



2011 Cost of Producing Peppermint under Rill and Center-Pivot Irrigation in Washington State

WASHINGTON STATE UNIVERSITY EXTENSION FACT SHEET • FS077E

Preface

The study results presented in this WSU publication serve as a general guide for the total costs of producing peppermint using rill and center-pivot irrigation in the state of Washington. Specific assumptions were adopted for this study, but these assumptions may not fit every situation since production costs and returns vary among farm operations, depending on the following factors:

- Farm size
- Crop Yields
- Input Prices
- Capital, labor, and natural resources
- Type and size of machinery available
- Cultural practices
- Commodity prices
- Management skills

Peppermint Production in Washington State

Washington State is the nation's second leading producer of peppermint oil. In 2009, 16,500 acres of peppermint were grown in central Washington, and this acreage yielded 1.931 million pounds of peppermint oil (USDA NASS 2011).

The following is a study of 2011 costs of establishing peppermint and producing peppermint oil using rill and center-pivot irrigation with the estimated prices required for an economically viable peppermint-growing enterprise.

Study Objectives

The primary objectives of this study are: (1) to provide estimates for the costs of equipment, materials, supplies, and labor required for establishing and producing peppermint oil under rill and center-pivot irrigation, and (2) to provide estimates for the prices and yields needed to establish and produce a profitable peppermint-growing venture.

Sources of Information

The data used in this study, including input prices, were obtained from a group of experienced peppermint growers in the state of Washington. Their production practices and input requirements for equipment, supplies, and labor form the basis for the assumptions used to develop this enterprise budget. These assumptions represent what this group of growers considers to be the latest developments in peppermint production methods. Furthermore, the values reported in this study represent what growers can anticipate as their average production costs, if no unforeseen production failures occur. However, crop loss should be anticipated periodically. Individual growers can use the Excel Workbook provided to estimate their own costs and returns.

Budget Assumptions

1. The sample budget is based on a farm of 1,000 acres with 400 acres in peppermint and 600 acres in other row crops.
2. The costs of establishment and production are calculated on a per-acre basis for 40-acre units (10 plots, 40 acres per plot) under rill irrigation and 100-acre units (4 plots, 100 acres per plot) under center-pivot irrigation.
3. The total value of bare agricultural land is \$4,500 per acre with property taxes of \$20 per acre. Rent is \$250 per acre for rill-irrigated land and \$400 per acre for center-pivot-irrigated land. Land rent is used as a proxy for the land ownership cost.
4. The initial costs for a rill irrigation system designed for 40 acres are:

120 tubes	\$ 700
10 dams	\$ 350
Total	\$1,050
5. The "years of life" for a rill irrigation system vary from 3 years for dams to 10–15 years for tubes.
5. The cost of center-pivot irrigation (designed for 125 acres) is included in the \$400 land rent.

6. The annual irrigation water charge is \$90 per acre. The electrical costs are \$20 per acre for rill irrigation and \$37.50 per acre for center-pivot irrigation.
7. Peppermint has a 4-year life span, which includes the establishment year.
8. The estimated oil production for rill-irrigated peppermint is 75 pounds of oil per acre during the establishment year. Annual oil production during each of the remaining 3 producing years is 115 pounds per acre. Estimated production for center-pivot-irrigated peppermint is 75 pounds of oil per acre during the establishment year and 130 pounds per acre during each of the remaining 3 producing years (80 pounds during July harvest and 50 pounds during September harvest).
9. The price received for peppermint oil is \$15 per pound.
10. The interest rate on operating loans is assumed to be 7%. Return on alternative investments is also assumed to be 7% and represents the opportunity cost of the investments in machinery, building, and irrigation system.

Summary of Study Results

A detailed budget is presented for the establishment and production costs of peppermint under rill irrigation (PR Tables) and under center-pivot irrigation (PC Tables).

Based on the assumptions used, the estimated full production cost for peppermint grown under rill irrigation is \$2,671 per acre (shown in Table 1PR) and \$2,828 per acre for peppermint grown under center-pivot irrigation (shown in Table 1PC). These estimates include variable costs that occur only if the crop is produced, such as fertilizer, chemicals, custom work, harvest, repairs, and overhead, as well as fixed costs, which are incurred whether or not peppermint is produced, such as depreciation on capital, interest, taxes, and management.

Annual yield and price received are two key factors affecting the net return to growers. To illustrate their effects on the profitability of producing peppermint, four break-even price levels have been estimated for different levels of cost recovery. Refer to Table 2PR and Table 2PC.

