machinery values is shown in Table 2. Estimated labor, variable, and fixed costs for machinery are shown in Table 3, based on an hourly and per acre basis. The machinery costs are calculated based on the total farm use of the machinery. Off-road diesel is \$4.00 per gallon.

Operations

Table 1 shows the machine operations for hemp production. A 340-hp tractor is used to pull the v-ripper, offset disk, field cultivator, flail, and assist during planting. A 165-hp tractor pulls the transplanter, fertilizer spreader, and boom sprayer. A charge for miscellaneous and other expenses is five percent of production costs, including additional labor, repairs and maintenance, supplies and materials, tax preparation, memberships in professional organizations, and educational workshops not included in field operations.

Results

Hemp price has been based on a percentage point of CBD per pound of dry biomass in the past. However, based on current markets, a price of \$2.25 per pound of dry matter, assuming an 8% CBD content, is used. The total gross income in this budget is \$9,000 per acre. At harvest, hemp flowers are custom hauled to a processor for \$2 per mile, 25 miles round-trip, and six loads per year. Drying costs are \$0.50 per dry pound, although field drying is an option. Variable cash costs are \$9,349 per acre, giving a net return above variable costs of -\$349 per acre. Total costs are \$10,075 per acre when all costs are considered, resulting in a projected net return of -\$1,075. A break-even price of \$2.34 per pound is needed to pay all variable costs and \$2.52 for total expenses. Therefore, a break-even yield of 4,155 pounds of dry matter is required to pay variable costs and 4,478 pounds for total expenses.

Hemp production in Oregon is a relatively new crop, and prices paid to the grower and production levels are quite variable. Therefore, Tables 4 and 5 are sensitivity analyses of the returns per acre for variable cash and total costs at different yields and prices.

Note: Not included in this study are a return to management, family living withdrawals for unpaid labor, depreciation and opportunity costs for vehicles, buildings, and improvements, an accounting for all regulatory costs, and local, state, and federal income taxes paid by the owner.

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Table 1. Economic and Cash Costs and Returns of Producing Hemp for CBD Oil, \$/acre

Returns		Unit	\$/Unit	Quantity	Value		
Hemp for CBD Oil, dry matter		pound	\$2.25	4,000.00	<u>\$9,000.00</u>		
Total Returns					\$9,000.00		
Variable Cash Costs	Price	Quantity	Unit	Labor	Machinery	Materials	Total
Land Preparation and Maintenance							
V-Ripper		1.00	acre	\$8.07	\$23.88	\$0.00	\$31.94
Offset disk		1.00	acre	4.22	15.58	0.00	19.80
Field cultivator		1.00	acre	2.77	7.67	0.00	10.44
Crop Production							
Soil sampling	\$57.00	4.00	/acre	0.00	0.00	228.00	228.00
Drill		1.00	acre	4.84	23.77	25.00	53.61
- Seed Cost to Establish Cover Crop	\$25.00	1.00	acre				
Transplanter		1.00	acre	530.15	119.18	1,778.00	2,427.33
- Plugs	\$0.50	3,556.00	acre				
- Planting labor	\$16.00	32.00	hour	512.00	0.00	0.00	512.00
Rouging male pants	\$150.00	1.00	acre	0.00	0.00	150.00	150.00
Fertilizer spreader		1.00	acre	1.68	5.73	650.00	657.41
- NPK inputs	\$650.00	1.00	acre				
- Micronutrients	\$0.00	1.00	acre				
- Anhydrous Application	\$0.00	1.00	acre				
Boom sprayer		2.00	x/acre	1.42	4.30	275.00	280.72
- Pest & Disease Control	\$275.00	1.00	acre				
Hand weeding	\$700.00	1.00	acre	0.00	0.00	700.00	700.00
Row cultivator		4.00	x/acre	12.91	53.56	0.00	66.47
Irrigation				40.00	5.00	150.00	195.00
Drip - Irrigation Water Applied	\$150.00	1.00	ac ft				
Drip - Irrigation Labor	\$16.00	2.50	hour				
Drip - Repairs & Maint.	\$5.00	1.00	/acre/year				
Harvest							
Pre-harvest testing (THC)	\$50.00	1.00	acre	0.00	0.00	50.00	50.00
Harvest, Custom	\$60.00	1.00	acre	0.00	0.00	60.00	60.00
Trucking	\$2.00	150.00	unit	0.00	0.00	300.00	300.00
Drying	\$0.50	4,000.00	unit	0.00	0.00	2,000.00	2,000.00
Pulling & raking stumps	\$35.00	1.00	acre	0.00	0.00	35.00	35.00
Flail		1.00	acre	2.77	7.48	0.00	10.25
Pelletizing/sorting sticks & stems, storage	\$150.00	2.00	ton	0.00	0.00	300.00	300.00
Other Charges							
ODA Hemp Grower License	\$3.30	1.00	acre	0.00	0.00	3.30	3.30
Disposal of plastic mulch groundcover	\$104.00	1.00	acre	0.00	0.00	104.00	104.00
Disposal of dripline	\$65.00	1.00	acre	0.00	0.00	65.00	65.00
Labor to disposal of plastic cover and dripline	\$16.00	24.00	hour	384.00	0.00	0.00	384.00
Other Expenses		5.00%		0.00	0.00	432.21	432.21
Interest on Operating Capital		6.00%		<u>0.00</u>	<u>0.00</u>	<u>272.29</u>	<u>272.29</u>
Total Variable Cash Costs				\$1,504.81	\$266.15	\$7,577.81	\$9,348.76
Total Returns minus Total Variable Cash Costs							-\$348.76
Fixed Cash Costs				Unit	\$/Unit	Value	
Property Insurance				acre	\$5.00	\$5.00	
Property Taxes				acre	2.85	2.85	
Land Interest Charge or Cash Rent				acre	450.00	<u>450.00</u>	
Total Fixed Cash Costs						\$457.85	
Fixed Non-Cash Costs				Unit	\$/Unit	Value	
Power Units, Machinery & Equipment, depreciation & interest				acre	\$268.80	<u>\$268.80</u>	
Total Fixed Non-Cash Costs						\$268.80	
Total Annual Costs							\$10,075.41
Returns minus Total Annual Costs							-\$1,075.41
Break-even Price to Cover Variable Costs							\$2.34
Break-even Price to Cover Total Costs							\$2.52
Break-even Yield to Cover Variable Costs							4,155
Break-even Yield to Cover Total Costs							4,478

