



# 2013 Cost Estimation of Producing Seedless Watermelon in Eastern Washington

WASHINGTON STATE UNIVERSITY EXTENSION FACT SHEET • FS150E

## Preface

The results presented in this WSU publication serve as a general guide for evaluating the feasibility of producing seedless watermelon in eastern Washington as of 2013. This publication is not intended to be a definitive guide to production practices, but is helpful in estimating the physical and financial requirements of comparable plantings. Specific assumptions were adopted for this study, but these assumptions may not fit every situation since production costs and returns vary across farm operations, depending on the following factors:

- Capital, labor, and natural resources
- Crop yield
- Cultural practices
- Input prices
- Prices of watermelon
- Management skills
- Size of the operation
- Type and size of machinery and irrigation systems

Cost estimations in the enterprise budget also vary depending on the budget's intended use. To avoid unwarranted conclusions for any particular farm, readers must closely examine the assumptions made in this study, and then adjust the costs and/or returns as appropriate for their operation.

## Watermelon Production in Washington

According to the 2012 agricultural census, there are 38 farms growing watermelon in Washington—36 of the farms are located in eastern Washington—with a total of 488 acres in production. These numbers have declined relative to the 2007 census, where 53 farms grew 754 acres of watermelon (NASS 2012). Watermelons are typically produced on beds with plastic mulch (clear or black plastic) and drip irrigation (Figure 1). The majority of marketed fruit are picnic-type (15-18 lb per fruit) seedless cultivars (Figure 2). Seedless cultivars are planted on a 3 to 1 ratio with a pollinator (seeded) cultivar. Seeded fruit (from the pollinator cultivar) may be marketed at a lower return per

fruit, but is often discarded due to low market demand. There are many icebox (6-12 lb per fruit) and personal-sized (less than 6 lb per fruit) cultivars of watermelon well suited to production in Washington (Miles 2004); however, these are generally grown for niche markets.

## Study Objectives

This study provides information on (1) the costs of physical capital, materials, and labor required to produce seedless watermelon in eastern Washington, and (2) the ranges of price and yield levels at which seedless watermelon production would be a profitable enterprise. An Excel workbook is also developed, which allows the user to estimate production costs and examine the impact of different input assumptions, yields, and price scenarios.

## Sources of Information

The data used in this study were a composite of information gathered from a group of experienced watermelon growers in eastern Washington, and from similar cost studies on watermelon production in California, Florida, Ohio, Oklahoma, Oregon, Pennsylvania, and South Carolina (Meister 2004; University of Florida 2003; Ohio State



*Figure 1. Commercial seedless watermelon field in the Columbia Basin. Photo by Jesse Wimer.*

University 2000; Roberts et al. n.d.; Connor et al. 2002; Orzolek et al. 2010; Clemson University 2014). The production practices of participating growers form the baseline assumptions that were used to develop the enterprise budget. Due to the assumptions and sources of information used, the values reported in this study represent what growers can anticipate as their average cost of production if no unforeseen production failures occur. Given that many factors affect production costs and returns, individual growers can use the Excel Workbook provided to estimate their own costs and returns.

## Budget Assumptions

1. The enterprise budget is based on a total production area of 150 acres.
2. The growing season is from May 1 to the first week of September. The harvest season is from mid-July to the first week of September. Watermelon transplants are planted in late spring at a rate of 2,500 plants per acre, including seeded pollinator plants.
3. Pollinators (seeded cultivar) are planted in rows using a 3 to 1 ratio, with every fourth and outside row being the seeded cultivar. One hive of honeybees per acre is used to aid the pollination.
4. Yield is 25 tons of watermelon per acre. Return to the grower is \$360 per ton or \$0.18/lb.
5. The irrigation system is drip. Total cost of installation (including materials and labor) is \$80,000 for 150 acres. Water source is the public irrigation district.
6. Harvest and packaging are done by hand labor.
7. Land rent is valued at \$500 per acre.
8. Post-production costs such as hauling to a storage facility are not included in this study.
9. Management is valued at \$200 per acre.
10. Interest on investment is 5%.

