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Blueberry Economics: The Costs of Establishing and Producing Conventional Blueberries in the Willamette Valley

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INTRODUCTION

The production of blueberries in the Willamette Valley, Oregon has increased dramatically in the last twenty years. Figure 1 shows that in 1995 there were 1,950 acres of blueberries harvested in the Willamette Valley. By 2017, the acreage of harvested blueberries had increased to 11,700. This represents a 500 percent increase in acreage over a 22-year period. The relationship of blueberry prices per pound to total production in the Willamette Valley is illustrated in Figure 2. The grower price for fresh and processed blueberries has varied from year to year, often related to national supply and demand for fruit. While prices reached record highs from 2005-2007 and again from 2010-2012, recent prices have declined from the 2007 peak. In 2017 and 2018, the price for fresh and processed has been slowly trending upwards compared to the previous few years. It is important to understand that returns for blueberries vary from year to year and to plan for this when developing your own budgets for a farm. This study uses available price data as of the

2019 growing season combined with a set of assumptions about management practices for a “representative” (i.e. hypothetical) twenty acre blueberry farm enterprise.

Blueberries are an expensive crop to produce. Profit and loss depend greatly on yield and price per pound. Yield for a mature farm will vary with cultivar or variety grown, soil type, and management practices. The number of years to reach full production may also vary by farm, with poorer performing farms taking longer than the 7 years assumed in this analysis. This cost of establishment and production study provides growers with a tool for economic management and decision making. This study is a product of cooperative input from interviewed growers, field representatives, researchers, and farm suppliers. The study provides typical costs and returns for a well managed 20-acre blueberry farm in the Willamette Valley of Oregon. Growers are encouraged to substitute their own costs to get an accurate accounting for their farms.

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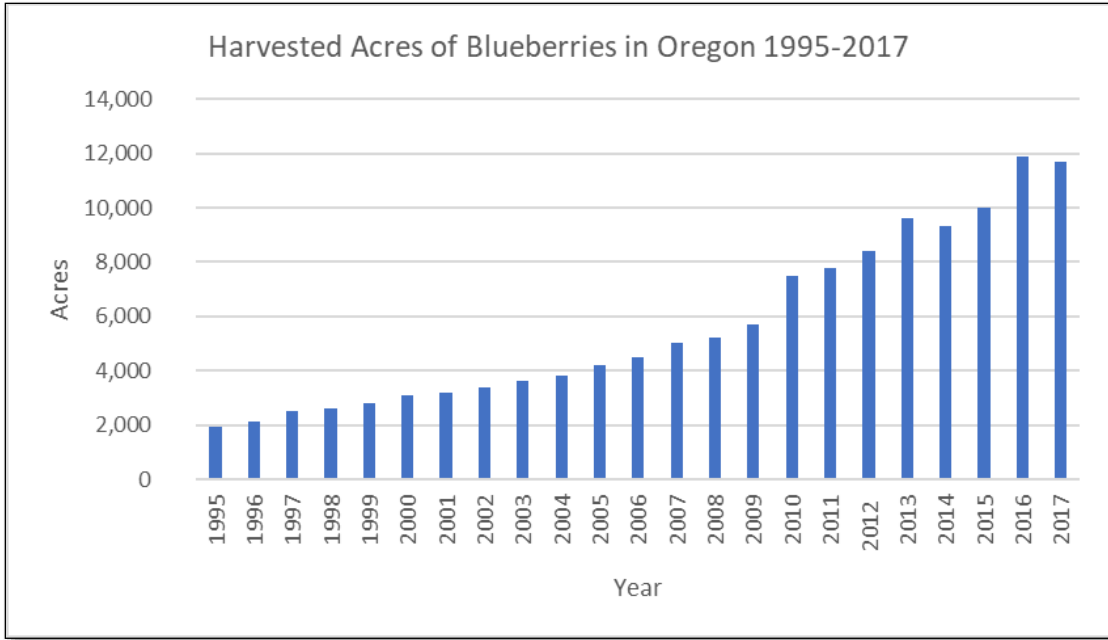


Figure 1. Harvested acres of blueberries in Oregon, 1995–2017.
 Source: USDA/NASS Fr Nt 1-3 (96 to 11).

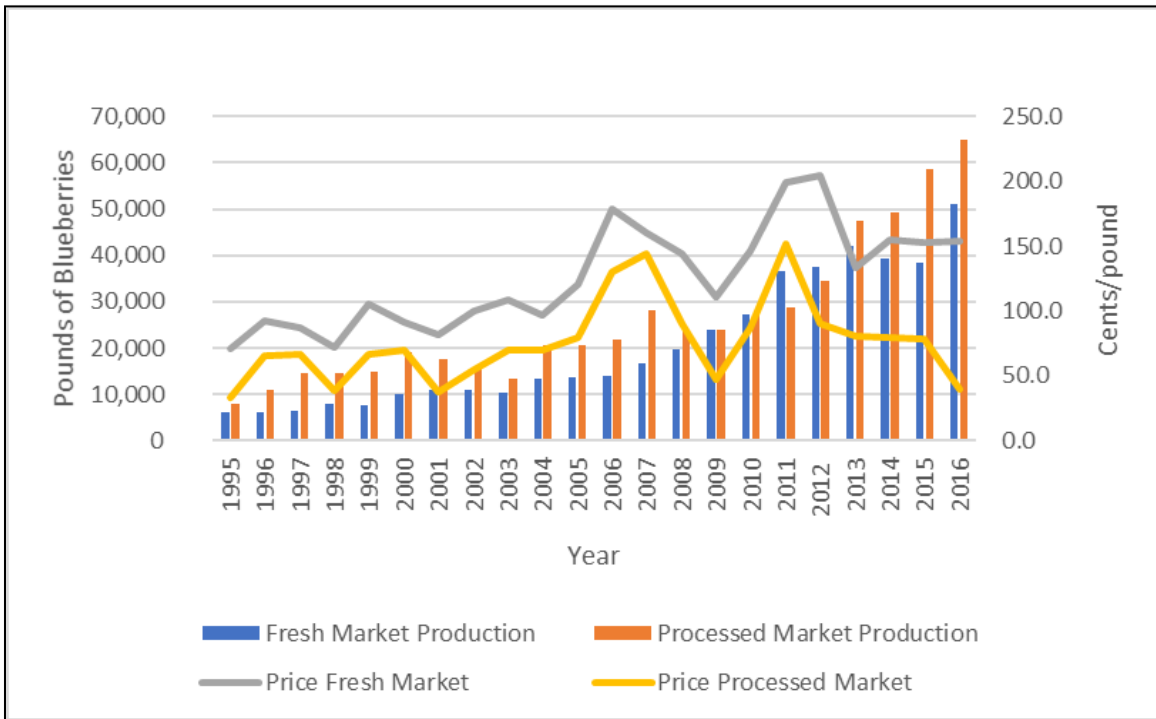


Figure 2. Oregon fresh and processed market blueberry production and prices, 1995–2010.
 Source: USDA/NASS Fr Nt 1-3 (94 to 11).

ASSUMPTIONS

Assumptions

Many individuals were involved in this study including growers, university researchers, and Extension faculty. Based upon insights and suggestions from these industry stakeholders, the following assumptions were made, which provided a basis for this analysis.

- 1) A typical producer of blueberries in the Willamette Valley has 20 acres of blueberries on a 100-acre farm.
- 2) The plant spacing is 3ft x 10ft (1,452 plants/acre). Plants cost \$4.00 each and are planted in October of year 0
- 3) The field has a 25-year life including all establishment years.
- 4) The soil is uniform throughout the 20-acre field and is well suited to blueberry production.
- 5) Pre-planting land preparation (plowing, disking, etc.) is contracted with custom farming providers.
- 6) Sawdust is incorporated prior to forming raised beds and planting blueberries.
- 7) Sawdust mulch is used and replenished every three years during planting life. Note that use of weed mat instead of sawdust mulch would change costs of production (for materials and weed management costs).
- 8) Commercial production begins in year 2 with typical yields of 1,500 lbs./acre. Full production begins in year 7 with typical yields of 16,000 to 18,000 lbs./acre depending upon harvest method.
- 9) Various types of techniques, including cannons and a rented AV alarm, are used to reduce bird depredation.
- 10) Berries are hand harvested through year 6 of establishment and for the purpose of this study, are also hand harvested at full production.
- 11) Full production pruning labor hours for hand harvested production is 100 hours.
- 12) Blueberry fresh market price is \$1.50 per lb. and the processed market price is \$0.40 per lb.
- 13) A machine shed and all farm equipment are owned by the operator.
- 14) The machinery and equipment used in the budget reflect the typical machinery complement of a Willamette Valley blueberry grower. A detailed breakdown of machinery values is shown in Table 1. Table 2 provides estimated machinery costs from the American Society of Agricultural Engineers. Table 3 lists the estimated cost of each operation.
- 15) Gasoline and diesel costs per gallon are \$3.00 and \$3.25, respectively.
- 16) General labor in year 0 is valued at \$14.70 per hour and equipment operator labor is valued at \$21.10 per hour, which includes worker's compensation, unemployment insurance, and other labor overhead expenses. These numbers were gathered from the USDA ERS.
- 17) During field preparation the field is watered with hand lines. The permanent irrigation system is installed in early spring of year 1, after planting, at a cost of \$50,000 (pump, filter, injector, manifold, lines and emitters) for the 20-acre field and has a 15-year expected life. Pumping cost estimates are in Table 5. Repairs and maintenance for the system costs one percent of the purchase price per year.
- 18) The trellis is installed in year 2 at a cost of \$34,000 (\$1,700/acre). This

- trellis system is comprised of t-posts, metal end posts, wire, and cross arms. This figure also accounts for the cost of marking out the field using a GPS system. This budget assumes the use of contract workers to drive the posts at a rate of \$200 per acre. Repairs and maintenance for the system costs 1% of the purchase price per year.
- 19) The interest rate on operating funds is 8.5 percent and treated as a cash expense. One-half of the cash expenses are borrowed for a six-month period.
 - 20) Machinery and land are owned by the operator and assessed 8.5 and 5 percent rates of interest, respectively, as a return on owner's investment. Land is valued at \$15,000 per acre. The 5 percent return on land is equivalent to the current rate land owners could charge for rent to other growers.
 - 21) Previous year's net establishment costs are funded by the operator at a charge of 10 percent interest as a return on owner's investment.
 - 22) Unrecovered establishment costs are amortized over the remaining 18 years of assumed field life and included as a fixed cost in the full production budget.
 - 23) Additional assumptions are listed for variable, fixed cash, and fixed non-cash costs in Table 5.
 - 24) \$1,140 per year was budgeted under "Compliance". Compliance includes record keeping, inspection fees, auditing, certification, documentation, training, and lab testing (e.g. water quality). Additional information about Compliance can be found in Table 4.
 - 25) No adjustments were made to account for year to year fluctuations in yields and prices.
 - 26) Price inflation for the time period of this study is ignored.
 - 27) Owner management, family living, State and Federal income tax consequences are ignored for this study.