Table 2. Whole Farm Machinery Cost Assumptions

Machine	Width (feet)	Market Value	Hours of Annual Use	Expected Life (Years)
340 HP 4WD tractor	N/A	\$250,000	1,218	10
165 HP 2WD tractor	N/A	135,000	1,344	20
V-Ripper	12.0	22,000	115	10
Offset disk	18.0	37,000	300	15
Field cultivator	20.0	10,000	79	15
Drill	20.0	25,000	275	15
Fertilizer spreader	40.0	18,000	72	15
Boom sprayer	90.0	9,500	151	15
Swather	16.0	75,000	83	15
Baler	16.0	120,000	129	10
Bale wagon	16.0	120,000	129	15

Table 3. Machinery Cost Calculations, on a per hour and per acre basis.

Machine	-- Variable Costs --			Fixed Cost	Total Cost
	Fuel & Lube	Repairs & Maint.	Deprec. & Interest		
	----- Costs Per Hour -----				
340 HP 4WD tractor	\$36.80	\$9.13	\$26.04		\$71.98
165 HP 2WD tractor	23.00	25.40	12.16		60.56
V-Ripper	0.00	6.16	24.48		30.64
Offset disk	0.00	19.07	13.82		32.88
Field cultivator	0.00	18.94	86.24		105.18
Drill	0.00	38.02	10.61		48.64
Fertilizer spreader	0.00	11.59	28.58		40.16
Boom sprayer	0.00	4.98	7.15		12.13
Swather	18.40	5.57	100.71		124.68
Baler	0.00	63.22	119.01		182.23
Bale wagon	23.00	28.52	114.17		165.69
	----- Costs Per Acre -----				
Field Operation	Acres/ Hour	Operator Labor	Variable Costs	Fixed Costs	Total Costs
340 HP 4WD tractor & V-Ripper	2.18	\$8.07	\$23.88	\$23.16	\$55.10
340 HP 4WD tractor & Offset disk	4.17	4.22	15.58	9.55	29.35
340 HP 4WD tractor & Field cultivator	2.55	6.91	25.49	44.11	76.51
340 HP 4WD tractor & Flail	3.64	4.84	23.77	6.26	34.87
165 HP 2WD tractor & Fertilizer spreader	10.47	1.68	5.73	3.89	11.30
165 HP 2WD tractor & Boom sprayer	24.82	0.71	2.15	0.78	3.64
Swather	9.09	1.94	2.64	11.08	15.65
165 HP 2WD tractor & Baler	5.82	3.03	19.18	22.55	44.75
Bale wagon	5.82	3.03	8.85	19.62	31.50

Table 4. Estimated Per Acre Returns Over Variable Cash Costs at Varying Yields and Prices.

----- Pounds of Dry Matter per Acre -----							
\$/Pound	1,000	2,000	3,000	4,000	5,000	6,000	7,000
\$1.65	(\$7,699)	(\$6,049)	(\$4,399)	(\$2,749)	(\$1,099)	\$551	\$2,201
\$1.85	(\$7,499)	(\$5,649)	(\$3,799)	(\$1,949)	(\$99)	\$1,751	\$3,601
\$2.05	(\$7,299)	(\$5,249)	(\$3,199)	(\$1,149)	\$901	\$2,951	\$5,001
\$2.25	(\$7,099)	(\$4,849)	(\$2,599)	(\$349)	\$1,901	\$4,151	\$6,401
\$2.45	(\$6,899)	(\$4,449)	(\$1,999)	\$451	\$2,901	\$5,351	\$7,801
\$2.65	(\$6,699)	(\$4,049)	(\$1,399)	\$1,251	\$3,901	\$6,551	\$9,201
\$2.85	(\$6,499)	(\$3,649)	(\$799)	\$2,051	\$4,901	\$7,751	\$10,601

Table 5. Estimated Per Acre Returns Over Total Costs at Varying Yields and Prices.

----- Pounds of Dry Matter per Acre -----							
\$/Pound	1,000	2,000	3,000	4,000	5,000	6,000	7,000
\$1.65	(8,425)	(6,775)	(5,125)	(3,475)	(1,825)	(175)	1,475
\$1.85	(8,225)	(6,375)	(4,525)	(2,675)	(825)	1,025	2,875
\$2.05	(8,025)	(5,975)	(3,925)	(1,875)	175	2,225	4,275
\$2.25	(7,825)	(5,575)	(3,325)	(1,075)	1,175	3,425	5,675
\$2.45	(7,625)	(5,175)	(2,725)	(275)	2,175	4,625	7,075
\$2.65	(7,425)	(4,775)	(2,125)	525	3,175	5,825	8,475
\$2.85	(7,225)	(4,375)	(1,525)	1,325	4,175	7,025	9,875