## Summary of Results

Table 1 shows the estimated annual cost and returns for producing seedless watermelon in eastern Washington. Production costs are classified into variable costs and fixed costs. Variable costs comprise the costs of materials, supplies, labor, maintenance and repairs. Fixed costs are incurred whether or not watermelons are produced. The fixed costs include depreciation on capital, interest, taxes, insurance, and management. Management is treated as a fixed cost rather than a variable cost because, like land, management has been committed to the production cycle of the crop. Based on the above assumptions, the total production costs for seedless watermelons are estimated at \$7,534 per acre.

The fixed costs in Table 1 are based on underlying cost data shown in Tables 2 to 4. Table 2 presents the machinery, equipment, and building requirements. Interest costs and depreciation costs are listed in Tables 3 and 4, respectively. Interest costs represent required return on investments.

They can be actual interest payments on funds borrowed to finance farm operations and physical capital investments, or an opportunity cost (a return that would have been received if the investment had been in an alternative activity), or a combination of the two. All interest costs assume 5% interest rate. Depreciation costs are annual, non-cash expenses that are calculated over the asset's useful life. These expenses represent the loss in an asset's value due to use, age and obsolescence.

The estimated net returns in Table 1 represent what the grower may receive from investing in land and management after accounting for all costs, including labor the grower contributed to crop production. Note that crop yield and prices can vary from year to year. Therefore, to be of use to potential investors, the assumptions underlying the estimates in the enterprise budget should be carefully examined. To further help users evaluate production scenarios, Table 5 illustrates likely per-acre net returns given different levels of prices and yields. The level of crop yield primarily affects the labor costs associated with harvest and packaging. The calculations in Table 5 include an adjustment of 25% to the aforementioned labor costs for every 5-ton change in crop yield, relative to the baseline of 25 tons per acre, to account for the labor intensity of harvest and packaging activities.

It is important to note that WSU enterprise budgets are economic budgets (not financial or cash budgets), which mean that they take into account not only financial costs but also opportunity costs. Opportunity costs are defined as revenue foregone by not investing in the next best alternative carrying a similar financial risk; for example, investing money in the stock market, or paying off an outstanding loan. If growers do not include the opportunity costs they forego from their investments when calculating their total cost break-even return, they are overlooking the profitability of farming relative to alternative uses of their resources.

The key results of this enterprise budget are formed by production-related assumptions established for the study. Production costs and returns for individual growers may differ, thus the results cannot be generalized to represent



Figure 2. Seedless picnic watermelon. Photo by Carol Miles.

the population of farmers. An interactive Excel Workbook, described below, is provided to enable individual growers to estimate their returns based on the costs of their production.

## Excel Workbook

An Excel spreadsheet version of this enterprise budget (Table 1), as well as associated data underlying the per-acre cost calculations in Tables 2 through 5 (appendix table on salvage value and depreciation costs) are available at the WSU School of Economic Sciences Extension webpage for crop enterprise budgets: [http://extecon.wsu.edu/pages/Enterprise\\_Budgets](http://extecon.wsu.edu/pages/Enterprise_Budgets). Select “watermelon” in the “Commodity” drop-down menu at this website to access both the factsheet and the Excel Workbook files for watermelon. In the Excel workbook file, growers can modify select values, and thus evaluate their own production costs and returns.