Table 1. Machinery Cost Assumptions.

Machine	Size or Description	Market value	Hours or miles of annual use	Expected life (years)	Salvage Value
Tractor	4 wheel dr 35hp, new	\$ 32,000	238	22	\$ 3,475
Air-blast sprayer	200 gallon unit, PTO, new	12,570	99	15	1,207
Mower	Flail, 5' unit	6,000	65	15	576
Weed sprayer	3 point, 200 gallon unit	5,600	22	15	538
Cultivator	6' unit disk/ripper	3,500	31	15	336
Planter	6' unit	5,000	8	15	480
Fertilizer spreader	Broadcast bander	4,000	14	15	384
Pickup*	1/2 ton 4x4, gas, new	27,930	12,000	10	10,562
ATV*	4 wheeler, new	5,980	3,000	7	2,983
Potable toilets	Rental units and servicing	750	N/A	N/A	0
Irrigation system	Pump, filter, injector, manifold, lines, and emitters	50,000	N/A	15	0
Trellis system, per acre	Two wire, wooden end post, metal in-row post	1,700	N/A	20	0
Shop and machine shed	40ft x 80ft Pole barn with partial slab floor	42,633	N/A	30	0

* Truck and ATV budget allocation will be 20% of total farm usage to reflect berry portion of farm.

Table 2. Machinery Cost Calculations.

Machine	Size or Description	--- Variable costs ---		----- Fixed costs -----		Total
		Fuel & Lube	Repairs & Maint.	Depr. & Interest	Insurance	
		----- Costs per hour -----				
Tractor	4 wheel dr 35hp, new	\$12.15	\$0.50	\$9.90	\$0.67	\$23.22
Air-blast sprayer	200 gallon unit, PTO, new	0.00	5.80	11.83	0.63	18.26
Mower	Flail, 5' unit	0.00	2.56	8.64	0.46	11.66
Weed sprayer	3 point, 200 gallon unit	0.00	1.64	23.98	1.27	26.89
Cultivator	6' unit disk/ripper	0.00	1.14	10.50	0.56	12.19
Planter	6' unit	0.00	1.10	56.46	2.99	60.54
Fertilizer spreader	Broadcast bander	0.00	1.02	27.10	1.43	29.56
		----- Costs per mile -----				
Pickup*	1/2 ton 4x4, gas, new	\$0.29	\$0.06	\$0.24	\$0.09	\$0.68
ATV*	4 wheeler, new	\$0.08	\$0.05	\$0.23	\$0.09	\$0.45
		----- Costs per acre -----				
Potable toilets	Rental units and servicing	0.00	0.00	0.00	0.00	37.50
Irrigation system	Pump, filter, injector, manifold, lines, and emitters	0.00	25.00	266.67	0.00	291.67
Trellis system, per acre	Two wire, wooden end post, metal in-row post	0.00	17.00	87.55	0.00	104.55
Shop and machine shed	40ft x 80ft Pole barn with partial slab floor	0.00	56.49	198.95	0.00	255.44

* Truck and ATV budget allocation will be 20% of total farm usage to reflect berry portion of farm.

Table 3. Estimated cost of each operation with power-unit for a 10' between row spacing.

Operation	Miles per hour	Acres per hour	Labor cost per acre	-- Machine costs --		Total cost per acre
				Variable cost per acre	Fixed cost per acre	
Air-blast sprayer	3.00	1.82	\$14.79	\$10.15	\$12.66	\$37.60
Mower	3.00	3.09	8.70	4.92	6.36	19.98
Weed sprayer	3.50	2.76	9.75	5.18	12.99	27.92
Cultivator	2.50	2.58	10.44	5.35	8.39	24.18
Planter	2.50	2.42	11.09	5.67	28.88	45.64
Fertilizer spreader	3.00	2.91	9.24	4.70	13.44	27.38

Table 4. Compliance Costs and Estimations

Various categories of compliance include legal, regulatory, and market programs. For this enterprise budget compliance costs are estimated to be \$1,140. Specific examples by general categories are listed below. Since not all growers participate in all programs, we recommend that growers compliance costs be based upon specific program participation.

For purposes of this enterprise budget, “compliance” includes: record keeping, inspection fees, auditing, certification, documentation, training, and lab testing.

Category	Examples	Range of Costs
Labor	OSHA Outreach Training	\$79-179 per certification per operation
Environment	Water testing	\$70-150 per test (completed biannually)
	Food Alliance	\$750-1200 (valid for three years)
	LIVE	\$350/acre up to 20 acres. Plus \$5/acre for additional acres above 20.
	Salmon Safe	\$95 Annually
Market Channels	Global GAP	\$153 certificate license fees \$175 for producer registration fee (for operations between 30-100 acres)
	ISO (such as ISO 22000)	\$1,500-2,500 Initial certification \$600-900 annual cost (annual audits and trainings)
Food Safety	FISMA – Produce Rule compliance	Very small Farm: \$25,000-\$250,000 in annual sales, \$4,477/year
		Small Farm: \$250,001-\$500,000 in annual sales, \$12,384/year

Table 5. Input assumptions for variable, harvest, and fixed cost, per acre.

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Full
Prices per lb, fresh market	\$0.00	\$0.00	\$1.50	\$1.50	\$1.50	\$1.50	\$1.50	\$1.50
Prices per lb, processed market	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.40
Lbs per acre, fresh market	0	0	1,500	3,600	7,200	10,800	14,400	16,200
Lbs per acre, processed market	0	0	0	0	0	0	0	1,800
Cost of general farm labor, per hour	\$14.70	\$15.39	\$16.34	\$17.30	\$17.82	\$18.36	\$18.91	\$19.47
Cost of tractor driver, per hour	\$21.10	\$21.24	\$22.56	\$23.89	\$24.61	\$25.34	\$26.10	\$26.89
Cost to load & haul berries, per lb	\$0.00	\$0.00	\$0.03	\$0.03	\$0.03	\$0.03	\$0.03	\$0.03
Berry commission fee, \$ per lb	\$0.00	\$0.00	\$0.04	\$0.04	\$0.04	\$0.04	\$0.04	\$0.04
Cost of fertilizer	\$120	\$170	\$350	\$350	\$350	\$350	\$350	\$350
Cost of herbicide	\$100	\$100	\$100	\$100	\$100	\$100	\$100	\$100
Cost of insecticide	\$0	\$0	\$100	\$100	\$100	\$100	\$100	\$100
Cost of fungicides	\$0	\$0	\$50	\$250	\$250	\$250	\$250	\$250
Cost of tissue analysis, per acre	\$0	\$0	\$10	\$10	\$10	\$10	\$10	\$10
Cost of soil analysis, per acre	\$8	\$0	\$0	\$0	\$8	\$0	\$0	\$2
Cost of bird control	\$0	\$0	\$150	\$150	\$150	\$150	\$150	\$150
Cost of bee hives	\$0	\$0	\$80	\$80	\$80	\$80	\$80	\$80
Cost of plants	\$4	\$4	\$0	\$0	\$0	\$0	\$0	\$0
Cost of hand-harvest labor, per lb	\$0.00	\$0.00	\$0.75	\$0.75	\$0.75	\$0.75	\$0.75	\$0.75
Cost of irrigation water and power	\$150	\$150	\$150	\$150	\$150	\$150	\$150	\$150
Cost of cover crop seed	\$25	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Cost of sawdust, per unit	\$85	\$85	\$0	\$0	\$85	\$0	\$0	\$85
Cost of loader rental	\$1,250	\$1,250	\$0.00	\$0.00	\$1,250	\$0	\$0	\$334
Units of sawdust	19.00	11.00	0.00	0.00	11.00	0.00	0.00	3.67
Hours of labor, pruning	0	0	25	40	60	85	100	100
Hours of labor, spot spray herbicide	0	2	2	2	2	2	2	2
Hours of labor, hand weeding	0	13	13	0	0	0	0	0
Hours of irrigating labor	32	3	3	3	3	3	3	3
Hours of fertigation labor	0	3	3	3	3	3	3	3
Hours of labor to plant	50	5	0	0	0	0	0	0
Hours of trellis labor	0	0	30	1	1	1	1	1
Hours of IPM scouting	0	0	5	5	5	5	5	5
Hours of bird control	0	0	1	1	1	1	1	1
Hives per acre	0	0	3	3	3	3	3	3
Portable toilets per acre	0	0.50	0.50	0.75	0.75	0.75	0.75	0.75
Times to herbicide spot spray	0	2	2	2	2	2	2	2
Times to herbicide strip spray	1	2	2	2	2	2	2	2
Times to fertilize (Dry)	1	1	2	2	2	2	2	2
Times to apply fungicides&insecticide	2	2	10	10	10	10	10	10
Compliance	1140	1140	1140	1140	1140	1140	1140	1140
Times to mow	0	3	5	5	5	5	5	5
Property taxes	\$30	\$30	\$30	\$30	\$30	\$30	\$30	\$30
Property insurance	\$25	\$25	\$25	\$25	\$25	\$25	\$25	\$25
Land values	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000
Miscellaneous & overhead	\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200
Fuel use gal/hr for tractor	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25
Gasoline price	\$3.00	\$3.00	\$3.00	\$3.00	\$3.00	\$3.00	\$3.00	\$3.00
Diesel fuel price	\$3.25	\$3.25	\$3.25	\$3.25	\$3.25	\$3.25	\$3.25	\$3.25
Operating interest rate	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Machinery interest rate	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Land interest rate	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Establishment interest rate	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
% of operating capital borrowed	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Months to borrow operating capital	6	6	6	6	6	6	6	6
Planted bushes	1452	35	0	0	0	0	0	0

