2022 COST ESTIMATES OF ESTABLISHING AND PRODUCING ORGANIC 'ELLIOTT' BLUEBERRIES IN EASTERN WASHINGTON

Preface

The results presented in this WSU publication serve as a general guide for evaluating the feasibility of producing organic 'Elliott' blueberries in eastern Washington in 2022. The primary use of this publication is in identifying inputs, costs, and yields considered typical of well-managed 'Elliott' blueberry fields. This publication is not intended to be a definitive guide to production practices, but it is intended to be helpful in estimating the physical and financial requirements of comparable plantings. Specific budget assumptions were adopted for this study, but these assumptions may not represent the conditions in all production and marketing situations since production costs and returns vary across farm operations, depending on the following factors:

- Capital, labor, and natural resources
- Crop yields
- Type and size of machinery and irrigation systems
- Input prices
- Cultural practices
- Extreme weather conditions
- Organic 'Elliott' blueberry prices (fresh and processing)
- Farm size
- Management skills

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

Organic 'Elliott' Blueberry Production in Eastern Washington

Washington represents 46% of the total organic blueberry production in the United States, with 35.4 million pounds produced in 2019. The value of Washington organic blueberry production was $74.3 million (USDA NASS 2020). Twenty-three percent of the total blueberry acreage in Washington is organic (Granatstein 2021).

Washington State has two major production regions divided by the Cascade Mountain Range—western and eastern. The harvest season is from June through August. The blueberries in the eastern region ripen early, while those in the western region ripen slightly later, depending on the season, cultivar, and management (Fresh Fruit Portal 2022). Organic blueberry production in the eastern region of the state is concentrated in Benton County, with production also in Walla Walla, Grant, and Franklin Counties (Brady et al. 2015; DeVetter et al. 2015).

Growing conditions for large plantings in eastern Washington have been shown to be ideal in terms of weather and low insect and disease pressure (Milkovich 2012). Eastern Washington has fewer disease and pest problems, likely due to its semi-arid climate, resulting in higher yields than western Washington.

'Elliott' blueberries are a late-season blueberry cultivar that can be used for the fresh market. The fruit ripens over a period of three to five weeks. The berries are medium-sized and exhibit a small, dry scar. 'Elliott' blueberry plants have moderate vigor and must be adequately pruned to retain bush growth and berry size (Fall Creek Nursery 2022).

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Study Objectives

This publication is designed to enable growers to estimate (1) the costs of equipment, materials, supplies, and labor required to produce organic 'Elliott' blueberries in eastern Washington, including packing costs, and (2) the ranges of price and yield at which 'Elliott' blueberry production would be a profitable enterprise.

Information Sources

The data used in this study were collected from information shared by a group of experienced 'Elliott' blueberry growers in eastern Washington. Their production practices and input requirements form the baseline assumptions that were used to develop the enterprise budget. Additionally, the data represent what these owner-operators anticipate would occur over a planting's life if no unforeseen failures occur. Calculations of chemical costs in the enterprise budget considered pesticide programs that are based on common industry practices and the most common pesticide products used within those programs.

Given that many factors affect production costs, pack-out, and returns, individual growers can use the Excel Workbook (available at the WSU School of Economic Sciences' Crop Enterprise Budgets website) to make necessary modifications and estimate their own costs and returns.

