2015 COST ESTIMATES OF ESTABLISHING AND PRODUCING ORGANIC HIGHBUSH BLUEBERRIES IN EASTERN WASHINGTON

By
Suzette P. Galinato, Research Associate, IMPACT Center, School of Economic Sciences, Washington State University, Pullman, WA.
R. Karina Gallardo, Associate Professor and Extension Specialist, School of Economic Sciences, Center for Precision and Automated Agricultural Systems, Washington State University Puyallup Research and Extension Center, Puyallup, WA. **Yeon A Hong**, Graduate Research Assistant, School of Economic Sciences, Washington State University, Pullman, WA.

WSU PEER REVIEWED
TB28

2015 Cost Estimates of Establishing and Producing Organic Highbush Blueberries in Eastern Washington

Preface

The results presented in this publication serve as a general guide for evaluating the feasibility of producing organic blueberries in eastern Washington as of 2015. This publication is not intended to be a definitive guide to production practices, but it 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 yields
- Cultivar ('Duke' was assumed for this study)
- Type and size of machinery, irrigation, and frost control systems
- Input prices
- Cultural practices
- Organic blueberry prices
- Size of the farm operation
- Management skills

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

Organic Blueberry Production in Washington State

The total certified organic highbush blueberry (*Vaccinium corymbosum*) acreage in Washington State increased from 599 acres in 2009 to 1,540 acres in 2014—a 157% increase over the six-year period (Brady et al. 2015; DeVetter et al. 2015). Organic blueberry production increased from 3 million pounds to 18.5 million pounds between 2009 and 2013 (DeVetter et al., 2015). The share of organic blueberries in the total volume of blueberries produced in the state was 23% in 2013 (DeVetter et al. 2015). In 2014, retail price premiums for fresh organic blueberries in Washington ranged from 21% to 50% over the price of non-organic blueberries depending on the package size, and shipping point premiums were 35% higher than those of non-organic blueberries (Cook et al. 2015).

Organic blueberry production is located in Skagit, Whatcom, and Snohomish Counties in western Washington, and in Benton, Walla Walla, Grant, and Franklin Counties in eastern Washington (Brady et al. 2015; DeVetter et al. 2015). In 2009, there were more certified organic blueberry acres in western Washington than in eastern Washington: 368 acres versus 231 acres. However, since 2010, organic blueberry farms have been concentrated in eastern Washington. Certified organic blueberry acreage in this region increased from 530 acres to 1,110 acres between 2010 and 2013 (Brady et al. 2015; Cook et al. 2015). Large plantings in eastern Washington have been attributed to ideal growing conditions in terms of weather, soil fertility, and low insect pressure (Milkovich 2012). Western Washington has a mild, humid climate whereas eastern Washington's climate is semi-arid. This climate difference leads to fewer disease and pest problems in the eastern production regions, which is a contributing factor in the higher average blueberry yields in eastern Washington than in western Washington. The favorable climate and absence of major pests and diseases are also the primary reasons that organic blueberry production is gaining popularity in eastern Washington (DeVetter et al. 2015).

Study Objectives

This publication is designed to enable growers to estimate: (1) the costs of equipment, materials, supplies, and labor required for establishing and producing organic blueberries for the fresh and processing markets and (2) the breakeven returns at which organic blueberry production would be a profitable enterprise.

The primary use of this report is to identify inputs, costs, and yields considered to be typical of a well-managed organic blueberry operation. This publication does not necessarily represent any particular operation and is not intended to be a definitive guide to production practices. However, it describes current industry trends and, as such, can be helpful in estimating the physical and financial requirements of comparable plantings.