Results of establishing and producing blueberries in the Willamette Valley, Oregon

Cash flow analysis

Table 6 shows a cash flow analysis of establishing blueberries in the Willamette Valley. Cash costs include: labor, plants, trellis, irrigation system, fertilizer, chemicals, machinery repairs, fuel, lube and oil, operating interest (short-term), machinery insurance, and property taxes. As noted, earlier yields become harvestable in year 2 with full production occurring by year 7.

A positive cash flow begins in year 4 with gross income exceeding total cash cost by \$88.50.

As presented in Figure 3, the majority of cash costs are associated with harvest at 51 percent. The category with the next highest associated cash costs is hired labor, which accounted for 15 percent of all cash costs. Other notable cash costs included fertilizer/chemicals and plants, which each accounted for 6 percent of total cash costs.

Economic Costs and Returns

This section presents the economic analysis of establishing blueberries in the Willamette valley. This economic analysis differs from the cash flow analysis since interest and depreciation costs are included in the cost estimate. Also included as economic costs are returns to investments in land and equipment (reference assumption #20). Table 7 shows the economic costs and returns associated with establishing an operation. Net projected returns become positive in year 6 with net projected returns estimated to be \$1,656.

As noted in Figure 4, cash net returns are expected to exceed economic net returns starting in year 4 and are projected to continue to become increasingly higher throughout the lifespan of the established operation.

Figure 5 shows the economic costs of establishing an operation by categorial percentages of total economic costs. Similar to cash costs, harvesting accounted for the largest percentage of economic costs at 41 percent. Interest accounted for the second highest percentage of the total economics costs at 19 percent. Other notable economic costs include plants and fertilizer/chemical.

Figure 6 shows the impact on operation size (as measured by harvested acres) on economic costs. Given the assumptions in this study, blueberry operations with less than 5 acres do not generate sufficient gross revenue to recover economic costs of production. This study predicts that at 5 acres the operation would leave the grower in a deficit of \$45,000 over 25 years. In comparison, 10-acre, 20-acre, 40-acre and 80-acre operations have cumulative returns (rounded to 1000s) of approximately \$27,000, \$66,000, \$83,000, and \$90,000, respectively. A further note on operation size can be found in appendix B: *A look at the Oregon Blueberry Industry*.

In addition to Tables 6 and 7, detailed annual budgets for each year of establishment are provided in Appendix A, Tables 8-15.

Table 6. Cash Costs and Returns of Establishing and Producing Blueberries in Oregon's Willamette Valley.

Income:	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Full Prod
Yield (lbs/acre) fresh	0	0	1,500	3,600	7,200	10,800	14,400	16,200
Processed	0	0	0	0	0	0	0	1,800
Price (dollars/lb) Fresh	0	0	1.50	1.50	1.50	1.50	1.50	1.50
Price (dollars/lb) Processed	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>	<u>0.40</u>
Gross Income(dollars/acre)	0	0	2,250	5,400	10,800	16,200	21,600	25,020
Variable Costs (per acre):								
Custom work/Rental equipt.	772.50	62.50	0.00	0.00	62.50	0.00	0.00	16.70
Blue berry bushes	5,082.00	122.50	0.00	0.00	0.00	0.00	0.00	0.00
Fertilizer	120.00	170.00	350.00	350.00	350.00	350.00	350.00	350.00
Soil test	8.00	0.00	0.00	0.00	8.00	0.00	0.00	2.00
Chemicals	100.00	100.00	250.00	450.00	450.00	450.00	450.00	450.00
Sawdust	1,615.00	935.00	0.00	0.00	935.00	0.00	0.00	311.95
Cover crop seed	25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Harvest costs	0.00	0.00	1,240.00	2,962.00	5,914.00	8,866.00	11,818.00	13,420.00
Pruning Labor	0.00	0.00	408.51	692.12	1,069.32	1,560.31	1,890.73	1,947.45
General labor	828.86	906.43	1,193.42	514.24	523.06	532.15	541.51	551.16
Machine costs	71.65	75.87	191.90	187.20	187.20	187.20	187.20	187.20
Irrigation	155.00	2,500.00	175.00	175.00	175.00	175.00	175.00	175.00
Trellis	0.00	0.00	1,700.00	17.00	17.00	17.00	17.00	17.00
Bee hives	0.00	0.00	240.00	240.00	240.00	240.00	240.00	240.00
Bird Control	0.00	0.00	150.00	150.00	150.00	150.00	150.00	150.00
Portable toilets	0.00	18.75	37.50	37.50	37.50	37.50	37.50	37.50
Shop and machine shed	56.49	56.49	56.49	56.49	56.49	56.49	56.49	56.49
Miscellaneous & overhead	210.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00
Interest: operating capital	<u>132.55</u>	<u>41.96</u>	<u>67.39</u>	<u>90.47</u>	<u>155.63</u>	<u>192.32</u>	<u>241.70</u>	<u>271.69</u>
Total variable costs	9,177.05	5,189.51	6,260.20	6,122.01	10,530.69	13,013.98	16,355.13	18,384.13
Gross Income - Variable Cost	-9,177.05	-5,189.51	-4,010.20	-722.01	269.31	3,186.02	5,244.87	6,635.87
Fixed cash costs (per acre):								
Compliance	57.00	57.00	57.00	57.00	57.00	57.00	57.00	57.00
Insurance	93.81	93.81	93.81	93.81	93.81	93.81	93.81	93.81
Property taxes	<u>30.00</u>	<u>30.00</u>	<u>30.00</u>	<u>30.00</u>	<u>30.00</u>	<u>30.00</u>	<u>30.00</u>	<u>30.00</u>
Total fixed cash cost	180.81	180.81	180.81	180.81	180.81	180.81	180.81	180.81
Total cash cost	9,357.86	5,370.32	6,441.01	6,302.82	10,711.50	13,194.79	16,535.94	18,564.94
Net projected returns	-9,357.86	-5,370.32	-4,191.01	-902.82	88.50	3,005.21	5,064.06	6,455.06
Cumulative returns	-9,357.86	-14,728.18	-18,919.19	-19,822.01	-19,733.51	-16,728.30	-11,664.24	-5,209.19 *

* Cumulative returns for full production years is the sum of net projected returns for that year and cumulative returns from year 6.

Table 7. Economic Costs and Returns of Establishing and Producing Blueberries in Oregon's Willamette Valley.