Budget Assumptions

1. The area of the total farm operation is 300 acres of diverse crops (i.e., blueberries, apples, sweet cherries, and pears), of which 100 acres are planted with blueberries.
2. This budget is based on a 50-acre field of organic 'Elliott' blueberries within a 300-acre farm. It is assumed that 1 acre of this block is dedicated to roads, pond, loading area, buildings, etc., rather than to fruit production. Therefore, the total productive area for this block is 49 acres. Table 1 shows the assumed production specifications, which are generally accepted across all growers interviewed.
3. The total value of bare agricultural land (including water rights) is $18,000 per acre with annual property taxes of $110 per acre.
4. The irrigation infrastructure is a dual irrigation system of drip and overhead sprinklers. Water is provided through a public irrigation district.
5. The pond, mainline, and pump already exist.
6. Cultural practices are completed without mechanical aid. The hourly manual labor rate is calculated using the Washington adverse wage rate for 2022 at $17.41/hour. In this analysis, we add 25% to reflect medical leave and all administrative costs for H2A employees, including housing, amounting to $21.76/hour. Activities such as chemical application and irrigation are assumed to cost $23.01/hour (i.e., base of $18.41/hour plus 25%).
7. Harvest is usually done by hand for the fresh market, with some machine harvesting near the end of a harvest season. Harvest labor rates follow the Department of Labor rates, plus 4% to account for mandated paid rest breaks. These labor rates are assumed the same for all years of production.
8. The free on board (FOB) price or gross return (i.e., the return before all expenses, including packing charges, are subtracted) is $3.05/lb for fresh-market blueberries and $1.25/lb for processing blueberries.
9. In Year 3, all yield goes to fresh market. Starting Year 4, 85% of the total yield goes to the fresh market. The remainder goes to processing, out of which 15% is mechanical harvester-induced loss.
10. Management is valued at $450 per acre. This value is representative of what the producer group felt was a fair return for an operator's management skills.
11. Interest in investment represents a 5% opportunity cost to the enterprise. These are forgone earnings for investing money in the blueberry field, equipment, and buildings rather than in an alternative activity. This also represents interest in funds borrowed to finance the field, equipment, and building purchases.

Table 1. Organic 'Elliott' blueberry production specifications in eastern Washington.

In-row Spacing	3 feet
Between-row Spacing	10 feet
Cultivar	'Elliott'
Block Size	49 acres
Life of Planting	25 years (5 years of establishment, 20 years of full production)
Plant Density	1,452 plants per acre
Trellis System	Basic tree post trellis system

Summary of Study Results

The estimated annual cost and returns for a 49-acre organic 'Elliott' blueberry enterprise in Washington are shown in Table 2. Production costs are classified into variable costs and fixed costs. Variable costs comprise farm operations, harvest activities, materials, maintenance and repairs, and packing costs. Fixed costs are incurred whether or not organic 'Elliott' blueberries are produced. These costs will generally be calculated for the whole farm enterprise and allocated across each unit of production. The fixed costs include depreciation on capital, interest, taxes, insurance, management, and amortized establishment costs. 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.

Table 2. Cost and returns ($) per acre of producing organic 'Elliott' blueberries on a 49-acre field in eastern Washington.

	Establishment Years						
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Full Production[a]
Estimated Gross Production, Fresh (lb/acre)[b]				6,000	8,925	14,280	17,850
Estimated FOB Price, Fresh ($/lb)[c]				3.05	3.05	3.05	3.05
Estimated Gross Production, Processing (lb/acre)[b]					1,339	2,142	2,678
Estimated FOB Price, Processing ($/lb)[c]					1.25	1.25	1.25
Total Returns				**18,300**	**28,895**	**46,232**	**57,789**
Variable Costs (VC):							
Establishment							
Soil Preparation[d]	9,746	1,065	25	25	1,065	25	402
Plants (including labor)		8,347					
Cover Crop (including labor)		48					
Field Activities							
Pruning			102	205	342	478	581
Flower Removal			102				
Weed Mat		1,258					
Pest Control[e]			0	104	1,178	1,178	1,178
Fertilizer[f]		222	437	471	510	553	600
Beehives				150	150	150	150
Bird Control				1,657	1,657	1,657	1,657
Frost Protection (labor)				9	9	9	9
Hand Weeding (labor)	435	653	870	870	870	870	870
Mowing	131	131	131	131	131	131	131
Irrigation Labor		414	414	414	414	414	414
General Farm Labor[g]	225	225	225	225	225	225	225
IPM Scouting				115	115	115	115
Irrigation Water & Electric Charge		275	275	275	275	275	275
Harvest Activities[h]							
Hand Harvest				6,000	8,925	14,280	17,850
Mechanical Harvest Labor				0	13	21	26
Loading and Hauling				180	308	493	616
Packing and Handling Charges[i]				3,000	5,065	8,104	10,130
Maintenance and Repairs							
Maintenance & Repair		284	284	694	729	729	729
Fuel & Lube	0	290	320	330	370	410	410
Other Variable Costs							
Commission Fees[j]				78	133	213	267
Organic Certification Fee			8	24	28	41	41
Overhead (7% of VC)[k]	738	925	224	1,047	1,576	2,126	2,567
Interest (5% of VC)	564	707	171	800	1,204	1,625	981
Total Variable Costs	**11,839**	**14,843**	**3,588**	**16,805**	**25,292**	**34,122**	**40,224**
Fixed Costs:							
Depreciation							
Irrigation System		284	284	284	284	284	284

