



# 2010 Cost Estimates of Establishing and Producing Organic Apples in Washington

WASHINGTON STATE UNIVERSITY EXTENSION FACT SHEET • FS041E

## Preface

Production costs and returns vary greatly for any particular orchard operation due to case-specific:

- Capital, labor, and natural resources
- Crop yields
- Type and size of machinery implements
- Input prices
- Cultural practices
- Commodity prices
- Operation size
- Management skills

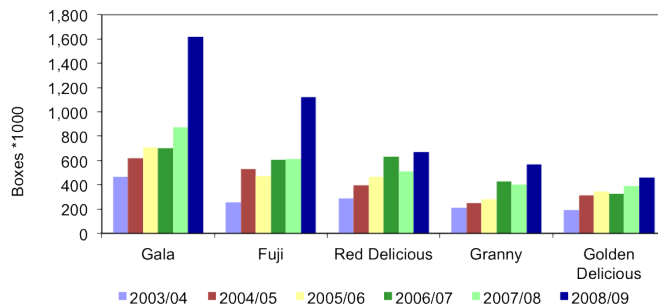
Cost estimation also varies with the intended use of the enterprise budget. The information in this publication serves as a general guide for projecting costs and returns of a certified organic apple enterprise in Washington State. To avoid drawing unwarranted conclusions about any particular orchard or group of orchards, the reader is asked to closely examine the assumptions made and adjust the costs and/or returns as appropriate for the situation.

## Organic Apple Production in Washington

Washington leads the nation in the production of certified organic apples, with 15,700 acres accounting for an estimated 74 percent of total U.S. organic apple acreage as of 2009 (Table 1). Between 2008 and 2009, certified apple acreage in the state grew by about 20 percent, compared to 60 percent growth in the previous year (Kirby and Granatstein 2010). Certified organic apples now account for 10 percent of all state apple acres, and support services (production inputs, consulting, marketing, and more) have expanded over the years to serve the organic fruit sector. Organic apple production is primarily based in central Washington east of the Cascade Mountains in the commercial tree fruit growing districts. In particular, nearly two-thirds of certified apple acres are located in Grant, Douglas, and Yakima counties.

Most major fruit companies now supply their customers with a range of both conventional and organic apple varieties, so they have expanded to include organic production and sales. More than 5.6 million boxes of organic apples were sold during the 2008-09 marketing

season. Gala has led organic apple varieties grown in Washington since 2003 (based on sales volume), followed by Red Delicious and Fuji (Figure 1).



**Figure 1. Organic Sales Volume by Variety and Marketing Season, Washington State, 2003–2009.** Source: Washington Growers Clearing House Association and Wenatchee Valley Traffic Association as cited in Kirby and Granatstein (2010).

Price premiums for organic apples have fluctuated over the past 10 years, reaching a high of \$8.93 per box<sup>1</sup> freight on board (FOB) in 2007 and a low of \$3.86 per box FOB in 2008 (Figure 2). The five-year average price premium (2005–2009) for all organic apples is \$6.47 per box FOB.<sup>2</sup>

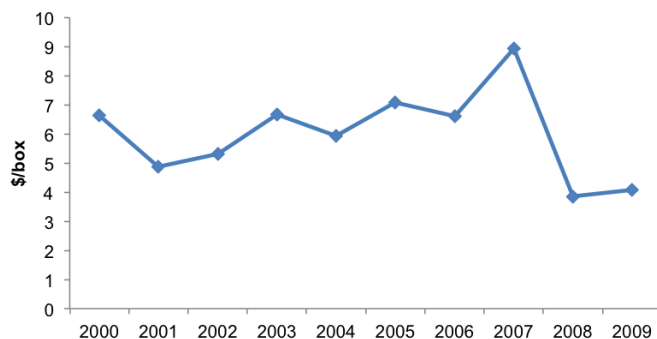
## Study Objectives

This publication enables organic apple growers to estimate: (1) the costs of equipment, materials, supplies, and labor required to establish and maintain a modern organic apple orchard; and (2) price and yield ranges at which certified organic apple production would be profitable.

To provide baseline information for the enterprise budget, we gathered data from a group of experienced organic apple growers in Washington who run modern, well-managed orchards. Their production practices, input

<sup>1</sup> A box of apples is 40 pounds, standard equivalent box (SEB).

<sup>2</sup> Market trends and analyses of organic tree fruit production, including organic apples, are discussed in more detail in Kirby and Granatstein (2009).