Income:	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Full Prod HH
Yield (lbs/acre) fresh	0.00	0.00	1,500.00	3,600.00	7,200.00	10,800.00	14,400.00	16,200.00
Processed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,800.00
Price (dollars/lb) Fresh	0.00	0.00	1.50	1.50	1.50	1.50	1.50	1.50
Price (dollars/lb) Processed	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>	<u>0.40</u>
Gross Income(dollars/acre)	0.00	0.00	2,250.00	5,400.00	10,800.00	16,200.00	21,600.00	25,020.00
Variable Costs (per acre):								
Custom work/Rental equipt.	772.50	62.50	0.00	0.00	62.50	0.00	0.00	16.70
Blue berry bushes	5,082.00	122.50	0.00	0.00	0.00	0.00	0.00	0.00
Fertilizer	120.00	170.00	350.00	350.00	350.00	350.00	350.00	350.00
Soil test	8.00	0.00	0.00	0.00	8.00	0.00	0.00	2.00
Chemicals	100.00	100.00	250.00	450.00	450.00	450.00	450.00	450.00
Sawdust	1,615.00	935.00	0.00	0.00	935.00	0.00	0.00	311.95
Cover crop seed	25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Harvest costs	0.00	0.00	1,240.00	2,962.00	5,914.00	8,866.00	11,818.00	13,420.00
Pruning Labor	0.00	0.00	408.51	692.12	1,069.32	1,560.31	1,890.73	1,947.45
General labor	828.86	906.43	1,193.42	514.24	523.06	532.15	541.51	551.16
Machine costs	71.65	75.87	191.90	187.20	187.20	187.20	187.20	187.20
Irrigation	155.00	150.00	175.00	175.00	175.00	175.00	175.00	175.00
Trellis	0.00	0.00	0.00	17.00	17.00	17.00	17.00	17.00
Bee hives	0.00	0.00	240.00	240.00	240.00	240.00	240.00	240.00
Bird Control	0.00	0.00	150.00	150.00	150.00	150.00	150.00	150.00
Portable toilets	0.00	18.75	37.50	37.50	37.50	37.50	37.50	37.50
Shop and machine shed	56.49	56.49	56.49	56.49	56.49	56.49	56.49	56.49
Miscellaneous & overhead	210.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00
Interest: operating capital	<u>132.55</u>	<u>41.96</u>	<u>67.39</u>	<u>90.47</u>	<u>155.63</u>	<u>192.32</u>	<u>241.70</u>	<u>271.69</u>
Total variable costs	9,177.05	2,839.51	4,560.20	6,122.01	10,530.69	13,013.98	16,355.13	18,384.13
Gross revenue - Variable costs	-9,177.05	-2,839.51	-2,310.20	-722.01	269.31	3,186.02	5,244.87	6,635.87
Fixed cash costs (per acre):								
Compliance	57.00	57.00	57.00	57.00	57.00	57.00	57.00	57.00
Insurance	93.81	93.81	93.81	93.81	93.81	93.81	93.81	93.81
Property taxes	<u>30.00</u>	<u>30.00</u>	<u>30.00</u>	<u>30.00</u>	<u>30.00</u>	<u>30.00</u>	<u>30.00</u>	<u>30.00</u>
Total fixed cash cost	180.81	180.81	180.81	180.81	180.81	180.81	180.81	180.81
Total cash cost	9,357.86	3,020.32	4,741.01	6,302.82	10,711.50	13,194.79	16,535.94	18,564.94
FIXED NON-CASH COSTS								
Mach. & equip. - dep., & int.	61.90	84.66	211.27	211.27	211.27	211.27	211.27	211.27
Pickup - dep. & int	49.65	49.65	49.65	49.65	49.65	49.65	49.65	49.65
Irrig. and Trellis - dep. & int.	0.00	266.67	354.22	354.22	354.22	354.22	354.22	354.22
Shop & machine shed	198.95	198.95	198.95	198.95	198.95	198.95	198.95	198.95
Land interest charge	900.00	900.00	900.00	900.00	900.00	900.00	900.00	900.00
Int. on prior year's est. costs	0.00	634.10	943.36	1,252.27	1,484.42	1,671.02	1,693.82	0.00
Amortized establishment costs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3,906.98
Total fixed non-cash costs	1,211	2,134	2,657	2,966	3,199	3,385	3,408	5,621
Total fixed costs	10,568	5,154	7,398	9,269	13,910	16,580	19,944	24,186
Net projected returns	-10,568	-5,154	-5,148	-3,869	-3,110	-380	1,656	834
Cumulative returns	-10,568	-15,723	-20,871	-24,740	-27,850	-28,230	-26,574	-25,740

* Cumulative returns for full production years is the sum of net projected returns for that year and cumulative returns from year 6.

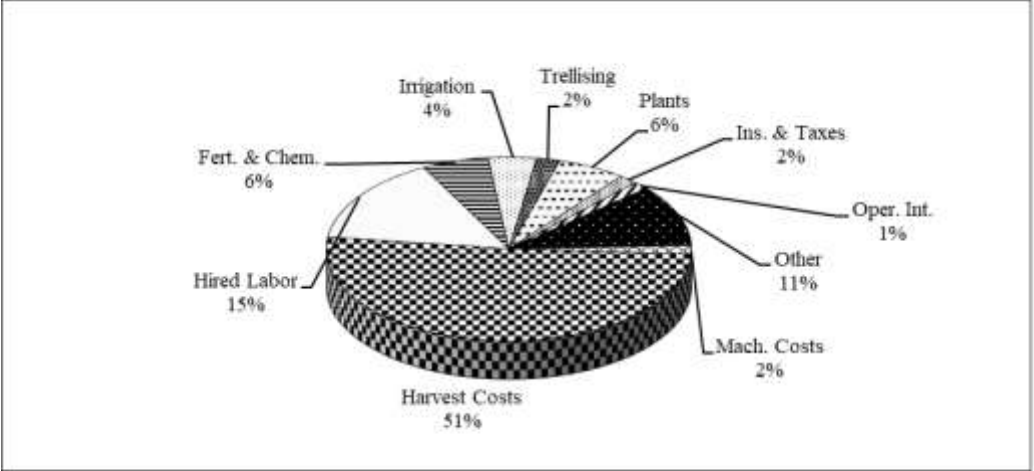


Figure 3. Cash costs per acre from years 0 - 7 to establish and produce fresh market blueberries in Oregon's Willamette Valley.

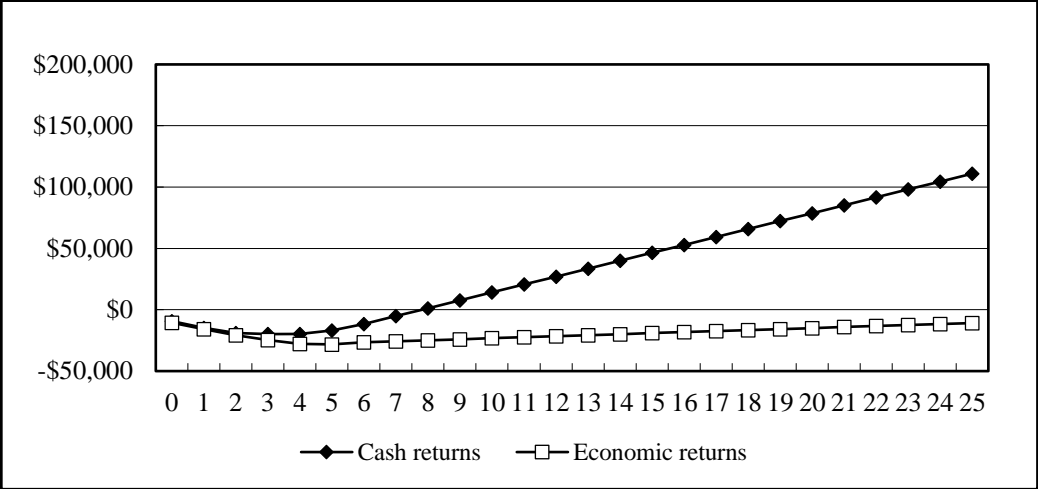


Figure 4. Comparison of cumulative net cash returns and cumulative net economic returns per acre for establishment and production of fresh market blueberries in Oregon's Willamette Valley over 25

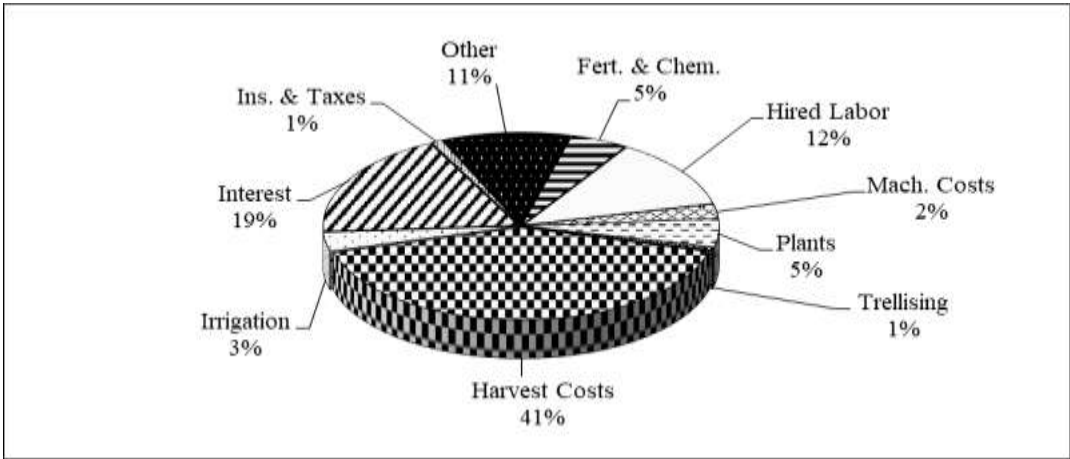


Figure 5. Economic costs per acre from years 0 - 7 to establish and produce fresh market blueberries in Oregon's Willamette Valley.

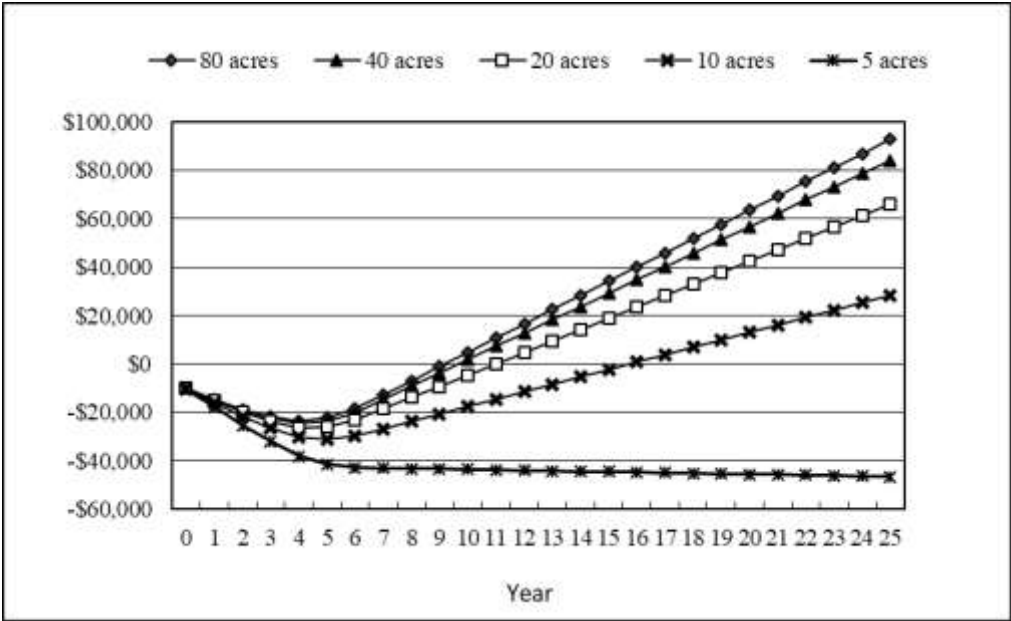


Figure 6. Projected annual economic returns per acre by farm size for hand harvested blueberries, over 25 years of establishment and production.