	Establishment Years						
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Full Production[a]
Machinery, Equipment & Building	212	212	212	212	212	212	212
Mechanical Harvester				102	102	102	102
Mainline/Well & Pump		36	36	36	36	36	36
Pond		0	0	0	0	0	0
Trellis			112	112	112	112	112
Wind Machine				198	198	198	198
Interest							
Irrigation System		178	178	178	178	178	178
Land[l]	900	900	900	900	900	900	900
Machinery, Equipment & Building	80	80	80	80	80	80	80
Mechanical Harvester				140	140	140	140
Mainline/Well & Pump		23	23	23	23	23	23
Pond		0	0	0	0	0	0
Trellis			70	70	70	70	70
Wind Machine				74	74	74	74
Establishment Costs (5%)		693	1,597	1,992	2,179	2,270	
Other Fixed Costs							
Miscellaneous Supplies	190	190	190	190	190	190	190
Land & Property Taxes	110	110	110	110	110	110	110
Insurance Cost (all farm)	80	80	80	80	80	80	80
Management Cost	450	450	450	450	450	450	450
Amortized Establishment Costs[m]							3,114
Total Fixed Costs	**2,022**	**3,236**	**4,322**	**5,232**	**5,419**	**5,510**	**6,353**
TOTAL COSTS	**13,861**	**18,079**	**7,910**	**22,037**	**30,711**	**39,632**	**46,578**
ESTIMATED NET RETURNS	**-13,861**	**-18,079**	**-7,910**	**-3,737**	**-1,816**	**6,599**	**11,212**
Accumulated Establishment Costs	13,861	31,940	39,849	43,586	45,402	38,803	

[a] The full production year is representative of all the remaining years the blueberries are in full production (Year 6 to Year 25).
[b] In Year 3, all yield goes to fresh market. Starting Year 4, 85% of the total yield goes to the fresh market and 15% goes to processing.
[c] These prices reflect the return before any expenses (including packing charges for fresh-market blueberries and handling charges for processing) are subtracted.
[d] Soil preparation in Year 0 only includes soil analysis; rip, plow, drag and roll; sawdust application; bed shaping; and application of sulfur and compost. Soil analysis is done every year for $100/acre in Year 0 and $25/acre in succeeding years. After Year 0, sawdust application is done in Year 1, Year 4, and during full production as part of soil maintenance.
[e] Includes insecticides, bacteriacides, pheromones, and biological control costs (material and application).
[f] Includes dry and liquid fertilizer costs (material and application) and tissue analysis for fertilizer management program.
[g] General farm labor rate is a lump sum per acre and is applied to miscellaneous/all other labor. The rate includes applicable taxes and benefits.
[h] Hand harvest labor rate is $1/lb. Mechanical harvest crew includes one driver and three workers with rates of $21.76/hour and $23.01/hour, respectively. The loading and hauling rate to packinghouse is $0.03/lb.
[i] Packing charge for fresh blueberries is $0.50/lb; Handling charge for processing blueberries is $0.45/lb.
[j] Commission fees include the Washington Blueberry Commission fee at $0.004/lb of total yield and the US Highbush Blueberry Council fee at $0.009/lb of total yield.
[k] Captures indirect costs of operations that fluctuate with the level of organic blueberry production but are not accounted for by the variable costs already identified. Also captures unforeseeable expenses.
[l] Land cost is approximated by using the 5% interest rate multiplied by the land value of $18,000 per acre.
[m] Represents the costs incurred during the establishment years (minus revenues during those years) that must be recaptured during the full production years. It is calculated as: accumulated establishment costs in Year 5 amortized at 5% for 20 years.