Information Sources

The data used in this study were gathered from experienced organic blueberry growers in eastern Washington, validated by WSU Extension educators and industry representatives. Their production practices and input requirements form the baseline assumptions that were used to develop the enterprise budget. Additionally, the data represent what these growers anticipate over a blueberry's productive life, if no unforeseen 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 area of the total farm operation is 300 acres. Bearing acres include: 20 acres of blueberries (7%), 210 acres of apples (70% of total area), 45 acres of sweet cherries (15%), and 25 acres of pears (8%).
2. This budget is based on a 21-acre field of organic ‘Duke’ blueberries within a 300-acre farm operation of diverse crops. It is assumed that one acre of this field is not used for the direct production of organic blueberries; rather, it is dedicated to roads, a pond, a loading area, etc. Therefore, the total productive area for the organic blueberry field is 20 Table 1 shows the assumed specifications for organic blueberry production.
3. The value of bare agricultural land (including water rights) is $12,000 per acre with annual property taxes of $75 per acre.
4. The irrigation infrastructure includes dual system drip irrigation and overhead sprinklers. Water is provided through a public irrigation district.
5. Soil preparation is done in Year 0, which includes: soil analysis; rip, plow, drag and roll; sawdust application; shaping of beds; and application of sulfur and compost. Soil analysis is done every year for $8/acre. After Year 0, sawdust application is done in Year 1, Year 4, and during full production as part of maintenance of the soil. Blueberry bushes are planted and the pond is installed in Year 1. A trellis system is installed in Year 2.
6. Cultural practices are done by hand (no mechanical aids). In most cases in Washington State, blueberries going to the fresh market are harvested by hand, and those going to the processing market are mechanically harvested.
7. Organic practices begin in the first year of establishment. The organic certification process begins in Year 2 with the discontinuation of all prohibited materials before harvest (i.e., in Year 3). The application for transition status is submitted in Year 2 along with the following fees: $470 new applicant fee and $200 annual fee. In Year 3 and onwards, the renewal fee includes: $20 site fee and a certification fee based on a percentage of sales from the reporting period and estimated at $2,200 + 0.11% of income for a gross income of more than $750,000. The determination of applicable fees can be found in the WSDA Organic Certification Fee form for producers (WSDA 2016).
8. Production of the fruit was suppressed until Year 3 to promote crop establishment. In the third year of production, all yields go to the fresh market. Starting Year 4, 85% of the total yield goes to the fresh market and 15% goes to processing. The gross return is $2.05/lb for fresh blueberries and $1.05/lb for processing blueberries.
9. Management is valued at $300 per acre. This value is representative of what the producer group felt as a fair return for an operator’s management skills.
10. Interest on investment is 5%. Five percent is the median of the range of the average annual effective interest rates on non-real estate bank loans made to farmers from 2010 to 2015 (Federal Reserve Bank of Kansas City 2016).

Summary of Study Results

Table 2 shows the estimated annual cost and returns for a 21-acre field of organic ‘Duke’ blueberries in eastern Washington. The major cost components shown in Table 2 are provided in more detail in the Excel Workbook discussed in the next section. Production costs are classified into variable costs and fixed costs. Variable costs comprise field, harvest, and packing activities, materials and application costs, maintenance and repairs, fuel and lube, and fees. Fixed costs are incurred whether or not the crop is produced. These costs will generally be calculated for the whole farm enterprise and allocated for the unit of production. The fixed costs include land rent, depreciation and interest costs on fixed capital, management, and amortized establishment costs. Management is treated as a fixed rather than a variable cost because, like land, management has been committed to the production cycle of the crop. The amortized establishment costs assume a total productive life of 25 years, which includes five years of establishment and 20 years of full production. The amortized establishment costs must be recaptured during the full production years in order for an enterprise to be profitable. Most of the values given in Table 2 are based on more comprehensive underlying cost data, which are shown in Appendix Tables 1 through 4 of the Excel Workbook.

The study assumed that organic ‘Duke’ blueberries could achieve full production in the sixth year after planting. Based on the above assumptions, the total production costs for organic ‘Duke’ blueberries during full production are estimated at $31,937 per acre. Given these costs and holding all else constant, the breakeven return required for fresh market organic blueberries during full production is estimated at $1.60/lb assuming a yield of 17,850 lb/acre. Table 3 shows the breakeven returns for different levels of cost recovery during full production.

Considering that 85% of the harvested fruit goes to the fresh market and the remaining goes to the processing market, in Table 3, the fresh market breakeven price appearing in the first row ($1.41/lb) is the amount required to cover total variable costs (e.g., field, harvest and packing activities, materials and application costs, maintenance and repairs, fuel and lube, and fees). The breakeven price in the second row ($1.42/lb) should cover total cash costs (e.g., variable costs, land and property taxes, insurance, and miscellaneous supplies), assuming there are no outstanding loans or land rent.