The first break-even price is the amount required to cover total variable costs. If the break-even price is greater than the actual price received, it will not be economical to produce peppermint, even in the short run. The second break-even price is the amount necessary to cover total cash costs, assuming no outstanding loans or land rent. This amount may be viewed as what is needed to remain financially viable in the short run. The third break-even price represents the amount required to cover total cash costs and machinery depreciation. This value must be realized to stay in business over the long run.

The fourth break-even price is the total cost break-even price. When this price is received, the grower will make

a profit, which is a dollar return over and above all costs associated with peppermint production, including the opportunity cost of investments on land, machinery, and management. Failure to reach this break-even price level means that the grower will not earn a return on capital and management contributions equal to what could be earned in an alternative investment. Realizing a profit means that in addition to covering all cash and opportunity costs, the grower will receive a return on the opportunity cost of management and on the financial risk assumed in producing peppermint.

Table 3PR and Table 3PC show the potential net returns for different scenarios with varying price and yield levels. Different combinations of price and yield levels suggest that when both levels are high, positive returns are likely.

Excel Workbook

Most budget values given in Table 1PR and Table 1PC are based on comprehensive underlying information included in an Excel® spreadsheet version of the peppermint budgets, which is also available at http://extecon.wsu.edu/pages/Enterprise_Budgets. In particular, supporting data for peppermint under rill irrigation can be found in the Excel workbook "Tables for Peppermint Under Rill.xls." This file includes details on the data that were used to create the budgets for establishment and full production of peppermint. It also includes machinery and building requirements and hourly machinery use and activity costs, including machinery depreciation; interest; housing, taxes, and insurance; labor; repairs; and fueling and lubrication. The primary reference for machinery use is Hinman (2001).

Similar data for growing peppermint using center-pivot irrigation can be found in "Tables for Peppermint Under Center-Pivot.xls." Growers can use the Excel workbook as a starting point for collecting and analyzing their own cost data, so they can make informed decisions about the cost structures involved in establishing and producing peppermint.

Concluding Remarks

This WSU publication includes a description of current industry practices and can be used as a general guide for identifying production inputs, costs, and yields, as well as for developing budgets for individual peppermint-growing enterprises. This study does not represent any particular operation or recommend any particular production practices. Therefore, it is important when using these enterprise budgets to understand the assumptions and procedures that were used and to interpret the results accordingly.

References

- Hinman, H. 2001. 2001 Cost of Producing Peppermint under Rill and Central Pivot Irrigation, Central Washington. *Washington State University Farm Business Management Report EB1921E*. http://extecon.wsu.edu/pages/Enterprise_Budgets.

U.S. Department of Agriculture National Agricultural Statistics Service, Washington Field Office. 2011. Specialty Commodities Historic Data, Peppermint 1929–2009. http://www.nass.usda.gov/Statistics_by_State/Washington/Historic_Data/specialty/peppermint.pdf.

Acknowledgments

The authors would like to acknowledge the assistance of the Far West Spearmint Oil Administrative Committee and the funding provided by the USDA's National Institute of Food and Agriculture – Specialty Crop Research Initiative Project, “Agronomic, Biochemical, Social, and Economic Impacts of Biotic and Abiotic Stress on Pacific Northwest Flavor Crops” (2009-51181-05790).

Table 1PR. Cost Per Acre of Establishing and Producing Peppermint Under Rill Irrigation

	Establishment Year	Full Production¹	Your Costs
Estimated Production (pounds of oil)	75.00	115.00	
Estimated Price (per pound)	\$15.00	\$15.00	
Total Returns	\$1,125.00	\$1,725.00	
Variable Costs			
<u>Establishment</u>			
Fumigation	\$226.00	\$0.00	
Planting (cost of plants and labor)	\$575.00	\$0.00	
<u>Field Activities (cost of chemicals and application)</u>			
Fertilizer Application	\$405.64	\$407.05	
Herbicide Application	\$131.26	\$63.73	
Insecticide Application	\$50.36	\$109.40	
Irrigation	\$185.00	\$185.00	
Weeding	\$50.00	\$0.00	
Field Border Spraying	\$10.00	\$10.00	
<u>Harvest</u>			
Custom Harvesting and Processing	\$450.00	\$690.00	
Market Assessment	\$3.75	\$5.75	
Residue Disposal	\$50.00	\$75.00	
<u>Maintenance and Repairs</u>			
Machinery Repair	\$31.14	\$8.65	
Machinery Fueling and Lubrication	\$82.72	\$36.13	
<u>Other Variable Costs</u>			
Crop Insurance	\$14.00	\$14.00	
Overhead (3% of variable costs)	\$67.95	\$48.14	
Total Variable Costs	\$2,332.82	\$1,652.85	
Fixed Costs			
Machine Depreciation	\$71.77	\$23.57	
Machine Interest	\$31.07	\$7.29	
Machine Housing, Insurance, and Taxes	\$7.53	\$1.35	
Land Rent	\$250.00	\$250.00	
Management Charge	\$100.00	\$100.00	
Amortized Establishment Cost ²	\$0.00	\$635.67	
Total Fixed Costs	\$460.37	\$1,017.88	
TOTAL COST	\$2,793.19	\$2,670.73	
ESTIMATED NET RETURNS	-\$1,668.19	-\$945.73	

¹The full production year is representative of all the remaining years that peppermint is in full production (Year 2 to Year 4).