**Figure 2. Average Price Premium (per box) of All Organic Apples, Washington State, 2000–2009.** Source: Premium values were calculated by Kirby and Granatstein (2010) using data from the Washington Growers Clearing House Association Apple and Pear FOB Average Reports. Data are confidential, available only to members.

requirements, and views about the latest developments in production methods form the basis for the assumptions used to develop the budget estimates.

Of primary value to organic orchardists is the identification of the types of inputs, costs, and yields considered to be typical of well-managed organic apple orchards. This publication does not necessarily represent any individual grower and is not intended to be a guide to production practices. It does, however, indicate current industry trends and, as such, can be helpful in estimating the physical and financial requirements of comparable plantings.

## Budget Assumptions

Budget information provided in this publication represents what knowledgeable area growers anticipate over an orchard's life, not accounting for production risks. Growers may encounter challenges with weed control, pest control, and fertility management as they transition from conventional to organic apple production. Crop loss should be periodically anticipated. Also, many factors alter not only establishment and production costs, but also packout and returns. Organic apple price premiums also vary. We recommend that individual growers use the blanks provided on the budget's right-hand column (Table 3) and the Excel® spreadsheets mentioned below to calculate their own costs and returns.

1. The budget and production cost items in Tables 2–8 are based on a 45-acre organic apple block within a 160-acre orchard. About 12 percent of the total acreage is dedicated to roads, a pond, a loading area, and so on. Therefore, the total productive orchard area is 140 acres, and the total productive organic apple block is 40 acres. Block specifications are presented in Table 2.
2. The irrigation system consists of overhead cooling and under-tree drip sprinklers, with two separate main lines and a pump. Water is provided through a public irrigation district.

3. Labor is done by hand and ladder, without platforms.
4. Weed control costs in this budget are based on flaming and hand-weeding. An alternative weed control method is the use of fabric, which has 8–10 years of useful life and costs about \$1,200 per acre for material and installation and \$200 per acre for labor (to close and open fabric during the growing season). If this alternative is chosen, fabric will be installed during Year 3 of production.
5. Conventional apple production practices are used in the first two years. Organic production practices begin in August of the second year so that by the fifth year, harvested apples will be certified organic.
6. The organic certification process begins in Year 2 with the discontinuation of all prohibited materials<sup>3</sup> before harvest. The application for transition status is submitted in January of Year 3 along with the following fees: \$250 new application fee, \$200 annual fee, and \$20 site fee. The annual and site fees are renewed in Year 4. In Year 5, the renewal fee is based on a percentage of sales from the previous year and estimated at \$1,425 per year or approximately \$36 per acre for 40 acres of organic apples.<sup>4</sup>
7. Based on growers' input, the assumed organic apple price premium is \$50 per bin.

## Summary of Results

Table 3 shows the estimated annual cost and returns for a 40-acre block of organic apples in Washington. Production costs are classified into: (1) variable costs, which comprise orchard operations and harvest activities, materials, and machinery maintenance and repairs; and (2) fixed costs, incurred whether or not organic apples are grown, that include depreciation on capital, interest, taxes, insurance, management, and certification fee. Amortized establishment costs, also included in fixed costs, must be recovered during the certified production years for an enterprise to be profitable.

The per-acre cost of producing certified organic apples is estimated at \$11,407 in the scenario described for this budget, compared to \$10,757 for conventional Gala apples using a similar production scenario and 2009 input costs (Gallardo, Taylor, and Hinman 2009). Assuming a price received of \$250 per bin, the net revenue for conventional Gala apples would be \$1,743 per acre. The net revenue estimated for organic Gala production is much higher at \$3,593 per acre. While organic apple production costs are slightly higher, the price received boosts net returns to organic production over conventional production in this

<sup>3</sup> Materials to be used must comply with the National List of Allowed and Prohibited Substances, established under the Organic Foods Production Act of 1990 (U.S. Department of Agriculture Agricultural Marketing Service 2010). For example, most synthetic pesticides and fertilizers (e.g., azinphos-methyl, urea) are not allowed.

<sup>4</sup> The annual certification fee is based on a grower's sales of organic apples. It is 0.3% for the first \$750,000 in sales and 0.1% for all sales beyond that amount. For simplicity, the annual fee is assumed to be \$1,425, incurred during Year 5.

budget scenario. In addition to prices received, annual yield can also affect an orchard's net returns. Table 4 shows the sensitivity of net returns to different price and yield scenarios for a fully certified organic apple orchard.

Most of the budget values given in Table 3 are based on more comprehensive underlying cost data shown in Tables 5 to 8. Annual capital requirements for a 40-acre organic apple block are listed in Table 5. Table 6 provides detailed machinery and building requirements for the entire 140-acre producing orchard. Interest and depreciation costs are listed in Tables 7 and 8, respectively. All interest and amortization costs assume a 7 percent interest rate. Amortized establishment costs assume a total productive life of 15 years, including 4 years of establishment and 11 years of full, certified production.