The breakeven price in the third row ($1.46/lb) is the amount required to cover total cash costs and depreciation costs, and must be realized to stay in business in the long run. Note that if the intention of using this enterprise budget is to analyze the farm's economic situation in the short run, then only cash costs should be considered. For example, in the short run it is often considered that reinvestment in capital costs (i.e., new machinery and equipment) is not needed and, therefore, not included; if not included in the long run, on the other hand, this implies the risk that capital might be eventually depleted (Missouri Extension 2011). However, note that for organic blueberry production, variable costs might not be variable in the strict sense. Once the field is established, a farmer could consider the establishment costs as fixed costs and would continue to produce even if profits in one or two years appear as negative.

The breakeven price in the fourth row ($1.60/lb) covers the total cost of production (e.g., total cash costs, depreciation, and opportunity costs). It is only when this breakeven price is received that the grower can recover all cash costs, depreciation, and opportunity costs. For the purposes of this study, opportunity costs are the inevitable income that would have been realized if the funds had been invested in an alternative activity. Not obtaining the final breakeven price means the grower will not receive a return on capital contributions equal to what could have been earned through an alternative investment. On the other hand, receiving a price greater than the estimated total cost breakeven price means that, in addition to covering all cash and opportunity costs, the grower will receive a return for management and the financial risk assumed in producing organic blueberries.

Table 4 shows the sensitivity of net returns to different price and yield combinations of fresh market organic blueberries, considering that 85% of the total yield goes to the fresh market and the remainder goes to processing. Positive grower returns can be observed when both prices and yields are at high levels (e.g., price at $1.90/lb and yield at 19,550 lb/acre).

Table 5 presents the annual capital requirements for a 20-acre organic 'Duke' blueberry field. Table 6 specifies the machinery, equipment, and building requirements for the 300-acre farm operation. Interest costs and depreciation are listed in Tables 7 and 8, 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, 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 and amortization costs assume a 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 economic feasibility of investing in an organic blueberry operation is further assessed by using the net present value (NPV) and discounted payback period. NPV is the sum of the discounted cash flows throughout the planting's productive life (i.e., 25 years). NPV provides an indicator of an investment's feasibility by estimating and converting its future profits into present-day dollars given the cost and length of the investment, time value of money, and how long it takes for an investment to return a profit. The discounted payback period gives the number of years it would take to recoup an investment from discounted cash flows.

Discounting is a method of estimating the present value of future payments by using a discount rate, which represents the time value of money or the opportunity cost of capital. NPV is the sum of the discounted cash flows from the first year to the last year of the planting's productive life (i.e., 25 years). A discount rate of 5% is used in the calculation of NPV and payback periods, and represents the opportunity cost of capital. Given this discount rate, the NPV of the investment is $1.55 million (Table 9). The estimated discounted payback period for the organic blueberry operation can vary depending on the costs included in the calculation and ranges from 6.41 to 9.47 years. If one includes total cash costs (which are the sum of total variable costs, miscellaneous supplies, land and property taxes, and farm insurance), the discounted payback period is 6.41 years. Whereas, if one includes all production costs (which are the sum of total cash cost, management cost, and fixed capital investment), the discounted payback period is 9.47 years. Table 9 also shows the sensitivity of the NPV calculations to different discount rates: 3% through 9%. The range of the average annual effective interest rates on non-real estate bank loans made to farmers in the past six years (2010 to 2015) is between 4% and 6%, according to the Federal Reserve Bank of Kansas City (2016). The other discount rates are added to further demonstrate the opportunity of better investments or risk of inflation. The NPV and payback period calculators can be found in Appendix 6 of the Excel Workbook.

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 the population of farmers. An interactive Excel Workbook 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 2) as well as associated data underlying the per acre cost calculations (Tables 5 through 8 and Appendices 1 through 6 for establishment costs, full production costs, calculation of salvage value and depreciation costs, amortization calculator, production-related data, and NPV value and payback period calculators) are available on the WSU School of Economic Sciences Extension website for crop enterprise budgets.