²Represents the cost incurred during the establishment year, minus the revenue during that year. This cost must be recaptured during the full production years in order for an enterprise to be profitable.

Table 1PC. Cost Per Acre of Establishing and Producing Peppermint Under Center-Pivot Irrigation

	Establishment Year	Full Production¹	Your Costs
Estimated Production (pounds of oil)	75.00	130.00	
Estimated Price (per pound)	\$15.00	\$15.00	
Total Returns	\$1,125.00	\$1,950.00	
Variable Costs			
<u>Establishment</u>			
Planting (cost of plants and labor)	\$575.00	\$0.00	
<u>Field Activities (cost of chemicals and application)</u>			
Fertilizer Application	\$367.87	\$357.90	
Herbicide Application	\$56.58	\$119.67	
Insecticide Application	\$84.75	\$24.01	
Irrigation	\$187.50	\$187.50	
Weeding	\$50.00	\$0.00	
Field Border Spraying	\$10.00	\$10.00	
<u>Harvest</u>			
Custom Harvesting and Processing	\$450.00	\$780.00	
Market Assessment	\$3.75	\$6.50	
Residue Disposal	\$50.00	\$75.00	
<u>Maintenance and Repairs</u>			
Machinery Repair	\$13.26	\$4.90	
Machinery Fueling and Lubrication	\$52.58	\$33.65	
<u>Other Variable Costs</u>			
Root Borer Control	\$0.00	\$115.00	
Crop Insurance	\$14.00	\$14.00	
Overhead (3% of variable costs)	\$57.46	\$51.84	
Total Variable Costs	\$1,972.73	\$1,779.98	
Fixed Costs			
Machine Depreciation	\$30.49	\$12.01	
Machine Interest	\$12.58	\$3.55	
Machine Housing, Insurance, and Taxes	\$3.27	\$0.92	
Land Rent	\$400.00	\$400.00	
Management Charge	\$100.00	\$100.00	
Amortized Establishment Cost ²	\$0.00	\$531.22	
Total Fixed Costs	\$546.34	\$1,047.70	
TOTAL COST	\$2,519.08	\$2,827.67	
ESTIMATED NET RETURNS	-\$1,394.08	-\$877.67	

¹The full production year is representative of all the remaining years that peppermint is in full production (Year 2 to Year 4).

²Represents the cost incurred during the establishment year, minus the revenue during that year. This cost must be recaptured during the full production years in order for an enterprise to be profitable.

Table 2PR. Breakeven Selling Prices Per Pound of Peppermint Oil Produced Under Rill Irrigation¹

	Cost Per Acre	Your Cost	Break-even Price (per pound)	Your Break-even Price (per pound)
1. Total Variable Cost	\$1,652.85	_____	\$14.37 ²	_____
2. Total Cash Costs	\$1,904.20	_____	\$16.56 ³	_____
Total Variable Cost	\$1,652.85	_____		_____
Machinery Insurance and Taxes	\$1.35	_____		_____
Land Rent	\$250.00	_____		_____
3. Total Cash Cost and Depreciation	\$1,927.77	_____	\$16.76 ⁴	_____
Total Cash Costs	\$1,904.20	_____		_____
Machinery Depreciation	\$23.57	_____		_____
4. Total Cost	\$2,670.73	_____	\$23.22 ⁵	_____
Total Cash Cost and Depreciation	\$1,927.77	_____		_____
Machinery Interest	\$7.29	_____		_____
Management	\$100.00	_____		_____
Amortized Establishment Cost	\$635.67	_____		_____

¹Assumes a production of Peppermint oil (pounds/acre) = 115.

²If price is below this level, the crop is uneconomical to produce.

³Price allows producer to stay in business in the short run.

⁴Price allows producer to stay in business in the long run.

⁵Price covers all cash and opportunity costs.

