2022 COST ESTIMATES OF PRODUCING AND PACKING CONVENTIONAL 'DRAPER' BLUEBERRIES IN WESTERN WASHINGTON

Preface

The results presented in this WSU publication serve as a general guide for evaluating the feasibility of producing conventional 'Draper' blueberries in western Washington in 2022. The primary use of this publication is identifying inputs, costs, and yields considered typical of well-managed 'Draper' blueberry fields. This publication is not intended to be a definitive guide to production practices, but it is meant to help estimate the physical and financial requirements of comparable plantings. Specific budget assumptions were adopted for this study. Still, 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
- Conventional 'Draper' 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 about 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 farm operation.

Conventional 'Draper' Blueberry Production in Western Washington

In 2021, Washington State was the largest producer of conventional highbush blueberries (*Vaccinium corymbosum*) in volume, at 180 million pounds, representing 27% of the total US production. Oregon was second with 151 million pounds, 23% of total production, and Georgia was third with 86.5 million pounds, 13% of total US production (USDA NASS 2022).

Conventional blueberry production in Washington State has steadily increased from 61 million pounds in 2011 to 180 million in 2021. In 2021, 65% of Washington's production was destined for processing and 35% for fresh markets (USDA NASS 2022).

Blueberry yield per acre in Washington State increased 2% from 8,710 lb/acre to 8,910 lb/acre between 2011 and 2021. Other states have seen larger yield per acre increases. For instance, for the same period, Oregon's yield per acre increased by 24% from 8,400 to 10,400 lb/acre, and Michigan increased by 20% from 3,750 to 4,500 lb/acre (USDA NASS 2022).

In 2021, the season's average grower price of blueberries in Washington was $1.27/lb, which was lower than the US average price of $1.55/lb. In other states where a greater volume is destined for the fresh market, average prices were higher; for example, California's average price during that same time period was $3.01/lb and Florida's was $3.03/lb (USDA NASS 2022).

Washington State has two major production regions divided by the Cascade Range—western and eastern. The mountain range creates distinct climates that impact production practices within each region (DeVetter et al. 2015). The harvest season begins in June and ends in October. Blueberries in the eastern region ripen early in the season, while ripening in the western region occurs slightly later but is also dependent on cultivar, season, and management (Fresh Fruit Portal 2022).

'Draper' is a blueberry cultivar developed by the Michigan State University breeding program. This cultivar ripens in the early midseason with harvest between 'Duke' and 'Bluecrop' (Weber 2012). 'Draper' has high fresh market quality and good storage capability. The plants are vigorous and upright. The berries are moderately large and unusually regular. They have small, dry picking scars. Also, they exhibit an excellent blue color, acceptable flavor, and firmness (US Patent and Trademark Office 2022).

Study Objectives

This publication is designed to enable growers to estimate: (1) the costs of equipment, materials, supplies, and labor required to produce conventional 'Draper' blueberries, including packing costs, and (2) the ranges of price and yield at which 'Draper' 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 'Draper' blueberry growers in western Washington. Their production practices and input requirements form the baseline assumptions used to develop the enterprise budget. Additionally, the data represent what these owner-operators anticipate would occur over an orchard's life if no unforeseen failures occur. The pesticide programs are based on what most growers sprayed for and the most common products used for each purpose.

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 costs and returns.