Growers can modify select values and thus use the Excel Workbook to evaluate their own organic blueberry enterprise.

Acknowledgements

This study was funded by the USDA National Institute of Food and Agriculture Specialty Crop Research Initiative project, Scale-Neutral Harvest-Aid System and Sensor Technologies to Improve Harvest Efficiency and Handling of Fresh Market Blueberries (2014-51181-22383). Assistance provided by the blueberry growers, Lisa DeVetter (WSU Small Fruit and Horticulture Research and Extension Program Leader) and industry representative Alan Schreiber in developing the enterprise budget is also greatly appreciated.

References

Brady, M., E. Kirby, and D. Granatstein. 2015. Trends and Economics of Washington State Organic Blueberry Production. *Washington State University Extension Publication* FS154E. Washington State University.

Cook, R., D. Peacock, J. Malensky, and D. Granatstein. 2015. Marketing – What's the Future for Fresh, Processed, and Organic Markets? Things You Must Think About Before Starting or Expanding Production. OSU Blueberry School. Oregon State University Extension Service.

DeVetter, L.W., D. Granatstein, E. Kirby, and M. Brady. 2015. Opportunities and Challenges of Organic Highbush Blueberry Production in Washington State. *HortTechnology* 26(6): 796–804.

Federal Reserve Bank of Kansas City. 2016. Agricultural Finance Databook: Tables.

Milkovich, M. 2012. Western Southern States Lead Blueberry Surge. Interview to Alan Schreiber. Fruit Grower News.

Missouri Extension. 2011. Know Your Cost of Production – Develop and Enterprise Budget.

WSDA (Washington State Department of Agriculture). 2015. Organic Certification Fee Form – Producers.

Table 1. Organic Blueberry Production Specifications for Eastern Washington

In-row Spacing	3 feet
Between-row Spacing	10 feet
Cultivar	Duke
Block Size	20 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

Table 2. Cost and Returns of Establishing and Producing Organic Blueberries on a 20-Acre Field in Eastern Washington

	Establishment Years						Full
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Production[A]
Gross Production (lb/acre), Fresh[B]				6,000.00	8,925.00	14,280.00	17,850.00
Price ($/lb), Fresh[C]				2.05	2.05	2.05	2.05
Gross Production (lb/acre), Processing[B]					1,575.00	2,520.00	3,150.00
Price ($/lb), Processing[C]					1.05	1.05	1.05
TOTAL RETURNS ($/acre)				**12,300.00**	**19,950.00**	**31,920.00**	**39,900.00**
Variable Costs							
Establishment[D]	8,710.50	8,459.00	8.00	8.00	1,048.00	8.00	384.70
Field Activities[E]	537.00	2,205.00	1,727.14	2,145.96	2,321.10	2,500.51	2,650.50
Harvest Activities[F]	0.00	0.00	0.00	3,480.00	5,384.55	8,518.80	10,608.30
Packing and Handling Charges				3,900.00	6,037.50	9,660.00	12,075.00
Maintenance and Repairs[G]	150.00	279.00	279.00	302.24	334.19	334.19	334.19
Other Variable Costs[H]	716.56	834.40	160.45	870.58	1,345.46	1,896.69	2,348.08
Total Variable Costs	**10,114.06**	**11,777.40**	**2,174.58**	**10,706.78**	**16,470.80**	**22,918.18**	**28,400.77**
Total Fixed Costs[I]	**1,481.85**	**2,339.46**	**2,616.57**	**3,728.87**	**3,835.65**	**3,853.47**	**3,507.75**
TOTAL COSTS ($/acre)	**11,595.91**	**14,116.86**	**4,791.15**	**14,435.65**	**20,306.45**	**26,771.65**	**31,908.52**
ESTIMATED NET RETURNS ($/acre)	**-11,595.91**	**-14,116.86**	**-4,791.15**	**-2,135.65**	**-356.45**	**5,148.35**	**7,991.48**

Notes:

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 and handling charges) are subtracted.

D. Includes soil preparation, planting (Year 1), and cover cropping (Year 1).

E. Includes the costs associated with pruning, flower removal, weed mat, chemicals (organic pesticides), organic fertilizers, beehives, bird control, frost protection, hand weeding, mowing, irrigation labor (starting Year 1), general farm labor, integrated pest management scouting, and irrigation and electric charge (starting Year 1).