Conclusions

This cost-of-establishment study is a baseline benchmark to be used as a reference point for fresh and processed market blueberry producers and investors who are considering planting berries. Like any other enterprise budget, however, the intent is that producers use their own estimates of current costs in the budget to make it more relevant and specific to their operations. Many tools are available to assist in budgeting such as templates from university farm management specialists and computer software programs such as AgProfit™. AgProfit™ is available as a download for free at (www.agbizprofit.org). Talk with your local extension agent to find the latest in tools and budget information.

Growers should consider the impact that a particular enterprise such as a blueberry planting can have on the overall financial stability of the farm business. Financial managers can recommend planting one crop over another to improve profitability, but the financial requirements to complete the planting could jeopardize cash flows, increase the debt-to-asset ratio, and diminish the solvency of the farm. There are many economic and financial considerations to review before such decisions are made. Seeking advice from university extension and research faculty, industry representatives, or consultants can help in those decisions and keep a farm profitable and economically viable over time.

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Appendix A

Annual Enterprise Budgets – Establishment through Full Production

Table 8. Year 0, Blueberry Establishment, \$/acre economic costs and returns.

VARIABLE CASH COSTS	Description	Labor	Machinery	Materials	Total
Soil sample	0.2 x / acre			8.00	8.00
Land prep, custom operation					200.00
Rip, plow, drag and roll	2 x / acre			200.00	
Weed Control					\$114.93
Herbicide spray application	1 x / acre	\$9.75	\$5.18		
Herbicide	\$100 / acre			\$100.00	
Sawdust application					1,677.50
Sawdust	19 units @ \$85 / unit			1,615.00	
Loader rental	\$1250 / 20 acre farm			62.50	
Fertilizer, preplant application	2 x / acre	9.24	4.70		133.94
Fertilizer	\$120 / acre			120.00	
Incorporate fert.	2 x / acre	10.44	5.35		25.79
Rototiller, rental	\$200 / 20 acre farm			10.00	
Mark field	2 hrs / acre @ \$15.38502 / hr	29.40		10.00	39.40
Shape beds, custom	2 x / acre			500.00	500.00
Plant bushes					5,817.00
Plant material	\$3.5 / plant @ 1452 plants / acre			5,082.00	
Labor	50 hrs / acre @ \$15.38502 / hr	735.00			
Drag field	1 x / acre	9.24	4.70		13.94
Seed cover crop between rows	1 x / acre	11.09	5.67		41.76
Seed	\$25 / acre			25.00	
Irrigation					169.70
Handline labor, preplant	1 hr / acre @ \$15.38502 / hr	14.70			
Handline rental				5.00	
Power	\$150 / acre			150.00	
Pickup			42.12		42.12
ATV			3.93		3.93
Shop and machine shed				56.49	56.49
Miscellaneous and overhead				200.00	200.00
Interest: operating capital	6 months			132.55	132.55
Total variable costs		828.86	71.65	8,276.54	9,177.05
FIXED CASH COSTS				Unit	Total
Compliance				acre	57.00
Pickup & ATV insurance				acre	68.81
Property insurance				acre	25.00
Property taxes				acre	30.00
Total fixed cash costs					180.81
FIXED NON-CASH COSTS				Unit	Total
Mach. & equip. - dep., & int.				acre	61.90
Pickup & ATV - dep. & int				acre	49.65
Shop & machine shed				acre	198.95
Land interest charge				acre	900.00
Total fixed non-cash costs					1,210.51
Total fixed costs					1,391.32
Total of all costs per acre					\$10,568
Projected Net Returns					-\$10,568

Table 9. Year 1, Blueberry Establishment, \$/acre economic costs and returns.

VARIABLE CASH COSTS	Description	Labor	Machinery	Materials	Total
Weed Control					\$391.41
Herbicide sprayer	2 x / acre	19.50	10.36		
Spot spray	2 x / acre	61.54			
Spot spray labor	2 hrs / acre @ \$15.38502 / hr				
Hand weeding	13 hrs / acre @ \$15.38502	200.01			
Herbicide	\$100 / acre			100.00	
Sawdust application					997.50
Sawdust	11 units @ \$85 / unit			935.00	
Loader rental	\$1250 / 20 acre farm			62.50	
Fertilization					230.10
Spreader application	2 x / acre	9.24	4.70		
Fertigation labor	3 hrs / acre @ \$15.38502	46.16			
Fertilizer	\$170 / acre			170.00	
Irrigation					620.40
Labor, installation	32 hrs / acre @ \$14.7 / hr	470.40			
Water and power	\$150 / acre			150.00	
Plant bushes					196.00
Blueberry bush	\$3.5 / plant @ 35 plants / acre			122.50	
Labor	5 hrs / acre @ \$15.38502	73.50			
Mowing between rows	3 x / acre	26.09	14.76		40.86
Portable toilet	0.5 unit / acre			18.75	18.75
Pickup			42.12		42.12
ATV			3.93		3.93
Shop and machine shed				56.49	56.49
Miscellaneous and overhead				200.00	200.00
Interest: operating capital	6 months			41.96	41.96
Total variable costs		906.43	75.87	1,857.20	2,839.51
FIXED CASH COSTS				Unit	Total
Compliance				acre	57.00
Pickup & ATV insurance				acre	68.81
Property insurance				acre	25.00
Property taxes				acre	30.00
Total fixed cash costs					180.81
FIXED NON-CASH COSTS				Unit	Total
Mach. & equip. - dep., & int.				acre	84.66
Pickup & ATV - dep. & int				acre	49.65
Irrig. - dep. & int.				acre	266.67
Shop & machine shed				acre	198.95
Land interest charge				acre	900.00
Int. on prior year's establishment costs				acre	634.10
Total fixed non-cash costs					2,134.03
Total fixed costs					2,314.84
Total of all costs per acre					\$5,154.35
Projected Net Returns					-\$5,154.35

Table 10. Year 2, Blueberry Establishment, \$/acre economic costs and returns.

TOTAL GROSS INCOME		Quantity	Unit	\$/Unit	Total		
Blue berries, fresh market		1,500	lbs	1.50	\$2,250		
Total gross income					\$2,250		
VARIABLE CASH COSTS		Description	Labor	Machinery	Materials	Total	Cost \$/lb
Pruning and brush mgmt		25 hr / acre @ \$16.34042	408.51			408.51	0.27
Weed Control						\$407.65	0.27
Herbicide sprayer		2 x / acre	19.50	10.36			
Spot spray		2 x / acre	65.36				
Spot spray labor		2 hrs / acre @ \$16.340429742 / hr					
Hand weeding		13 hrs / acre @ \$16.34042	212.43				
Herbicide		\$100 / acre			100.00		
Disease and insect control						399.34	0.27
Pesticide applications		10 x / acre	147.86	101.48			
Fungicide		\$50 / acre			50.00		
Insecticide		\$100 / acre			100.00		
Fertilization						426.90	0.28
Spreader application		2 x / acre	18.48	9.40			
Fertigation labor		3 hrs / acre @ \$16.34042	49.02				
Fertilizer		\$350 / acre			350.00		
Bird control						166.34	0.11
Labor		1 hr / acre @ \$16.340429	16.34				
Equipment		\$150 / acre			150.00		
Harvest						1,240.00	0.83
Contract laborers		\$0.75 / lb.			1,125.00		
Load & haul berries		\$0.03 / lb.			45.00		
Berry commission fees		\$0.04 / lb.			60.00		
Tissue analysis		0.2 x / acre			10.00		
Irrigation						224.02	0.15
Labor		3 hrs / acre @ \$16.34042	49.02				
Repairs & maint.		\$25 / acre			25.00		
Water and power		\$150 / acre			150.00		
Trellis						490.21	0.33
Installation labor		30 hrs / acre @ \$16.34042	490.21				
Mow between rows		5 x / acre	43.49	24.61		68.09	0.05
Bee hives		3 hives @ \$80 / hive			240.00	240.00	0.16
IPM scouting		5 hrs / acre @ \$16.34042	81.70			81.70	0.05
Portable toilet		0.5 unit / acre			37.50	37.50	0.03
Pickup				42.12		42.12	0.03
ATV				3.93		3.93	0.00
Shop and machine shed					56.49	56.49	0.04
Miscellaneous and overhead					200.00	200.00	0.13
Interest: operating capital		6 months			67.39	67.39	0.04
Total variable costs			#####	191.90	2,766.38	4,560.20	3.04
FIXED CASH COSTS					Unit	Total	Cost \$/lb
Compliance					acre	57.00	0.03
Pickup & ATV insurance					acre	68.81	0.05
Property insurance					acre	25.00	0.02
Property taxes					acre	30.00	0.02
Total fixed cash costs						180.81	0.12
FIXED NON-CASH COSTS					Unit	Total	Cost \$/lb
Mach. & equip. - dep., & int.					acre	211.27	0.14
Pickup & ATV insurance					acre	49.65	0.03
Irrig. & trellis - dep. & int.					acre	354.22	0.24
Shop & machine shed					acre	198.95	0.13
Land interest charge					acre	900.00	0.60
Int. on prior year's establishment costs					acre	943.36	0.63
Total fixed non-cash costs						2,657.45	1.77
Total fixed costs						2,838.26	1.89
Total of all costs per acre						\$7,398	4.93
Net projected returns						-\$5,148	-3.43

Table 11. Year 3, Blueberry Establishment, Hand Harvested, \$/acre economic costs and returns.