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**Table 1. Estimated Cost and Returns of Producing Seedless Watermelon for a 150-Acre Farm (\$/acre)**

<b>Total Returns</b>	<b>Unit</b>	<b>Price/unit</b>	<b>Quantity</b>	<b>Total</b>	<b>Note</b>	<b>Your Return</b>
Watermelon	ton	\$360.00	25	\$9,000.00	Actual quantity of watermelons sold or marketable yield.	_____
<b>Variable Costs</b>						
	<b>Unit</b>	<b>Cost/unit</b>	<b>Quantity</b>	<b>Total</b>	<b>Note</b>	<b>Your Cost</b>
Fertilizer and lime	acre	\$300.00	1	\$300.00		_____
Watermelon transplants	transplants	\$0.28	3000	\$840.00	Plant density is 2,500 transplants per acre including pollinators. 500 extra transplants are purchased to account for transplant loss.	_____
Fumigation	acre	\$275.00	1	\$275.00	Including cost of labor and materials	_____
Disease control	acre	\$115.00	1	\$115.00	Including cost of labor and materials	_____
Insect control	acre	\$60.00	1	\$60.00	Including cost of labor and materials	_____
Plastic mulch	acre	\$200.00	1	\$200.00	Including plastic and drip tape	_____
Plastic installation	hour	\$12.00	8	\$96.00		_____
Irrigation equipment	acre	\$250.00	1	\$250.00	Drip tape and connectors that are replaced every year	_____
Beehive rental	hive	\$25.00	2	\$50.00		_____
Hired labor						_____
Machine operation	acre	\$200.00	1	\$200.00		_____
Weed control (hand labor)	acre	\$100.00	1	\$100.00		_____
Planting (hand labor)	acre	\$90.00	1	\$90.00		_____
Other labor	acre	\$75.00	1	\$75.00	General labor/unallocated labor costs	_____
Irrigation						_____
Water charge	acre	\$55.00	1	\$55.00		_____
Electric charge	acre	\$30.00	1	\$30.00		_____
Harvest	acre	\$600.00	1	\$600.00	Harvest by hand	_____
Packaging						_____
Packaging labor	acre	\$400.00	1	\$400.00	Packing by hand	_____
Packaging materials	acre	\$1,200.00	1	\$1,200.00	Boxes/bins, pallets, lids	_____
Maintenance and repairs						_____
Machinery repair	acre	\$100.00	1	\$100.00		_____
Fueling and lubrication	acre	\$50.00	1	\$50.00		_____
Irrigation system maintenance and repair	acre	\$100.00	1	\$100.00		_____
Year-end crop removal						_____
Plastic mulch removal	acre	\$85.00	1	\$85.00		_____
Mulch disposal	acre	\$7.50	1	\$7.50	Landfill disposal	_____
Clean-up (disking)	acre	\$25.00	1	\$25.00	Disk is used to cut the mulch; Mulch is pulled out by hand.	_____
Other variable costs						_____
Marketing and advertising*	acre	\$720.00	1	\$720.00	Broker fee: 8% of total returns	_____
Overhead (5% of variable costs)	acre			\$301.18	Covers office costs and other unallocated costs	_____
Interest on variable costs (5%)**	acre			\$131.76		_____
<b>Total Variable Costs</b>				<b>\$6,456.44</b>		_____
<b>Fixed Costs</b>						
Depreciation						_____
Irrigation system	acre			\$26.67		_____
Machinery, equipment and building	acre			\$212.86		_____
Interest						_____
Irrigation system	acre			\$13.33		_____
Machinery and equipment	acre			\$134.63		_____
Other fixed costs						_____
Land rent	acre			\$500.00		_____
Insurance cost (on entire farm)	acre			\$40.00		_____
Management cost	acre			\$150.00		_____
<b>Total Fixed Costs</b>				<b>\$1,077.49</b>		_____
<b>Total Cost</b>				<b>\$7,533.93</b>		_____
<b>Estimated Net Returns</b>				<b>\$1,466.07</b>		_____

Notes:  
 \*Marketing charges are assumed to be 8% of total returns. However, these costs can vary depending on the type of marketing involved. These costs include the labor, advertising, supplies, and facilities used in the marketing of watermelons.  
 \*\*Interest charges for 5 months.