Budget Assumptions

1. The area of the total farm operation is 100 acres of diverse crops (e.g., blueberries, raspberries, apples, blackberries, strawberries, vegetables, and other horticultural crops), of which 67 acres are planted with blueberries.
2. This budget is based on a 26-acre field of 'Draper' blueberries within a 100-acre farm. It is assumed that 1 acre of this block is dedicated to roads, ponds, loading areas, buildings, etc., rather than fruit production. Therefore, the total productive area for this block is 25 acres. Table 1 shows the assumed production specifications generally accepted by all growers interviewed.
3. The total value of bare agricultural land (including water rights) is $20,000 per acre, with annual property taxes of $150 per acre.
4. The irrigation infrastructure consists of a dual drip irrigation system. Water is provided through a public irrigation district.
5. The pond is installed in Year 1.
6. Cultural practices and harvest activities are completed using a combination of manual labor and labor-enhancing equipment. The following information refers to 2022: the hourly manual labor rate is calculated using the Washington adverse wage rate 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 cost $23.01/hour (i.e., the base of $17.41/hour plus 25%). Harvest labor rates follow the Department of Labor rates, plus 4%, to account for mandated rest breaks. These labor rates are assumed to be the same for all years of production.
7. The free on board (FOB) price or gross return (i.e., the return before all expenses, including packing charges, are subtracted) is $2.25/lb for fresh-market blueberries and $1.25/lb for processing blueberries.
8. All blueberries are mechanically harvested starting in Year 3. Prior to that, it is assumed the orchard is establishing and fruit will not be produced. Of the gross yield (after accounting for the 15% loss induced by the mechanical harvester), 35% goes to the fresh market, and 65% goes to processing.
9. Management is valued at $760 per acre. This value represents what the producer group felt was a fair return for an operator's management skills.
10. Interest in the 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 the interest in funds borrowed to finance the field, equipment, and building purchases.

Table 1. 'Draper' blueberry production specifications in western Washington.

In-row Spacing	3 feet
Between-row Spacing	10 feet
Cultivar	'Draper'
Block Size	25 acres
Life of Planting	25 years (6 years of establishment, 19 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 25-acre conventional 'Draper' blueberry enterprise in western 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, repairs, and packing costs.

Fixed costs are incurred whether or not ‘Draper’ blueberries are produced. These costs will generally be calculated for the whole farm enterprise and allocated across each production unit. The fixed costs include capital depreciation, 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 conventional ‘Draper’ blueberries on a 40-acre field in western Washington.

	Establishment Years						Full
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Production[a]
Estimated Gross Production, Fresh (lb/acre)[b]			1,071.00	2,142.00	3,213.00	4,284.00	4,819.50
Estimated FOB Price, Fresh ($/lb)[c]			2.25	2.25	2.25	2.25	2.25
Estimated Gross Production, Processing (lb/acre)[b]			1,989.00	3,978.00	5,967.00	7,956.00	8,950.50
Estimated FOB Price, Processing ($/lb)[c]			1.25	1.25	1.25	1.25	1.25
Total Returns			**4,890.65**	**9,781.29**	**14,671.94**	**19,562.58**	**22,007.90**
Variable Costs (VC):							
Establishment							
Soil Preparation[d]	1,817.00	0.00	0.00	0.00	0.00	0.00	376.70
Plants (including labor)	6,315.20						
Cover Crop (including labor)	230.00						
Field Activities							
Pruning	130.56	152.32	261.12	326.40	718.08	718.08	826.88
Weed Control[e]	122.09	122.09	122.09	122.09	122.09	122.09	122.09
Chemicals[f]	189.67	316.67	448.35	491.35	491.35	491.35	491.35
Fertilizer[g]	393.72	393.72	468.72	468.72	468.72	468.72	468.72
Irrigation Water & Electric Charge	50.00	50.00	50.00	50.00	50.00	50.00	50.00
Irrigation Labor	69.03	69.03	69.03	69.03	69.03	69.03	69.03
Beehives			275.00	275.00	275.00	275.00	275.00
IPM Scouting	23.01	23.01	34.52	34.52	34.52	34.52	34.52
Bird Control			100.00	100.00	100.00	100.00	100.00
General Farm Labor[h]	50.00	50.00	50.00	50.00	50.00	50.00	50.00
Harvest Activities[i]							
Hand Harvest			535.50	1,071.00	1,606.50	2,142.00	2,409.75
Mechanical Harvest Labor			30.00	59.54	89.54	89.54	134.31
Loading and Hauling			91.80	183.60	275.40	367.20	413.10
Packing and Handling Charges[j]			1,430.55	2,861.10	4,291.65	5,722.20	6,437.48
Maintenance and Repairs							
Maintenance & Repair	0.00	125.85	142.85	142.85	142.85	142.85	142.85
Fuel & Lube	150.00	150.00	150.00	150.00	150.00	150.00	150.00
Other Variable Costs							
Commission Fees[k]			39.78	79.56	119.34	159.12	179.01
Overhead (7% of VC)[l]	667.82	101.69	300.95	457.43	633.78	780.62	891.15
Interest (5% of VC)	510.40	77.72	230.01	349.61	484.39	596.62	340.55
Total Variable Costs	10,718.50	1,632.09	4,830.26	7,341.80	10,172.24	12,528.93	13,962.48
Fixed Costs:							
Depreciation							
Irrigation System	129.45	129.45	129.45	129.45	129.45	129.45	129.45
Machinery, Equipment & Building	272.53	272.53	272.53	272.53	272.53	272.53	272.53