This study assumed that an organic 'Elliott' blueberry field could achieve full production in the sixth year. Based on the above assumptions, the total production costs are estimated at $46,578 per acre. The net returns during full production are about $11,212 per acre. Table 3 shows the sensitivity of net returns to different combinations of processing prices and yields. For this analysis, the FOB prices considered are $3.05–$3.45 per pound, and the gross yields are 15,000 to 27,000 pounds per acre. All gross yield-price combinations result in positive net returns for the owner-operator, based on the study's production and cost assumptions.

Table 4 shows the break-even return given different levels of enterprise costs during full production. As of 2022, the first break-even, fresh-market return of organic 'Elliott' blueberries was about $2.07 per pound. This is the minimum return needed for the owner-operator to cover the operation's variable costs. Returns lower than this figure suggest that it is more profitable not to operate (shutdown price) to produce 'Elliott' blueberries. The second break-even return is about $2.09 per pound, which is needed to cover the total cash costs and to be economically viable in the short run. The third break-even return is $2.14 per pound, which is needed to cover the cash costs plus depreciation of machinery and buildings. This return must be realized for the operation to be financially viable in the long run. The fourth break-even return is about $2.42 per pound. When this return is received, the owner-operator would recover all out-of-pocket expenses plus realize a competitive return on equity capital invested in land, the 'Elliott' blueberry field, machinery, equipment, and buildings. Failure to obtain this break-even return level means that the owner-operator will not receive a return on capital contributions equal to what could be earned in alternative uses.

Most of the budget values given in Table 2 are based on more comprehensive underlying cost data, which are shown in Tables 5 through 8. Table 5 presents the annual capital requirements for a 49-acre organic 'Elliott' blueberry field. Table 6 specifies the machinery and building requirements for the 300-acre multicrop farm. Interest costs and depreciation are listed in Tables 7 and 8, respectively. Interest costs represent the required return on investments. They can be actual interest payments on funds borrowed to finance farm operations and physical capital investments, 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. Depreciation costs are annual, noncash 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 key results of this enterprise budget are formed by production-related assumptions established for the study. It is important to note that this publication should be used primarily as a guide in determining costs for the establishment and maintenance of mature blueberry plants. Production costs and returns for individual owner-operators may differ; thus, the results cannot be generalized to represent all organic 'Elliott' blueberry operations in eastern Washington. An interactive Excel Workbook, described below, is provided to enable individual owner-operators to estimate their returns based on the costs of their production.

Excel Workbook

The enterprise budget (Table 2) as well as associated data underlying the per-acre cost calculations (Tables 5 through 8 and Appendices 1 through 5 for establishment costs, full production costs, calculation of salvage value and depreciation costs, amortization calculator, and all production-related data) are available at the WSU School of Economic Sciences Extension website. Owner-operators can modify select values and thus use the Excel Workbook to evaluate their own production costs and returns.

Table 3. Estimated net returns[a] per acre at various prices and yields of organic 'Elliott' blueberries during full production in eastern Washington.