F. Includes the costs associated with hand harvest (Year 3 and onwards), mechanical harvest (Year 4 and onwards), and loading and hauling (Year 3 and onwards).

F. Includes dry and liquid fertilizer costs (material and application), and tissue analysis for fertilizer management program

G. Includes the costs of maintenance and repair, and fuel and lube.

H. Includes commission fees, organic certification fee (starting Year 2), overhead, and interest on operating capital.

I. Includes depreciation and interest on fixed capital (irrigation system, machinery, equipment and building, mainline and pump, pond, trellis, wind machine, and land), miscellaneous supplies, land and property taxes, insurance cost, management cost, and amortized establishment cost.

Table 3. Breakeven return for Different Levels of Enterprise Costs during Full Production of Fresh-Market Organic Blueberries in Eastern Washington[A]

		Cost ($/acre)	Breakeven Return ($/lb), fresh[B]
1.	Total Variable Costs	28,400.77	1.41 [C]
2.	Total Cash Costs = Total Variable Costs + Land & Property Taxes + Insurance Cost + Miscellaneous Supplies	28,740.77	1.42 [D]
3.	Total Cash Costs + Depreciation Costs	29,387.30	1.46 [E]
4.	Total Cost = Total Cash Costs + Depreciation Costs + Interest Costs + Management Cost	31,908.52	1.60 [F]

Notes:

A. Of the total yield, 85% goes to the fresh market and 15% goes to processing.

B. Breakeven return is calculated as cost divided by yield of blueberries for the fresh market, holding the total return from processing blueberries constant.

C. If the return is below this level, blueberries are uneconomical to produce.

D. The second breakeven return allows the producer to stay in business in the short run.

E. The third breakeven return allows the producer to stay in business in the long run because the fixed costs are being covered.

F. The fourth breakeven return is the ***total cost breakeven return***. Only when this breakeven return is received can the grower recover all out-of-pocket expenses plus opportunity costs.

Table 4. Estimated Net Returns[A] at Various Prices and Yields of Fresh-Market Organic Blueberries during Full Production in Eastern Washington

	FOB Price ($/lb)[C]								
Net Yield (lb/acre)[B]	**$1.45**	**$1.60**	**$1.75**	**$1.90**	**$2.05**	**$2.20**	**$2.35**	**$2.50**	**$2.65**
12,750	-$5,511	-$3,237	-$963	$1,311	$3,585	$5,860	$8,134	$10,408	$12,682
14,450	-$5,071	-$2,542	-$13	$2,516	$5,045	$7,574	$10,103	$12,631	$15,160
16,150	-$4,631	-$1,847	$936	$3,720	$6,504	$9,287	$12,071	$14,855	$17,638
17,850	-$4,190	-$1,152	$1,886	$4,925	$7,963	$11,001	$14,040	$17,078	$20,116
19,550	-$3,750	-$457	$2,836	$6,129	$9,422	$12,715	$16,008	$19,301	$22,594
21,250	-$3,310	$238	$3,786	$7,334	$10,881	$14,429	$17,977	$21,525	$25,072

Notes:

Shaded area denotes a positive profit based on the combination of yield and price.

A. Net returns consider only the changes in prices and yields of fresh market blueberries, holding all else constant.

B. The yield only considers blueberries going to the fresh market. Of the total yield, 85% goes to the fresh market and 15% goes to processing.

C. Price represents the gross return or price before any expenses (including packing and handling charges) are subtracted.