TOTAL GROSS INCOME		Quantity	Unit	\$/Unit	Total		
Blue berries, fresh market		3,600	lbs	1.50	\$5,400		
Total gross income					\$5,400		
VARIABLE CASH COSTS		Description	Labor	Machinery	Materials	Total	Cost/lb
Pruning and brush mgmt		40 hr / acre @ \$17.302881	692.12			692.12	0.19
Weed Control						\$199.07	0.06
Herbicide sprayer		2 x / acre	19.50	10.36			
Spot spray		2 x / acre	69.21				
Spot spray labor		2 hrs / acre @ \$17.302881	34.62				
Herbicide		\$100 / acre			100.00		
Disease and insect control						599.34	0.17
Pesticide applications		10 x / acre	147.86	101.48			
Fungicide		\$250 / acre			250.00		
Insecticide		\$100 / acre			100.00		
Fertilization						415.85	0.12
Spreader application		2 x / acre	9.24	4.70			
Fertigation labor		3 hrs / acre @ \$17.302881	51.91				
Fertilizer		\$350 / acre			350.00		
Bird control						167.30	0.05
Labor		1 hr / acre @ \$17.302881	17.30				
Equipment		\$150 / acre			150.00		
Harvest						2,962.00	
Contract harvest		\$0.75 / lb.			2,700.00		0.00
Load & haul berries		\$0.03 / lb.			108.00		
Berry commission fee		\$0.04 / lb.			144.00		
Tissue analysis		0.2 x / acre			10.00		
Irrigation						226.91	0.06
Labor		3 hrs / acre @ \$17.302881	51.91				
Repairs & maint.		\$25 / acre			25.00		
Water and power		\$150 / acre			150.00		
Trellis						34.30	0.01
Repair & maint.		\$17 / acre			17.00		
Labor		1 hrs / acre @ \$17.302881	17.30				
Bee hives		3 hives @ \$80 / hive			240.00	240.00	0.07
IPM scouting		5 hrs / acre @ \$17.302881	86.51			86.51	0.02
Flail mow		5 x / acre	43.49	24.61		68.09	0.02
Portable toilet		0.75 unit / acre			37.50	37.50	0.01
Pickup				42.12		42.12	0.01
ATV				3.93		3.93	0.00
Shop and machine shed					56.49	56.49	0.02
Miscellaneous and overhead					200.00	200.00	0.06
Interest: operating capital		6 months			90.47	90.47	0.03
Total variable costs			1,206.35	187.20	4,728.46	6,122.01	1.70
FIXED CASH COSTS				Unit	Total	Cost/lb	
Compliance				acre	57.00	0.01	
Pickup & ATV insurance				acre	68.81	0.02	
Property insurance				acre	25.00	0.01	
Property taxes				acre	30.00	0.01	
Total fixed cash costs					180.81	0.05	
FIXED NON-CASH COSTS				Unit	Total	Cost/lb	
Mach. & equip. - dep., & int.				acre	211.27	0.06	
Pickup & ATV - dep. & int				acre	49.65	0.01	
Irrig. & trellis - dep. & int.				acre	354.22	0.10	
Shop & machine shed				acre	198.95	0.06	
Land interest charge				acre	900.00	0.25	
Int. on prior year's establishment costs				acre	1,252.27	0.35	
Total fixed non-cash costs					2,966.36	0.82	
Total fixed costs					3,147.17	0.87	
Total of all costs per acre					\$9,269	2.57	
Net projected returns					-\$3,869	-1.07	

Table 12. Year 4, Blueberry Establishment, Hand Harvested, \$/acre economic costs and returns.

TOTAL GROSS INCOME		Quantity	Unit	\$/Unit	Total		
Blue berries, fresh market		7,200	lbs	1.50	10,800		
Total gross income					10,800		
VARIABLE CASH COSTS		Description	Labor	Machinery	Materials	Total	Cost/lb
Pruning and brush mgmt		60 hr / acre @ \$17.8219674854179 / hr	1,069.32			1,069.32	0.15
Soil sample		0.2 x / acre			8.00	8.00	0.00
Weed Control						\$201.15	0.03
Herbicide sprayer		2 x / acre	19.50	10.36			
Spot spray		2 x / acre	71.29				
Spot spray labor		2 hrs / acre @ \$17.8219674854179 / hr					
Herbicide		\$100 / acre			100.00		
Sawdust application						997.50	0.14
Sawdust		11 units @ \$85 / unit			935.00		
Loader rental		\$1250 / 20 acre farm			62.50		
Disease and insect control						599.34	0.08
Pesticide applications		10 x / acre	147.86	101.48			
Fungicide		\$250 / acre			250.00		
Insecticide		\$100 / acre			100.00		
Fertilization						417.41	0.06
Spreader application		2 x / acre	9.24	4.70			
Fertigation labor		3 hrs / acre @ \$17.8219674854179 / hr	53.47				
Fertilizer		\$350 / acre			350.00		
Bird control						167.82	0.02
Labor		1 hr / acre @ \$17.8219674854179 / hr	17.82				
Equipment		\$150 / acre			150.00		
Harvest						5,914.00	0.82
Contract harvest		\$0.75 / lb.			5,400.00		
Load & haul berries		\$0.03 / lb.			216.00		
Berry commission fee		\$0.04 / lb.			288.00		
Tissue analysis		0.2 x / acre			10.00		
Irrigation						228.47	0.03
Labor		3 hrs / acre @ \$17.8219674854179 / hr	53.47				
Repairs & maint.		\$25 / acre			25.00		
Water and power		\$150 / acre			150.00		
Trellis						34.82	0.00
Repair & maint.		\$17 / acre			17.00		
Labor		1 hrs / acre @ \$17.8219674854179 / hr	17.82				
Bee hives		3 hives @ \$80 / hive			240.00	240.00	0.03
IPM scouting		5 hrs / acre @ \$17.8219674854179 / hr	89.11			89.11	0.01
Flail mow		5 x / acre	43.49	24.61		68.09	0.01
Portable toilet		0.75 unit / acre			37.50	37.50	0.01
Pickup				42.12		42.12	0.01
ATV				3.93		3.93	0.00
Shop and machine shed					56.49	56.49	0.01
Miscellaneous and overhead					200.00	200.00	0.03
Interest: operating capital		6 months			155.63	155.63	0.02
Total variable costs			1,592.38	187.20	8,751.11	10,530.69	1.46
FIXED CASH COSTS					Unit	Total	Cost/lb
Compliance					acre	57.00	0.02
Pickup & ATV insurance					acre	68.81	0.01
Property insurance					acre	25.00	0.00
Property taxes					acre	30.00	0.00
Total fixed cash costs						180.81	0.03
FIXED NON-CASH COSTS					Unit	Total	Cost/lb
Mach. & equip. - dep., & int.					acre	211.27	0.03
Pickup & ATV - dep. & int.					acre	49.65	0.01
Irrig. & trellis - dep. & int.					acre	354.22	0.05
Shop & machine shed					acre	198.95	0.03
Land interest charge					acre	900.00	0.13
Int. on prior year's establishment costs					acre	1,484.42	0.21
Total fixed non-cash costs						3,198.51	0.44
Total fixed costs						3,379.32	0.47
Total of all costs per acre						\$13,910	1.93
Net projected returns						-\$3,110	-0.43

Table 13. Year 5, Blueberry Establishment, Hand Harvested, \$/acre economic costs and returns.

TOTAL GROSS INCOME		Quantity	Unit	\$/Unit	Total		
Blue berries, fresh market		10,800	lbs	1.50	16,200		
Total gross income					16,200		
VARIABLE CASH COSTS		Description	Labor	Machinery	Materials	Total	Cost/lb
Pruning and brush mgmt		85 hr / acre @ \$18.356	1,560.31			1,560.31	0.14
Weed Control						\$203.29	0.02
Herbicide sprayer		2 x / acre	19.50	10.36			
Spot spray		2 x / acre	73.43				
Spot spray labor		2 hrs / acre @ \$18.3566265099805 / hr					
Herbicide		\$100 / acre			100.00		
Disease and insect control						599.34	0.06
Pesticide applications		10 x / acre	147.86	101.48			
Fungicide		\$250 / acre			250.00		
Insecticide		\$100 / acre			100.00		
Fertilization						419.01	0.04
Spreader application		2 x / acre	9.24	4.70			
Fertigation labor		3 hrs / acre @ \$18.356	55.07				
Fertilizer		\$350 / acre			350.00		
Bird control						168.36	0.02
Labor		1 hr / acre @ \$18.3566	18.36				
Equipment		\$150 / acre			150.00		
Harvest						8,866.00	0.82
Contract harvest		\$0.75 / lb.			8,100.00		
Load & haul berries		\$0.03 / lb.			324.00		
Berry commission fee		\$0.04 / lb.			432.00		
Tissue analysis		0.2 x / acre			10.00		
Irrigation						230.07	0.02
Labor		3 hrs / acre @ \$18.356	55.07				
Repairs & maint.		\$25 / acre			25.00		
Water and power		\$150 / acre			150.00		
Trellis						35.36	0.00
Repair & maint.		\$17 / acre			17.00		
Labor		1 hrs / acre @ \$18.356	18.36				
Bee hives		3 hives @ \$80 / hive			240.00	240.00	0.02
IPM scouting		5 hrs / acre @ \$18.356	91.78			91.78	0.01
Flail mow		5 x / acre	43.49	24.61		68.09	0.01
Portable toilet		0.75 unit / acre			37.50	37.50	0.00
Pickup				42.12		42.12	0.00
ATV				3.93		3.93	0.00
Shop and machine shed					56.49	56.49	0.01
Miscellaneous and overhead					200.00	200.00	0.02
Interest: operating capital		6 months			192.32	192.32	0.02
Total variable costs			2,092.46	187.20	10,734.31	13,013.98	1.20
FIXED CASH COSTS				Unit	Total	Cost/lb	
Compliance				acre	57.00	0.01	
Pickup & ATV insurance				acre	68.81	0.01	
Property insurance				acre	25.00	0.00	
Property taxes				acre	30.00	0.00	
Total fixed cash costs					180.81	0.02	
FIXED NON-CASH COSTS				Unit	Total	Cost/lb	
Mach. & equip. - dep., & int.				acre	211.27	0.02	
Pickup & ATV - dep. & int				acre	49.65	0.00	
Irrig. & trellis - dep. & int.				acre	354.22	0.03	
Shop & machine shed				acre	198.95	0.02	
Land interest charge				acre	900.00	0.08	
Int. on prior year's establishment costs				acre	1,671.02	0.15	
Total fixed non-cash costs					3,385.11	0.31	
Total fixed costs					3,565.92	0.33	
Total of all costs per acre					\$16,580	1.54	
Net projected returns					-\$380	-0.04	

Table 14. Year 6, Blueberry Establishment, Hand Harvested, \$/acre economic costs and returns.