Gross Yield (lb/acre)	Net Yield—Fresh (lb/acre)[a]	Net Yield—Processing (lb/acre)[a]	FOB Price, Fresh ($/lb)[b]				
			$3.05	$3.15	$3.25	$3.35	$3.45
			Estimated Net Returns ($/lb)				
15,000	12,750	1,913	3,753	5,028	6,303	7,578	8,853
18,000	15,300	2,295	7,482	9,012	10,542	12,072	13,602
21,000	17,850	2,678	11,212	12,997	14,782	16,567	18,352
24,000	20,400	3,060	14,941	16,981	19,021	21,061	23,101
27,000	22,950	3,443	18,670	20,965	23,260	25,555	27,850

Notes: Shaded area denotes positive net returns based on the combination of net yield and price. Mechanical harvester induced loss (% of gross yield) is 15%.

[a] The portion going to the fresh market is 85% of gross yield. "Net yield-processing" refers to yield of processing blueberries after accounting for mechanical harvester induced loss.

[b] FOB price represents gross return (the return before total production costs, including packing charges, are subtracted).

Table 4. Break-even return of organic 'Elliott' blueberries for processing given different levels of enterprise costs during full production in eastern Washington.

		Cost ($/acre)	Break-even Return ($/bin)[a]
1.	Total Variable Costs	40,224	2.07[b]
2.	Total Cash Costs[c]	40,604	2.09[d]
	= Total Variable Costs + Land & Property Taxes + Insurance Cost + Miscellaneous Supplies		
3.	Total Cash Costs + Depreciation Costs	41,549	2.14[e]
4.	Total Costs		
	= Total Cash Costs + Depreciation Costs + Interest Costs[f] + Management Cost	46,578	2.42[g]

[a] Break-even (BE) return of organic 'Elliott' blueberries for the fresh market is calculated as **BE Return = [Cost – (Price of processing 'Elliott' × Net yield of processing 'Elliott')] ÷ Net yield of fresh-market 'Elliott'**. All variables in this equation are held constant, except for the "Cost," which takes the Total Variable Costs, Total Cash Costs, Total Cash Costs + Depreciation Costs, or Total Costs, depending on the level of enterprise cost that the break-even return is being calculated at.

[b] If the return is below this level, organic 'Elliott' blueberries are uneconomical to produce.

[c] If there are other cash costs on an individual's enterprise, these costs must be identified and included in the cash cost break-even return calculation.

[d] The second break-even return allows the producer to stay in business in the short run.

[e] The third break-even return allows the producer to stay in business in the long run.

[f] Interest costs include some actual cash interest payments.

[g] The fourth break-even return is the *total cost break-even return*. Only when this break-even return is received can the grower recover all out-of-pocket expenses plus opportunity costs.

Table 5. Summary of annual capital requirements ($) for a 49-acre organic 'Elliott' blueberry field in eastern Washington.

	Establishment Years						Full Production[a]
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	
Land (50 acres)	900,000						
Trellis System			137,420				
Irrigation System		348,120					
Mainline & Pump		44,100					
Pond		0					
Wind Machine				145,517			
Mechanical Harvester					250,000		
Operating Expenses[b]	620,759	767,992	216,467	864,092	1,279,979	1,712,670	2,011,666
Total Requirements ($)	1,520,759	1,160,212	353,887	1,009,609	1,529,979	1,712,670	2,011,666
Receipts ($)	0	0	0	896,700	1,415,840	2,265,344	2,831,679
Net Requirements ($)	1,520,759	1,160,212	353,887	112,909	114,139	(552,673)	(820,014)

[a] The full production year is representative of all the remaining years the planting is in full production (Year 6 to Year 25).

[b] Operating expenses are the sum of the total variable costs, miscellaneous supplies, land and property taxes, insurance cost, and management cost.

Table 6. Machinery, equipment, and building requirements for a 300-acre multi-crop farm in eastern Washington.