Interest costs represent the opportunity cost or forgone earnings for investing money in the orchard, machinery, equipment, and buildings rather than in alternative activities. These costs also represent interest on funds borrowed to finance orchard operations and purchased physical capital. Depreciation costs include the annual replacement cost of machinery and buildings. Replacement prices may overstate costs growers experience, but they indicate the earnings needed to replace depreciable assets. Recent increases in prices paid for machinery and equipment mean that depreciation claimed on older purchases substantially understates the capital required to replace them. When looking at long-term enterprise viability, it is important to consider the ability to replace depreciable assets on a replacement cost basis.

An Excel spreadsheet version of this enterprise budget (Table 3) and associated data underlying the per-acre cost calculations (Tables 5–8 and two other tables with establishment and full/certified production costs) are available at the Washington State University School of Economic Sciences' Extension website: [http://extecon.wsu.edu/pages/Enterprise\\_Budgets](http://extecon.wsu.edu/pages/Enterprise_Budgets). Growers can modify select values and thus use the Excel workbook for collecting and

analyzing their own cost data related to establishing and producing certified organic apples.

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## Acknowledgements

The authors wish to thank the WSU IMPACT Center, the WSU Center for Sustaining Agriculture and Natural Resources, and the Washington Tree Fruit Research Commission for funding this study. Assistance provided by organic apple growers in developing the enterprise budget is also greatly appreciated.

**Table 1. Estimated U.S. Organic Apple Production (in acres)**

State	1997	2000	2001	2003	2005	2007	2009
Washington	1,707	4,321	6,540	8,246	6,721	8,018	15,735
California	1,883	4,423	4,853	4,045	3,402	3,900	3,450
Arizona	3,178	1,795	1,715	835	865	881	~816
Colorado	1,270	431	635	235	202	n.a.	~164
Oregon	9	350	350	265	123	106	~136
Other Western States	59	279	674	169	81	n.a.	~88
Midwest	522	420	563	652	712	n.a.	~655
New York and Northeast	201	83	52	5	389	n.a.	~189
South and Southeast	17	28	20	1	12	n.a.	~36
<b>U.S. Total</b>	<b>8,846</b>	<b>12,130</b>	<b>15,402</b>	<b>14,453</b>	<b>12,507</b>	<b>&gt;14,000</b>	<b>~21,269</b>

Source: Kirby and Granatstein (2009).

**Table 2. Organic Apple Block Specifications**

<b>Architecture</b>	Two-dimensional system (planar canopy), randomly trained with 18-inch radius from tree center
<b>In-Row Spacing</b>	4 feet
<b>Between-Row Spacing</b>	10 feet
<b>Variety, Root Stock</b>	Gala, M.9 series
<b>Block Size</b>	40 acres
<b>Life of Planting</b>	15 years
<b>Trellis System</b>	Five-wire vertical system. Trellis is 11 feet high, with a 12-foot tree. Bottom wire is 18 inches from ground with 24 inches between each wire.