Table 5. Summary of Annual Capital Requirements for a 20-Acre Organic Blueberry Field in Eastern Washington

	Establishment Years						Full
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Production[A]
Annual Requirements ($)							
Land (21 acres)	252,000.00						
Trellis System			46,480.00				
Irrigation System		72,480.00					
Mainline & Pump		8,000.00					
Pond		5,000.00					
Wind Machine				63,915.60			
Operating Expenses[B]	215,081.19	248,348.08	56,291.62	226,935.69	342,216.02	471,163.65	580,815.32
Total Requirements ($)	467,081.19	333,828.08	102,771.62	290,851.29	342,216.02	471,163.65	580,815.32
Receipts ($)	0.00	0.00	0.00	246,000.00	399,000.00	638,400.00	798,000.00
Net Requirements ($)	467,081.19	333,828.08	102,771.62	44,851.29	(56,783.98)	(167,236.35)	(217,184.68)

Notes:

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 Diverse 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-75HP, 4WD	60,000	2	120,000
Tractor-40HP, 4WD	25,000	2	50,000
Fertilizer Spreader (broadcast bander)	20,000	1	20,000
Planter (6 ft)	5,000	1	5,000
Air-blast Sprayer (400 gal)	50,000	2	100,000
Cultivator (6 ft disk/ripper)	3,500	1	3,500
Mower-Rotary (7 ft)	5,000	1	5,000
Flail Mower (5 ft)	6,000	1	6,000
Fork Lift	30,000	2	60,000
4-Wheeler ATV	20,000	3	60,000
Pickup Truck (1/2 ton 4x4, gas)	25,000	1	25,000
Miscellaneous Equipment[C]	60,000	1	60,000
Shop Equipment[D]	15,000	1	15,000
Total Cost			**814,500**

Notes:

Machinery, equipment, and building requirements are utilized in growing diverse crops in the 300-acre farm, which include organic 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 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, ladders, etc.

D. Includes compressor, welder, pressure washer, and miscellaneous tools.

Table 7. Annual Interest Costs for a 20-Acre Organic Blueberry Field ($/acre)

	Total Purchase Price ($)	Salvage Value ($)[A]	Number of Acres	Total Interest Cost ($)	Interest Cost Per Acre ($)[B]
Irrigation System[C]	72,480	0	20	1,812	90.60
Land	252,000	N/A	21	12,600	600.00
Machinery, Equipment & Building[D,E]	814,500	52,950	300	21,686	72.29
Mainline & Pump[C]	8,000	0	20	200	10.00
Pond[C]	5,000	0	20	125	6.25
Trellis[C]	46,480	0	20	1,162	58.10
Wind Machine[C]	63,916	0	20	1,598	79.89
Interest Rate	*5.0%*				

Notes:

A. Not applied to land because land is not a depreciable asset.

B. Annual 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, trellis system, and wind machine are used for the direct production of the fruit. Hence, their respective interest costs are divided by the production area (20 acres) to get the interest cost per acre.

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

E. See Appendix 3 of the Excel Workbook for a detailed calculation of the salvage value of machinery, equipment, and building.

Table 8. Annual Depreciation Costs for a 20-Acre Organic Blueberry Field

	Total Purchase Price ($)	Number of Acres	Total Value Per Acre ($)	Years of Use	Depreciation Cost Per Acre ($/yr)[A]
Irrigation System	72,480	20	3,624.00	25	144.96
Mainline & Pump	8,000	20	400.00	25	16.00
Pond	5,000	20	250.00	25	10.00
Trellis	46,480	20	2,324.00	25	92.96
Wind Machine	63,916	20	3,195.78	15	213.05
Machinery, Equipment & Building[B]					169.57

Note:

A. Annual depreciation cost is calculated as straight-line depreciation: (Total Purchase Price – Salvage Value) ÷ Years of Use.

B. See Appendix 3 of the Excel Workbook for calculation of the depreciation cost of the machinery, equipment and building.

Table 9. NPV and Payback Periods given Different Discount Rates

Discount Rate	NPV	Payback Period of Total Cash Cost[A] (years)	Payback Period of Total Cost[B] (years)
3%	$2,263,703	6.17	8.78
4%	$1,875,935	6.28	9.10
5%	$1,547,995	6.41	9.47
6%	$1,269,441	6.54	9.87
7%	$1,031,828	6.68	10.35
8%	$828,299	6.83	10.89
9%	$653,264	6.99	11.53

Notes:

A. Cash cost is the sum of total variable cost, miscellaneous supplies, land and property taxes, and insurance cost. Excludes interest on operating capital.

B. Total cost is the sum of: total cash cost, management cost, and fixed capital investment. Excludes interest on operating capital and interest on fixed capital.

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.

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 2016.