	Establishment Years						Full
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Production[a]
Mechanical Harvester					223.88	223.88	223.88
Mainline/Well & Pump	11.40	11.40	11.40	11.40	11.40	11.40	11.40
Pond	12.00	12.00	12.00	12.00	12.00	12.00	12.00
Trellis		112.18	112.18	112.18	112.18	112.18	112.18
Interest							
Irrigation System	80.91	80.91	80.91	80.91	80.91	80.91	80.91
Land[m]	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00
Machinery, Equipment & Building	114.36	114.36	114.36	114.36	114.36	114.36	114.36
Mechanical Harvester					275.00	275.00	275.00
Mainline/Well & Pump	7.13	7.13	7.13	7.13	7.13	7.13	7.13
Pond	7.50	7.50	7.50	7.50	7.50	7.50	7.50
Trellis		70.11	70.11	70.11	70.11	70.11	70.11
Establishment Costs (5%)		670.44	929.19	1,116.26	1,193.73	1,197.01	
Other Fixed Costs							
Miscellaneous Supplies	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Land & Property Taxes	150.00	150.00	150.00	150.00	150.00	150.00	150.00
Insurance Cost (all farm)	125.00	125.00	125.00	125.00	125.00	125.00	125.00
Management Cost	760.00	760.00	760.00	760.00	760.00	760.00	760.00
Amortized Establishment Costs[n]							1,776.94
Total Fixed Costs	2,690.28	3,543.01	3,801.77	3,988.84	4,565.18	4,568.46	5,148.39
TOTAL COSTS	**13,408.78**	**5,175.10**	**8,632.03**	**11,330.63**	**14,737.42**	**17,097.38**	**19,110.87**
ESTIMATED NET RETURNS	**(13,408.78)**	**(5,175.10)**	**(3,741.38)**	**(1,549.34)**	**(65.49)**	**2,465.20**	**2,897.03**
Accumulated Establishment Costs	13,408.78	18,583.88	22,325.27	23,874.61	23,940.10	21,474.91	

[a] The full production year is representative of all the remaining years the blueberries are in full production (Year 7 to Year 25).
[b] Blueberries are mechanically harvested: 35% of the total yield goes to the fresh market and 65% goes to processing.
[c] These prices reflect the gross return, which is the return before any expenses (including packing charges for fresh-market blueberries and handling charges for processing) are subtracted.
[d] Soil analysis and sulfur application are done in Year 1 only. Sawdust application is done in Year 1 and during full production as part of soil maintenance.
[e] Includes use of herbicides (materials and labor) and hand weeding labor.
[f] Includes insecticides, fungicides, and rodenticides (material and application).
[g] Includes dry and liquid fertilizer costs (material and application), and tissue analysis for fertilizer management program.
[h] General farm labor rate is a lump sum per acre and applied to miscellaneous/all other labor. The rate includes applicable taxes and benefits.
[i] Mechanical harvest crew includes one driver and three workers with rates of $23.01/hour and $21.76/hour, respectively. The loading and hauling rate to packinghouse is $0.03/lb.
[j] Packing charge for fresh blueberries is $0.50/lb; handling charge for processing blueberries is $0.45/lb.
[k] 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.
[l] Captures indirect costs of operation that fluctuate with the level of conventional blueberry production but are not accounted for by the variable costs already identified. Also captures unforeseeable expenses.
[m] Land cost is approximated by using the 5% interest rate multiplied by the land value of $20,000 per acre.
[n] 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 6 amortized at 5% for 19 years.