**Table 3. Cost and Returns Per Acre of Establishing and Producing Organic Apples on a 40-Acre Orchard Block**

	Establishment Years <sup>[1]</sup>				Certified Organic	Your Costs
	Year 1	Year 2	Year 3	Year 4	Year 5	
Estimated Production (bins per acre)			12.00	35.00	50.00	
Estimated Price (per bin)			\$300.00	\$300.00	\$300.00	
<b>Total Returns</b>			\$3,600.00	\$10,500.00	\$15,000.00	
<b>Variable Costs (per acre):</b>						
<u>Establishment</u>						
Soil Preparation	\$912.00					
Trees (including labor and painting)	\$7,677.45					
<u>Orchard Activities</u>						
Pruning and Training	\$210.00	\$505.00	\$400.00	\$650.00	\$700.00	
Thinning <sup>[2]</sup>		\$200.00	\$150.00	\$420.00	\$630.00	
Chemical and Fertilizer Application <sup>[3]</sup>	\$748.00	\$548.00	\$1,518.00	\$1,518.00	\$1,518.00	
Beehives				\$45.00	\$90.00	
General Farm Labor	\$550.00	\$550.00	\$550.00	\$550.00	\$550.00	
Irrigation and Electricity Charge	\$100.00	\$100.00	\$100.00	\$100.00	\$100.00	
<u>Harvest Activities</u>						
Picking Labor			\$276.00	\$805.00	\$1,150.00	
Other Labor (checkers, tractor drivers)			\$60.00	\$175.00	\$250.00	
Hauling Apples			\$72.00	\$210.00	\$300.00	
<u>Maintenance and Repairs</u>						
Machinery Repair, Fueling, and Lubrication	\$400.00	\$400.00	\$400.00	\$400.00	\$400.00	
Irrigation and Pump Repair	\$70.00	\$70.00	\$70.00	\$70.00	\$70.00	
Wind Machine and Alarm System Repair				\$40.00	\$40.00	
Pond Maintenance				\$50.00	\$50.00	
<u>Other Variable Costs</u>						
Crop Insurance					\$86.52	
Overhead (5% of variable costs)	\$533.37	\$118.65	\$179.80	\$251.65	\$296.73	
Interest (7% of variable costs) <sup>[4]</sup>	\$784.06	\$174.42	\$264.31	\$369.93	\$327.14	
<b>Total Variable Costs</b>	<b>\$11,984.88</b>	<b>\$2,666.07</b>	<b>\$4,040.11</b>	<b>\$5,654.58</b>	<b>\$6,558.39</b>	
<b>Fixed Costs (per acre):</b>						
<u>Depreciation</u>						
Trellis	\$92.16	\$92.16	\$92.16	\$92.16	\$92.16	
Irrigation System	\$97.43	\$97.43	\$97.43	\$97.43	\$97.43	
Mainline and Pump	\$22.50	\$22.50	\$22.50	\$22.50	\$22.50	
Wind Machine and Alarm System				\$92.10	\$92.10	
Pond				\$59.29	\$59.29	
Machinery and Building Annual Replacement Cost	\$250.00	\$250.00	\$250.00	\$250.00	\$250.00	
<u>Interest</u>						
Land	\$525.00	\$525.00	\$525.00	\$525.00	\$525.00	
Machinery and Buildings	\$92.82	\$92.82	\$92.82	\$92.82	\$92.82	
Irrigation System	\$83.35	\$83.35	\$83.35	\$83.35	\$83.35	
Wind Machine and Alarm System				\$98.50	\$98.50	
Pond				\$50.72	\$50.72	
Establishment Costs (7%)		\$957.12	\$1,328.92	\$1,571.75		
<u>Other Fixed Costs</u>						
Land and Property Taxes	\$75.00	\$75.00	\$75.00	\$75.00	\$75.00	
Insurance Cost (on entire farm)	\$50.00	\$50.00	\$50.00	\$50.00	\$50.00	
Management Cost	\$400.00	\$400.00	\$400.00	\$400.00	\$400.00	
Annual Certification Fee			\$11.75	\$5.50	\$36.00	
Amortized Establishment Costs <sup>[5]</sup>					\$2,823.74	
<b>Total Fixed Costs</b>	<b>\$1,688.26</b>	<b>\$2,645.38</b>	<b>\$3,028.93</b>	<b>\$3,566.13</b>	<b>\$4,848.62</b>	
<b>TOTAL COSTS</b>	<b>\$13,673.14</b>	<b>\$5,311.45</b>	<b>\$7,069.04</b>	<b>\$9,220.70</b>	<b>\$11,407.00</b>	
<b>ESTIMATED NET RETURNS</b>	<b>-\$13,673.14</b>	<b>-\$5,311.45</b>	<b>-\$3,469.04</b>	<b>\$1,279.30</b>	<b>\$3,593.00</b>	
<b>Accumulated Establishment Costs</b>	<b>\$13,673.14</b>	<b>\$18,984.59</b>	<b>\$22,453.63</b>	<b>\$21,174.33</b>		

<sup>[1]</sup> Organic practices start during August of Year 2.

<sup>[2]</sup> Includes labor and chemicals.

<sup>[3]</sup> Includes labor.

<sup>[4]</sup> Interest expense on full year during establishment years and for three-quarters of a year during full production.

<sup>[5]</sup> Represents the costs incurred during the establishment years (minus revenues) that must be recovered during full production years.

**Table 4. Estimated Net Returns Per Acre at Various Prices and Yields of Certified Organic Apple Production<sup>[1]</sup>**

Yield (bins per acre) <sup>[3]</sup>	Price (per bin) <sup>[2]</sup>				
	\$300	\$350	\$400	\$450	\$500
30	-\$1,655.52	-\$155.52	\$1,344.48	\$2,844.48	\$4,344.48
35	-\$343.39	\$1,406.61	\$3,156.61	\$4,906.61	\$6,656.61
40	\$968.74	\$2,968.74	\$4,968.74	\$6,968.74	\$8,968.74
45	\$2,280.87	\$4,530.87	\$6,780.87	\$9,030.87	\$11,280.87
50	\$3,593.00	\$6,093.00	\$8,593.00	\$11,093.00	\$13,593.00
55	\$4,905.13	\$7,655.13	\$10,405.13	\$13,155.13	\$15,905.13

<sup>[1]</sup> Includes amortized establishment costs.