	Purchase Price ($)[a]	Number of Units	Total Cost ($)
Housing for Manager	135,000	1	135,000
Machine Shop/Shed[b]	150,000	1	150,000
Tractor—70HP, 4WD	45,000	5	225,000
Tractor—40HP, 4WD	25,000	2	50,000
4-Wheeler	7,500	3	22,500
Speed Sprayer	25,000	5	125,000
Weed Spray Boom & Tank	7,000	1	7,000
Mower—Rotary (7 ft)	5,000	1	5,000
Flail Mower (5 ft)	8,000	1	8,000
Forklift	25,000	2	50,000
Bin Trailer	7,500	3	22,500
Pickup Truck (1/2 ton, 4×4, gas)	35,000	1	35,000

	Purchase Price ($)[a]	Number of Units	Total Cost ($)
Miscellaneous Equipment[c]	50,000	1	50,000
Shop Equipment[d]	15,000	1	15,000
Mechanical Harvester[e]	250,000	1	250,000
Total Cost			**1,150,000**

Notes: These are the machinery, equipment, and building requirements for the 300-acre farm, which includes organic 'Elliott' blueberries. The costs of fixed capital are allocated on the entire farm operation.

[a] Purchase price corresponds to new machinery, equipment, or building.

[b] Includes manager's office, restroom, pesticide handling area and storage, dry storage, area for equipment cover, and shop bay for equipment work and repair.

[c] Includes blades, straight blade, quick connect loader, mechanical weeder, soil aerator, utility trailer, etc.

[d] Includes compressor, welder, pressure washer, and miscellaneous tools.

[e] Over-the-row blueberry harvester. One mechanical harvester is needed per 75 acres of blueberries.

Table 7. Annual interest costs per acre for a 49-acre organic 'Elliott' blueberry field in eastern Washington.

	Total Purchase Price ($)	Salvage Value ($)[a]	Number of Acres	Total Interest Cost ($)	Interest Cost per Acre ($)[b]
Irrigation System[c]	348,120	0	49	8,703	178
Land	900,000	N/A	50	45,000	900
Machinery, Equipment & Building[d,e]	900,000	58,000	300	23,950	80
Mechanical Harvester[e]	250,000	25,000	49	6,875	140
Mainline & Pump[c]	0	0	49	0	0.00
Pond[c]	0	0	49	0	0.00
Trellis[c]	137,420	0	49	3,435	70
Wind Machine[c]	145,517	0	49	3,638	74
Interest Rate	*5.0%*				

[a] Not applied to land because land is not a depreciable asset.

[b] Interest cost is calculated as: (Total Purchase Price + Salvage Value)/2 × Interest Rate. For land, the calculation is: Total Purchase Price × Interest Rate, because there is no salvage value for land.

[c] The irrigation system, mainline or well and pump, pond, and trellis are used for the direct production of the fruit. Hence, their respective interest costs are divided by the production area (i.e., 49 acres) to get the interest cost per acre.

[d] Total area of the multicrop farm operation is 300 acres, and the machinery, equipment, and building are used in the entire farm. Thus, the corresponding interest costs are divided by the total area (i.e., 300 acres) to derive the interest cost per acre.

[e] See the Excel Workbook (Appendix 3) for a detailed calculation of the salvage value of the machinery, equipment, and building.

Table 8. Annual depreciation costs per acre for a 49-acre organic 'Elliott' blueberry field in eastern Washington.

	Total Purchase Price ($)	Number of Acres	Total Value per Acre ($)	Years of Useful Life	Depreciation Cost per Acre ($/yr)[a]
Irrigation System	348,120	49	7,104	25	284
Mainline & Pump	44,100	49	900	25	36
Pond	0	49	0	25	0
Trellis	137,420	49	2,804	25	112
Wind Machine	145,517	49	2,970	15	198
Machinery, Equipment & Building[b]					212
Mechanical Harvester[b]					102

[a] The depreciation cost is calculated as straight-line depreciation: (Total Purchase Price – Salvage Value)/Years of Use.

[b] See the Excel Workbook (Appendix 3) for a calculation of the depreciation cost of the machinery, equipment, and building.

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