This study assumed that a ‘Draper’ blueberry field could achieve full production in the seventh year. Based on the above assumptions, the total production costs are estimated at $19,111 per acre. The net returns during full production are about $2,897 per acre. Table 3 shows the sensitivity of net returns to different combinations of processing prices and yields. For this analysis, the FOB processing prices are $0.75–$1.50 per pound. The gross yields are 12,200 to 20,200 pounds per acre, given that 65% of gross yield (after accounting for mechanical harvester-induced losses) goes to the processing market. Based on the study's production and cost assumptions, a gross yield-processing price combination of 16,200 pounds per acre or greater and $1 per pound or higher would result in positive net returns for the owner-operator.

Table 4 shows the break-even return given different levels of enterprise costs during full production. As of 2022, the first break-even processing return of conventional ‘Draper’ blueberries was about $0.35 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 produce 'Draper' blueberries (shutdown price). The second break-even return is about $0.38 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 $0.47 per pound, which is required to cover the cash costs plus the 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 $0.93 per pound. When this return is received, the owner-operator will recover all out-of-pocket expenses plus realize a competitive return on equity capital invested in land, the 'Draper' 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.

Table 3. Estimated net returns per acre at various prices and yields of conventional 'Draper' blueberries during full production in western Washington.

Gross Yield (lb/acre)	Net Yield—Fresh (lb/acre)	Net Yield—Processing (lb/acre)[a]	FOB Price, Processing ($/lb)[b] $640	$690	$740	$790
			Estimated Net Returns ($/lb)			
12,200	3,630	6,741	(3,351)	(1,666)	19	1,704
14,200	4,225	7,846	(2,465)	(503)	1,458	3,419
16,200	4,820	8,951	(1,578)	659	2,897	5,135
18,200	5,415	10,056	(692)	1,822	4,336	6,850
20,200	6,010	11,161	195	2,985	5,775	8,565

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 processing market (as % of gross yield after accounting for mechanical harvester induced loss) is 65%.

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

Table 4. Break-even return of conventional 'Draper' blueberries for processing given different levels of enterprise costs during full production in western Washington.

		Cost ($/acre)	Break-even Return ($/bin)[a]
1.	Total Variable Costs	13,962.48	0.35[b]
2.	Total Cash Costs[c] = Total Variable Costs + Land & Property Taxes + Insurance Cost + Miscellaneous Supplies	14,257.48	0.38[d]
3.	Total Cash Costs + Depreciation Costs	15,018.93	0.47[e]
4.	Total Costs = Total Cash Costs + Depreciation Costs + Interest Costs[f] + Management Cost	19,110.87	0.93[g]

[a] Break-even (BE) return of 'Draper' blueberries for processing is calculated as BE Return = [Cost − (Price of fresh-market 'Draper' × Net yield of fresh-market 'Draper')] ÷ Net yield of processing 'Draper'. 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, 'Draper' blueberries are uneconomical to produce.

[c] If there are other cash costs from 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.

Most of the budget values in Table 2 are based on more comprehensive underlying cost data, shown in Tables 5 through 8. Table 5 presents the annual capital requirements for a 25-acre conventional 'Draper' blueberry field. Table 6 specifies the machinery and building requirements for the 100-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, non-cash expenses calculated over the asset's useful life. These expenses represent an asset's loss of value due to use, age, and obsolescence.

The key results of this enterprise budget are formed by production-related assumptions established for the study.

Production costs and returns for individual owner-operators may differ; thus, the results cannot be generalized to represent all 'Draper' blueberry operations in western Washington. An interactive Excel Workbook, described below, enables individual owner-operators to estimate their returns based on their production costs.

Table 5. Summary of annual capital requirements for a 25-acre conventional 'Draper' blueberry field in western Washington.