<sup>[2]</sup> Price at the door of the packing house, including transportation from orchard to packing house. Price is after packing, storage, and other charges have been taken out and includes an assumed price premium of \$50 per bin.

<sup>[3]</sup> Assumes a packout of 18 fresh packs per bin (all grades) and a bin size of 925 pounds.

**Table 5. Summary of Annual Capital Requirements for a 40-Acre Organic Apple Block**

	Establishment Years				Certified Organic
	Year 1	Year 2	Year 3	Year 4	Year 5
<b>Annual Requirements</b>					
Land (45 acres)	\$337,500.00				
Trellis System	\$81,920.00				
Irrigation System	\$86,600.00				
Main Line and Pump	\$20,000.00				
Pond				\$52,700.00	
Wind Machine and Alarm System				\$102,336.00	
Operating Expenses	\$500,395.20	\$127,642.62	\$182,604.24	\$247,183.02	\$284,775.46
<b>Total Requirements</b>	<b>\$1,026,415.20</b>	<b>\$127,642.62</b>	<b>\$182,604.24</b>	<b>\$402,219.02</b>	<b>\$284,775.46</b>
<b>Receipts</b>				\$420,000.00	\$600,000.00
<b>Net Requirements</b>	<b>\$1,026,415.20</b>	<b>\$127,642.62</b>	<b>\$182,604.24</b>	<b>-\$17,780.98</b>	<b>-\$315,224.54</b>

**Table 6. Machinery and Building Requirements for a 140-Acre Producing Orchard**

	Purchase Price	Number of Units	Total Cost
Mobile Home	\$80,000	1	\$80,000
Machine Shop	\$40,000	1	\$40,000
70-Horsepower Tractor	\$30,000	2	\$60,000
50-Horsepower Tractor	\$22,000	1	\$22,000
30-Horsepower Tractor	\$12,000	1	\$12,000
Loader	\$5,000	1	\$5,000
Four-Wheeler	\$5,000	2	\$10,000
Speed Sprayer	\$20,000	2	\$40,000
Wonder Weeder or Weed Badger	\$5,000	1	\$5,000
Compost Spreader	\$20,000	1	\$20,000
Flail Mower	\$6,000	1	\$6,000
Flamer	\$3,540	1	\$3,540
Rotary Mower	\$6,000	1	\$6,000
Forklift	\$20,000	1	\$20,000
Bin Trailer	\$4,000	2	\$8,000
<b>Total Cost</b>			<b>\$337,540</b>

**Table 7. Interest Costs Per Acre for a 40-Acre Organic Apple Block**

	Total Purchase Price	Salvage Value	Number of Acres	Total Interest Cost	Interest Cost Per Acre
Land	\$337,500	\$337,500	45	\$23,625.00	\$525.00
Machinery and Buildings	\$337,540	\$33,754	140	\$12,995.29	\$92.82
Irrigation System	\$86,600	\$8,660	40	\$3,334.10	\$83.35
Wind Machine and Alarm System	\$102,336	\$10,234	40	\$3,939.94	\$98.50
Pond	\$52,700	\$5,270	40	\$2,028.95	\$50.72

Note: Interest Rate = 7%; Salvage Value = 10%. Salvage value is not applied to land because land is not a depreciable asset.

**Table 8. Depreciation Costs Per Acre for a 40-Acre Organic Apple Block**

	Total Purchase Price	Number of Acres	Total Value Per Acre	Years of Use	Depreciation Cost Per Acre
Trellis	\$81,920	40	\$2,048.00	20	\$92.16
Irrigation System	\$86,600	40	\$2,165.00	20	\$97.43
Main Line and Pump	\$20,000	40	\$500.00	20	\$22.50
Wind Machine and Alarm System	\$102,336	40	\$2,558.40	25	\$92.10
Pond	\$52,700	40	\$1,317.50	20	\$59.29
Machinery and Building Annual Replacement Cost <sup>[1]</sup>	\$35,000	140	\$250.00		\$250.00

<sup>[1]</sup> An estimate of average annual replacement costs, rather than depreciation costs, is used for machinery and buildings. Replacement prices may overstate costs growers experience, but they indicate the earnings needed to replace depreciable assets. When looking at long-term enterprise viability, it is important to consider the ability to replace depreciable assets.



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