**Table 2. Machinery, Equipment, and Building Requirements for a 150-Acre Watermelon Farm**

Physical Capital Requirements	Size or Description	Current Market Value		
		Number of Units <sup>1</sup>	Purchase Price (\$/Unit) <sup>1</sup>	Total Cost (\$)
Tractor (total)				444,000
65 hp		1	54,000	
85 hp		1	80,000	
150 hp		1	155,000	
200 hp		1	155,000	
Sprayer	Air blast sprayer, 100 gal	1	4,000	4,000
Weed sprayer boom & tank		1	4,000	4,000
Rotary mower		1	14,000	14,000
Fork lift	5000 lb, gas-powered	2	22,000	44,000
Pick-up truck		1	28,000	28,000
Melon transplanter		1	4,000	4,000
Bed shaper		1	3,000	3,000
Mulch layer		1	3,000	3,000
Melon shed		1	30,000	30,000
Packing shed		1	100,000	100,000
Machine shop/shed		1	44,000	44,000
Miscellaneous equipment <sup>2</sup>		1	18,000	18,000
Shop tools, used <sup>3</sup>		1	13,000	13,000
				<b>753,000</b>

Notes:

Purchase price corresponds to new machinery, equipment, or building.

The largest tractor is used for plowing, while the other tractors are used for disking and making raised beds.

Multiple tractors work together to speed up the work given the large production area.

<sup>1</sup>Includes rototiller, subsoiler, disk plow, etc.

<sup>2</sup>Includes miscellaneous tools for equipment maintenance, irrigation maintenance, etc.

<sup>3</sup>These values are estimates and must be changed to examine one's production setting.

**Table 3. Interest Costs for a 150-Acre Watermelon Farm**

	Total Purchase Price	Salvage Value	Number of Acres	Total Interest Cost	Interest Cost Per Acre
Irrigation System	\$80,000	\$0	150	\$2,000	\$13.33
Machinery, Equipment and Building*	\$753,000	\$54,800	150	\$20,195	\$134.63
<i>Interest Rate</i>	<i>5.0%</i>				

Notes:

Interest Cost is calculated as: (Total Purchase Price + Salvage Value)/2 x Interest Rate.

Salvage value refers to the estimated value of an asset at the end of its useful life. It is calculated as: Total Purchase Price of Machinery (tractor, sprayer, weed sprayer, mower, fork lift, pick-up truck, melon transplanter, bed shaper, and mulch layer) x 10%. In general, a salvage value will be a positive value. However, it may be zero if the asset will be used until it is completely worn out and will have no scrap value at the end of its useful life (for example, melon shed, packing shed, machine shop, miscellaneous equipment and shop tools).

\*See Appendix 1 in the Excel workbook for a detailed calculation of the salvage value.

**Table 4. Depreciation Costs for a 150-Acre Watermelon Farm**

	Total Purchase Price	Number of Acres	Total Value Per Acre	Years of Use	Depreciation Cost Per Acre
Irrigation System	\$80,000	150	\$533.33	20	\$26.67
Machinery, Equipment and Building*					\$212.86

Note: The depreciation cost is calculated as straight line depreciation: (Total Purchase Price – Salvage Value)/Years of Use.  
 \*See Appendix 1 in the Excel workbook for a detailed calculation of the depreciation cost.

**Table 5. Estimated Net Returns per Acre at Various Prices and Marketable Yields of Seedless Watermelon**

Marketable Yield (tons per acre)	Price (\$ per ton)					
	\$300	\$320	\$340	\$360	\$380	\$400
20	-\$1,009	-\$643	-\$277	\$88	\$454	\$820
25	\$95	\$552	\$1,009	\$1,466	\$1,923	\$2,380
30	\$1,198	\$1,747	\$2,295	\$2,844	\$3,392	\$3,941
35	\$2,302	\$2,941	\$3,581	\$4,221	\$4,861	\$5,501
40	\$3,405	\$4,136	\$4,868	\$5,599	\$6,331	\$7,062

Notes:  
 The baseline net return is \$1,466 per acre given a base yield of 25 tons/acre at \$360/ton.  
 Shaded area denotes a positive profit based on the combination of yield and price.

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