Table 2PC. Breakeven Selling Prices Per Pound of Peppermint Oil Produced Under Center-Pivot Irrigation¹

	Cost Per Acre	Your Cost	Break-even Price (per pound)	Your Break-even Price (per pound)
1. Total Variable Cost	\$1,779.98	_____	\$13.69 ²	_____
2. Total Cash Costs	\$2,180.90	_____	\$16.78 ³	_____
Total Variable Cost	\$1,779.98	_____		_____
Machinery Insurance and Taxes	\$0.92	_____		_____
Land Rent	\$400.00	_____		_____
3. Total Cash Cost and Depreciation	\$2,192.91	_____	\$16.87 ⁴	_____
Total Cash Costs	\$2,180.90	_____		_____
Machinery Depreciation	\$12.01	_____		_____
4. Total Cost	\$2,827.67	_____	\$21.75 ⁵	_____
Total Cash Cost and Depreciation	\$2,192.91	_____		_____
Machinery Interest	\$3.55	_____		_____
Management	\$100.00	_____		_____
Amortized Establishment Cost	\$531.22	_____		_____

¹Assumes a production of Peppermint oil (pounds/acre) = 130.

²If price is below this level, the crop is uneconomical to produce.

³Price allows producer to stay in business in the short run.

⁴Price allows producer to stay in business in the long run.

⁵Price covers all cash and opportunity costs.

Table 3PR. Estimated Net Returns Per Acre at Various Price and Yield Levels Under Rill Irrigation in a Full Production Year

Yield (pounds per acre)	Price (per pound)					
	\$15.00	\$17.00	\$19.00	\$21.00	\$23.00	\$25.00
115	(\$945.73)	(\$715.73)	(\$485.73)	(\$255.73)	(\$25.73)	\$204.27
120	(\$901.89)	(\$661.89)	(\$421.89)	(\$181.89)	\$58.11	\$298.11
125	(\$858.04)	(\$608.04)	(\$358.04)	(\$108.04)	\$141.96	\$391.96
130	(\$814.20)	(\$554.20)	(\$294.20)	(\$34.20)	\$225.80	\$485.80
135	(\$770.36)	(\$500.36)	(\$230.36)	\$39.64	\$309.64	\$579.64
140	(\$726.52)	(\$446.52)	(\$166.52)	\$113.48	\$393.48	\$673.48
145	(\$682.67)	(\$392.67)	(\$102.67)	\$187.33	\$477.33	\$767.33
150	(\$638.83)	(\$338.83)	(\$38.83)	\$261.17	\$561.17	\$861.17
155	(\$594.99)	(\$284.99)	\$25.01	\$335.01	\$645.01	\$955.01

Table 3PC. Estimated Net Returns Per Acre at Various Price and Yield Levels Under Center-Pivot Irrigation in a Full Production Year

Yield (pounds per acre)	Price (per pound)					
	\$15.00	\$17.00	\$19.00	\$21.00	\$23.00	\$25.00
115	(\$1,009.20)	(\$779.20)	(\$549.20)	(\$319.20)	(\$89.20)	\$140.80
120	(\$965.36)	(\$725.36)	(\$485.36)	(\$245.36)	(\$5.36)	\$234.64
125	(\$921.52)	(\$671.52)	(\$421.52)	(\$171.52)	\$78.48	\$328.48
130	(\$877.67)	(\$617.67)	(\$357.67)	(\$97.67)	\$162.33	\$422.33
135	(\$833.83)	(\$563.83)	(\$293.83)	(\$23.83)	\$246.17	\$516.17
140	(\$789.99)	(\$509.99)	(\$229.99)	\$50.01	\$330.01	\$610.01
145	(\$746.15)	(\$456.15)	(\$166.15)	\$123.85	\$413.85	\$703.85
150	(\$702.30)	(\$402.30)	(\$102.30)	\$197.70	\$497.70	\$797.70



By **R. Karina Gallardo**, Assistant Professor and Extension Specialist, School of Economic Sciences, Tree Fruit Research and Extension Center, Washington State University, Wenatchee, WA and **Suzette P. Galinato**, Research Associate, IMPACT Center, School of Economic Sciences, Washington State University, Pullman, WA.

Copyright 2012 Washington State University

WSU Extension bulletins contain material written and produced for public distribution. Alternate formats of our educational materials are available upon request for persons with disabilities. Please contact Washington State University Extension for more information.

You may order copies of this and other publications from WSU Extension at 1-800-723-1763 or <http://pubs.wsu.edu>.

Issued by Washington State University Extension and the U.S. Department of Agriculture in furtherance of the Acts of May 8 and June 30, 1914. Extension programs and policies are consistent with federal and state laws and regulations on nondiscrimination regarding race, sex, religion, age, color, creed, and national or ethnic origin; physical, mental, or sensory disability; marital status or sexual orientation; and status as a Vietnam-era or disabled veteran. Evidence of noncompliance may be reported through your local WSU Extension office. Trade names have been used to simplify information; no endorsement is intended. Published August 2012.