TOTAL GROSS INCOME		Quantity	Unit	\$/Unit	Total		
Blue berries, fresh market		14,400	lbs	1.50	21,600		
Total gross income					21,600		
VARIABLE CASH COSTS		Description	Labor	Machinery	Materials	Total	Cost/lb
Pruning and brush mgmt		100 hr / acre @ \$18.9073	1,890.73			1,890.73	0.13
Weed Control						\$205.49	0.01
Herbicide sprayer		2 x / acre	19.50	10.36			
Spot spray		2 x / acre	75.63				
Spot spray labor		2 hrs / acre @ \$18.9073253052799 / hr					
Herbicide		\$100 / acre			100.00		
Disease and insect control						599.34	0.04
Pesticide applications		10 x / acre	147.86	101.48			
Fungicide		\$250 / acre			250.00		
Insecticide		\$100 / acre			100.00		
Fertilization						420.66	0.03
Spreader application		2 x / acre	9.24	4.70			
Fertigation labor		3 hrs / acre @ \$18.90732	56.72				
Fertilizer		\$350 / acre			350.00		
Bird control						168.91	0.01
Labor		1 hr / acre @ \$18.907325	18.91				
Equipment		\$150 / acre			150.00		
Harvest						11,818.00	0.82
Contract harvest		\$0.75 / lb.			10,800.00		
Load & haul berries		\$0.03 / lb.			432.00		
Berry commission fee		\$0.04 / lb.			576.00		
Tissue analysis		0.2 x / acre			10.00		
Irrigation						231.72	0.02
Labor		3 hrs / acre @ \$18.90732	56.72				
Repairs & maint.		\$25 / acre			25.00		
Water and power		\$150 / acre			150.00		
Trellis						35.91	0.00
Repair & maint.		\$17 / acre			17.00		
Labor		1 hrs / acre @ \$18.90732	18.91				
Bee hives		3 hives @ \$80 / hive			240.00	240.00	0.02
IPM scouting		5 hrs / acre @ \$18.90732	94.54			94.54	0.01
Flail mow		5 x / acre	43.49	24.61		68.09	0.00
Portable toilet		0.75 unit / acre			37.50	37.50	0.00
Pickup				42.12	0.00	42.12	0.00
ATV				3.93	0.00	3.93	0.00
Shop and machine shed					56.49	56.49	0.00
Miscellaneous and overhead					200.00	200.00	0.01
Interest: operating capital		6 months			241.70	241.70	0.02
Total variable costs			2,432.25	187.20	13,735.69	16,355.13	1.14
FIXED CASH COSTS				Unit	Total	Cost/lb	
Compliance				acre	57.00	0.01	
Pickup & ATV insurance				acre	68.81	0.00	
Property insurance				acre	25.00	0.00	
Property taxes				acre	30.00	0.00	
Total fixed cash costs					180.81	0.01	
FIXED NON-CASH COSTS				Unit	Total	Cost/lb	
Mach. & equip. - dep., & int.				acre	211.27	0.01	
Pickup & ATV - dep. & int				acre	49.65	0.00	
Irrig. & trellis - dep. & int.				acre	354.22	0.02	
Shop & machine shed				acre	198.95	0.01	
Land interest charge				acre	900.00	0.06	
Int. on prior year's establishment costs				acre	1,693.82	0.12	
Total fixed non-cash costs					3,407.90	0.24	
Total fixed costs					3,588.71	0.25	
Total of all costs per acre					\$19,944	1.38	
Net projected returns					\$1,656	0.12	

Table 15. Full production, Blueberry Establishment, Hand Harvested, \$/acre economic costs and returns.

TOTAL GROSS INCOME						
	Quantity	Unit	\$/Unit	Total		
Blue berries, fresh market	16,200	lbs	1.50	24,300		
Blue berries, processed market	1,800	lbs	0.40	720		
Total gross income	18,000			25,020		
VARIABLE CASH COSTS						
	Description	Labor	Machinery	Materials	Total	Cost/lb
Pruning and brush mgmt	100 hr / acre @ \$19.4745450644383 / hr	1,947.45			1,947.45	0.11
Soil sample (every 4th yr)	0.2 x / acre			2.00	2.00	
Sawdust ap. (every 3rd yr)					328.65	
Sawdust	3.67 units @ \$85 / unit			311.95		
Loader rental	\$334 / 20 acre farm			16.70		
Weed Control					\$207.76	0.01
Herbicide sprayer	2 x / acre	19.50	10.36			
Spot spray	2 x / acre	77.90				
Spot spray labor	2 hrs / acre @ \$19.4745450644383 / hr					
Herbicide	\$100 / acre			100.00		
Disease and insect control					599.34	0.03
Pesticide applications	10 x / acre	147.86	101.48			
Fungicide	\$250 / acre			250.00		
Insecticide	\$100 / acre			100.00		
Fertilization					422.36	0.02
Spreader application	2 x / acre	9.24	4.70			
Fertigation labor	3 hrs / acre @ \$19.4745450644383 / hr	58.42				
Fertilizer	\$350 / acre			350.00		
Bird control					169.47	0.01
Labor	1 hr / acre @ \$19.4745450644383 / hr	19.47				
Equipment	\$150 / acre			150.00		
Harvest					13,420.00	0.75
Contract hand harvest	\$0.75 / lb.			12,150.00		
Load & haul berries	\$0.03 / lb.			540.00		
Berry commission fee	\$0.04 / lb.			720.00		
Tissue analysis	0.2 x / acre			10.00		
Irrigation					233.42	0.01
Labor	3 hrs / acre @ \$19.4745450644383 / hr	58.42				
Repairs & maint.	\$25 / acre			25.00		
Water and power	\$150 / acre			150.00		
Trellis					36.47	0.00
Repair & maint.	\$17 / acre			17.00		
Labor	1 hrs / acre @ \$19.4745450644383 / hr	19.47				
Bee hives	3 hives @ \$80 / hive			240.00	240.00	0.01
IPM scouting	5 hrs / acre @ \$19.4745450644383 / hr	97.37			97.37	0.01
Flail mow	5 x / acre	43.49	24.61		68.09	0.00
Portable toilet	0.75 unit / acre			37.50	37.50	0.00
Pickup				42.12	42.12	0.00
ATV				3.93	3.93	0.00
Shop and machine shed				56.49	56.49	0.00
Miscellaneous and overhead				200.00	200.00	0.01
Interest: operating capital	6 months			271.69	271.69	0.02
Total variable costs		2,498.61	187.20	15,698.33	18,384.13	1.02
FIXED CASH COSTS						
				Unit	Total	Cost/lb
Compliance				acre	57.00	0.01
Pickup & ATV insurance				acre	68.81	0.00
Property insurance				acre	25.00	0.00
Property taxes				acre	30.00	0.00
Total fixed cash costs					180.81	0.01
FIXED NON-CASH COSTS						
				Unit	Total	Cost/lb
Mach. & equip. - dep., & int.				acre	211.27	0.01
Pickup & ATV - dep. & int.				acre	49.65	0.00
Irrig. & trellis - dep. & int.				acre	354.22	0.02
Shop & machine shed				acre	198.95	0.01
Land interest charge				acre	900.00	0.05
Amortized establishment costs				acre	3,906.98	0.22
Total fixed non-cash costs					5,621.07	0.31
Total fixed costs					5,801.88	0.32
Total of all costs per acre					\$24,186	1.34
Net projected returns					\$834	0.05

Appendix B

A look at the Oregon Blueberry Industry

Production Numbers, Fresh Market and Processed Market (million pounds)

Oregon Blueberry Fresh Market Production:

Year	Quantity
2018	48.6
2017	45.1
2016	40.5
2015	33.1
2014	34.4
2013	37.2
2012	38.1
2011	32.3
2010	24.6
2009	20.8
2008	19.6
2007	16.8
2006	13.9
2005	13.8
2004	13.4
2003	10.4
2002	11.0
2001	10.9
2000	9.0
1999	7.5
1998	8.0
1997	6.5
1996	6.0
1995	6.0