	Establishment Years						Full Production[a]
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	
Annual Requirements ($)							
Land (41 acres)	520,000						
Trellis System		70,112					
Irrigation System	80,908						
Mainline & Pump	7,125						
Pond	7,500						
Mechanical Harvester			93,284				
Operating Expenses[b]	294,337	67,177	147,132	209,920	280,681	339,598	375,437
Total Requirements ($)	909,870	137,289	240,415	209,920	280,681	339,598	375,437
Receipts ($)	0	0	122,266	244,532	366,798	489,065	550,198
Net Requirements ($)	909,870	137,289	118,149	(34,612)	(86,117)	(149,466)	(174,761)

[a] The full production year is representative of all the remaining years the planting is in full production (Year 7 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 100-acre, multicrop farm in western Washington.

	Purchase Price ($)[a]	Number of Units	Total Cost ($)
Machine Shop/Shed[b]	40,000	1	40,000
Tractor—75HP, 4WD	60,000	2	120,000
Fertilizer Spreader (broadcast bander)	20,000	1	20,000
Planter (6 ft)	5,000	1	5,000
Air-blast Sprayer (400 gal)	55,000	2	110,000
Weed Sprayer (400 gal)	20,000	1	20,000
Cultivator (6 ft disk/ripper)	3,500	1	3,500
Flail Mower (5 ft)	6,000	1	6,000
Forklift	30,000	1	30,000
4-Wheeler ATV	20,000	1	20,000
Pickup Truck (1/2 ton, 4×4, gas)	25,000	1	25,000
Miscellaneous Equipment[c]	15,000	1	15,000
Shop Equipment[d]	5,000	1	5,000
Mechanical Harvester[e]	250,000	1	250,000
Total Cost			**669,500**

Notes: These are the machinery, equipment, and building requirements for the 100-acre farm, which includes 'Draper' blueberries. The costs of fixed capital are allocated on the entire farm operation.
[a] Purchase price corresponds to new machinery, equipment, or building.
[b] 40 ft × 80 ft pole barn with partial slab floor.
[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.
[e] Over-the-row blueberry harvester. One mechanical harvester is needed per every 75 acres of blueberries.

Table 7. Annual interest costs per acre for a 40-acre conventional 'Draper' blueberry field in western Washington.

	Total Purchase Price ($)	Salvage Value ($)[a]	Number of Acres	Total Interest Cost ($)	Interest Cost per Acre ($)[b]
Irrigation System[c]	80,908	0	25	2,023	80.91
Land	520,000	N/A	26	26,000	1,000.00
Machinery, Equipment & Building[d,e]	419,500	37,950	100	11,436	114.36
Mechanical Harvester[e]	250,000	25,000	25	6,875	275.00
Mainline & Pump[c]	7,125	0	25	178	7.13
Pond[c]	7,500	0	25	188	7.50
Trellis[c]	70,112	0	25	1,753	70.11
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, 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., 25 acres) to get the interest cost per acre.
[d] Total area of the multicrop farm operation is 100 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., 100 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 40-acre conventional 'Draper' blueberry field in western Washington.

	Total Purchase Price ($)	Number of Acres	Total Value per Acre ($)	Years of Useful Life	Depreciation Cost per Acre ($/yr)[a]
Irrigation System	80,908	25	3,236.32	25	129.45
Mainline & Pump	7,125	25	285.00	25	11.40
Pond	7,500	25	300.00	25	12.00
Trellis	70,112	25	2,804.48	25	112.18
Machinery, Equipment & Building[b]					272.53
Mechanical Harvester[b]					223.88

[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 the calculation of the depreciation cost of the machinery, equipment, and building.

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 production costs and returns.

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References

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.

Fresh Fruit Portal. 2022. Agronometrics in Charts: Washington Blueberry Commission Predicts a Record-breaking Blueberry Harvest.

USDA NASS (National Agricultural Statistics Service). 2022. Noncitrus Fruits and Nuts, 2021 Summary.

US Patent and Trademark Office. 2022. Blueberry Plant Denominated 'Draper'. Inventor James Hancock. Patent number US-PP15103-P3.

Weber, C. 2012. Blueberry Variety Review. *Cornell Cooperative Extension Publication*. Cornell University.

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