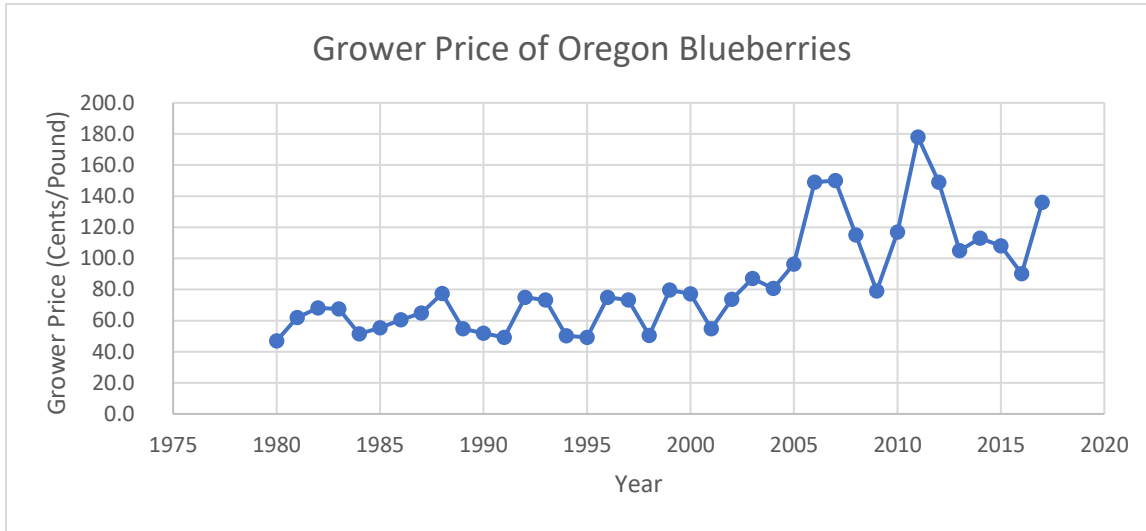
Oregon Blueberry Processed Market Production:

Year	Quantity
2018	74.7
2017	52.4
2016	65.1
2015	57.9
2014	48.1
2013	47.5
2012	34.7
2011	28.6
2010	27.2
2009	23.7
2008	23.7
2007	28.2
2006	21.7
2005	20.7
2004	20.6
2003	13.5
2002	15.5
2001	17.6
2000	19.0
1999	15.0
1998	15.0
1997	14.5
1996	11.0
1995	8.0

Source: USDA/NASS Fr Nt 1-3, Oregon (95 – 08)

Oregon Blueberry facts at a glance. Oregon Blueberry Commission. Retrieved from <https://www.oregonblueberry.com/pages/facts.html>

Grower Price – Weighted Average Price of Fresh and Processed Blueberries



Source: USDA/ERS Fruit Yearbook Table. Various states. Table D-2.

Year	Growers price (Cents/pound) Weighted Average Price of Fresh and Processed Blueberries
1995	49.3
1996	75.0
1997	73.3
1998	50.4
1999	79.7
2000	77.2
2001	54.8
2002	73.7
2003	87.0
2004	80.6
2005	96.4
2006	149.0
2007	150.0
2008	115.0
2009	79.0
2010	117.0
2011	178.0
2012	149.0
2013	105.0
2014	113.0
2015	108.0
2016	90.1
2017	136.0
2018	134.0

Source: USDA/ERS Fruit Yearbook Table. Various states. Table D-2.

Operation Scale

Currently the majority of Oregon blueberry farms are 20 acres or less, but the range of blueberry farm scale is quite broad, stretching from less than 5 acres to over 1,500 acres. Further, a bi-modal distribution appears to be emerging – a large number of smaller operations reliant upon hand harvesting and direct-to-consumer marketing such as farm stands and U-pick operations; and then, a large volume of total production coming from much bigger farms reliant on mechanical harvesting and commercial sales to large-scale downstream buyers.

Organic vs. Conventional

Organic Operations continue to grow. Organic production accounted for about 20 percent of the total crop in 2018. This is compared to about 2 percent in 2008. The Northwest region produces about half of the nation’s organic blueberry crop.

National Ranking of Oregon Blueberry Production

Years	Rank	% of US
2017	2	21%
2018	1	24%

Source: USDA/NASS. *Blueberry Harvested Acres, Yield, Production, Price, & Value of Utilized Production, by State.*

Top 10 Blueberry Producing states: 2016

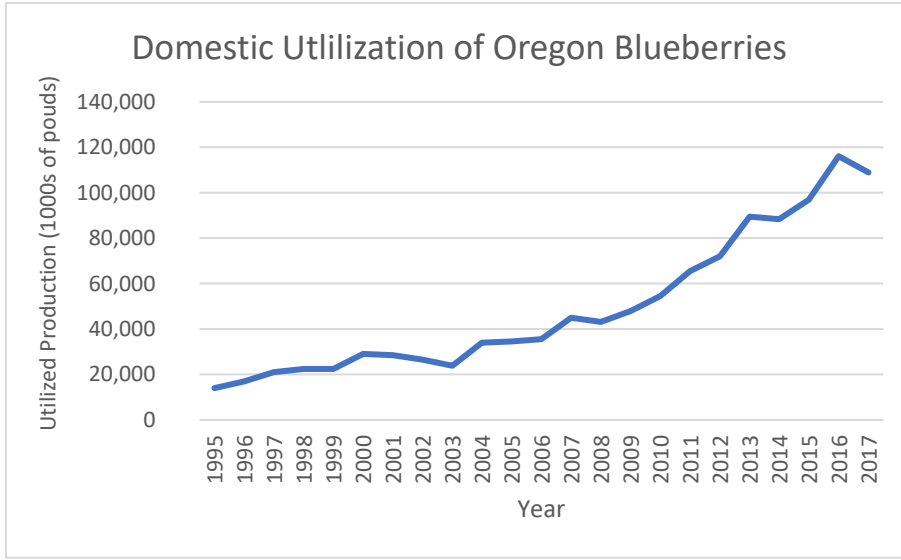
Rank	State	Pounds (millions of lbs.)
1	Washington	96.1
2	Georgia	92.0
3	Michigan	92.0
4	Oregon	86.1
5	New Jersey	56.68
6	California	53.35
7	North Carolina	48.5
8	Florida	16.0
9	Mississippi	8.55
10	Indiana	2.0

Source: Burton, James. (2017, April). *Top 10 Blueberry Producing States in America.*



Source: Author’s Creation, *Top 10 Blueberry Producing States in 2016*

Domestic Utilization of Oregon Blueberries – (Graph)



Source: USDA/ERS Fruit Yearbook Table. Various states. Table D-2.

Domestic Utilization of Oregon Blueberries – (Table)

Year	Utilized Production (1000 pounds)
1995	6,300
1996	8,190
1997	8,710
1998	10,500
1999	10,880
2000	12,410
2001	15,000
2002	13,650
2003	13,200
2004	18,000
2005	19,600
2006	19,000
2007	29,600
2008	32,000
2009	39,000
2010	42,000
2011	61,000
2012	70,000
2013	81,600
2014	95,800
2015	103,950
2016	119,650
2017	117,150
2018	136,100

Source: USDA/ERS Fruit Yearbook Table. Various states. Table D-2.

Appendix C

Mechanical Harvester Investments and Blueberry Operation Size.

This appendix analyzes the feasibility of investing in a mechanical harvester machine at several different operation sizes (20, 50, and 100 acres). The analysis determines the current ratio, operating profit margin¹, and debt to asset ratio. All assumptions used in this analysis match the assumptions determined and used in the enterprise budget.

There are economies of scale related to mechanical harvesting. Smaller operations are unlikely to recoup the cost of a mechanical harvester. This analysis determines that a blueberry operation of 100 acres is able to purchase the harvesting equipment out of cash flows without dramatically impacting the operation's Debt-To-Asset ratio.

Assumptions

Balance Sheet Assumptions			
Acres of Operation	20	50	100
Machine Purchase (\$/Acre)	\$10,500	\$ 4,200	\$2,100
Salvage Value (10%) (\$/Acre)	\$1,050	\$420	\$210
R & M + Fuel Costs (5%) (\$/Acre)	\$21	\$53	\$105
Whole Farm Expenses	\$100,000	\$100,000	\$200,000
Operating Line of Credit (\$)	\$145,000	\$372,400	\$733,403
Beginning Cash Balance	\$25,000	\$25,000	\$50,000
Intermediate Asset (machinery)	\$103,330	\$103,330	\$206,660
L-T Asset (Shop & Other Buildings)	\$42,633	\$ 42,633	\$42,633
Blueberry Land Price (\$/Acre) w/ mature plants	\$25,000	\$25,000	\$25,000

Balance Sheet Assumptions cont.	
Operating Line of Credit	8.5% Interest, 100% Borrowed Funds, 6 Months
Financing Harvesting Machine	\$210,000 purchase price; 6% interest; 10 year loan; no trade in.
Inflation for current, intermediate & long term assets	2%/year
Inflation for land values	0%/year

¹ **Operating profit margin** is the ratio of operating profit to gross farm income. Operating profit measures the funds available to finance a farm's ongoing operation. Industry standards suggests that a margin less than 10 suggests the farm is operating in the "critical zone" and indicates potential profitability problems.

Budget Assumptions	
Discount Rate	8.50%
Blueberry Price, Returns to Grower - Inflation	1.00%
Harvest Labor Costs - Inflation	3.00%
Labor Costs - Inflation	3.00%
Production Costs - Inflation	2.00%
Repairs & Maintenance + ((Fuel Costs) – Inflation)	2.00%

Results

	Fresh Market Yield	Processed market Yield
Mechanical Harvest	40%	60%
Hand Labor Harvest	90%	10%

	Current Ratio	Operating Profit Margin	Debt – to – Asset Ratio
20-Acre Cash	0	-52.88	0
50-Acre Cash	0	8.14	0
100-Acre Cash	0	21.58	0
20-Acre Finance	13.38	11.44	21.35
50-Acre Finance	25.48	32	32.55
100-Acre Finance	36.35	29.76	27.28

