

2019 COST ESTIMATES OF ESTABLISHING, PRODUCING, AND PACKING GALA APPLES IN WASHINGTON STATE



Preface

The results presented in this WSU publication serve as a general guide for evaluating the feasibility of producing Gala apples in Washington State as of 2019. 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 budget assumptions were adopted for this study, but these assumptions may not fit every situation since production costs and returns vary across orchard operations, depending on the following factors:

- Capital, labor, and natural resources
- Crop yields
- Type and size of machinery, irrigation, and frost control systems
- Input prices
- Cultural practices
- Apple prices
- Orchard size
- Management skills

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

Gala Production in Washington State

During 2006–2017, bearing acres of Gala in Washington State have increased by 48%, from 27,807 acres planted in 2006 to 41,036 total bearing acres in 2017. In 2017, acres planted to Gala represented 23% of Washington State's total apple acreage. That acreage is distributed across the state as follows: 43% in the Yakima District, 35% in the Columbia Basin, 17% in the Wenatchee Valley, and 5% in other areas (USDA NASS 2017).

Gala is the second largest cultivar grown in Washington State following the traditional variety, Red Delicious. About 33 million 40 lb boxes of Gala were sold in the 2019–2020 marketing season, of which 83% was conventionally grown. Gala accounted for nearly 25% of total fresh apple shipments from Washington State during the marketing season (WSTFA 2020). Gala is also considered Washington State's second primary export apple variety, accounting for approximately 28% of total Washington State apples exported from 2019 to 2020 (WSTFA 2020).

Study Objectives

This publication is designed to enable owner-operators to estimate: (1) their total production costs required to establish and produce a Gala orchard, including costs of equipment, materials, supplies, and labor, as well as packing costs, and (2) the ranges of price and yield at which Gala production would be a profitable enterprise.

The primary use of this report is in identifying inputs, costs, and yields considered to be typical of well-managed Gala orchards. This publication does not necessarily represent any particular orchard 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 a group of experienced Gala owner-operators in Washington State. Their production practices and input requirements form the baseline assumptions that were used to develop the enterprise budget. Additionally, the data represent what these owner-operators anticipate over an orchard's life if no unforeseen failures occur. Given that many factors affect production costs, pack-out, and returns, individual owner-operators can refer to the Excel Workbook section to estimate their own costs and returns.

Budget Assumptions

1. The area of the total farm operation is 300 acres. Bearing acres include 225 acres of apples (75% of total area), 48 acres of sweet cherries (16%), and 27 acres of pears (9%).
2. This budget is based on a 55-acre Gala block within a 300-acre orchard. It is assumed that 5% of this block is dedicated to roads, pond, loading area, buildings, etc., rather than to fruit production. Therefore, the total productive area for this block is 52 acres. Table 1 shows the assumed Gala block specifications.
3. The total value of bare agricultural land (including water rights) is \$18,000 per acre with annual property taxes of \$170 per acre.
4. The irrigation system consists of overhead cooling and under-tree drip sprinklers, with two separate sub-main lines. Water is provided through a public irrigation district.
5. The pond is installed in Year 1.
6. Cultural practices and harvest activities are done by using a combination of ladders and labor-enhancing equipment. The hourly manual labor rate for 2019 is calculated using the Washington adverse wage rate for 2019 at \$15.03/hour. In this analysis, we add 25% to reflect medical leave, payroll taxes, and all administrative costs for H2A employees, including housing, amounting to \$18.79/hour. Activities such as chemical application, irrigation, and frost protection are assumed to cost \$20.04/hour (i.e., base of \$16.03/hour plus 25%). Harvest labor rates follow the Department of Labor rates, plus 4% to account for mandated paid rest breaks. These labor rates are assumed to be the same for all years of production.
7. The gross return is \$481/bin, equivalent to \$26/box.
8. Average pack-out for Gala is 80% or 18.5 box/bin.
9. Warehouse packing charges assume a 925 lb bin.
10. Management is valued at \$700 per acre.

11. Interest on investment represents a 5% opportunity cost to the enterprise. These are forgone earnings for investing money in orchard, equipment, and buildings rather than in an alternative activity. This also represents interest on funds borrowed to finance orchard, equipment, and building purchases.

Summary of Study Results

Table 2 shows the estimated annual cost and returns for a 40-acre block of Gala apples in Washington State. Production costs are classified into variable costs and fixed costs. Variable costs comprise orchard operations, harvest activities, materials, maintenance and repairs, and packing costs. Fixed costs are incurred whether or not apples are produced. The fixed costs include depreciation on capital, interest, taxes, insurance, 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.

This study assumed that a Gala orchard could achieve full production in the sixth year. Based on the assumptions listed above, the total production costs for Gala during full production are estimated at \$42,144.31 per acre. The break-even price for Gala apples as of 2019 is estimated at \$658.5/925 lb bin or \$35.59/40 lb box (considering 80% pack-out). Table 3 shows the sensitivity of net returns to different combinations of price and yields. For this analysis, free on board (FOB) prices considered range from \$23 to \$29 per 40 lb box or \$425 to \$540 per 925 lb bin, and the net yields range from 56 to 88 bins per acre. Any price and yield combination within the range, under the study production and cost assumptions, would not result in a positive return for the owner-operator.

Table 1. Gala block specifications.

Architecture	Limbs arranged randomly at 18-inch radius from tree center
In-row Spacing	4 feet
Between-row Spacing	10 feet
Rootstock	Dwarf - 9 series
Productive Block Size	52 acres
Life of Planting	20 years
Tree Density	1,089 trees per acre
Trellis System	Vertical trellis system

Table 2. Cost and returns per acre of establishing, producing, and packing Gala on a 52-acre orchard block.

	Establishment Years					Full Production ^a	Your Costs
	Year 1	Year 2	Year 3	Year 4	Year 5		
Estimated Net Production (bins/acre) ^b			28.00	40.00	52.00	64.00	
Estimated FOB Price (\$/bin) ^c			481.00	481.00	481.00	481.00	
Total Returns (\$/acre)			13,468.00	19,240.00	25,012.00	30,784.00	
Variable Costs (\$/acre):							
<u>Establishment</u>							
Soil Preparation	1,271.44						
Trees (including labor)	10,809.20						
<u>Orchard Activities</u>							
Pruning & Training ^d	563.70	638.86	657.65	469.75	714.02	939.50	
Green Fruit Thinning ^d	93.95	281.85	281.85	563.70	845.55	1,033.45	
Irrigation Labor ^e	200.40	200.40	200.40	200.40	200.40	200.40	
Herbicide ^{e,f}	88.03	254.79	253.38	300.23	253.38	253.98	
Insecticide ^{e,f}	0.00	207.60	690.03	637.61	690.03	662.35	
Fungicide ^{e,f}	578.95	670.33	666.12	668.93	666.12	667.93	
Rodenticide ^{e,f}	39.62	51.84	51.24	51.64	51.24	51.44	
Sunburn Protection ^{e,f}	0.00	0.00	412.29	413.09	412.29	412.69	
Chemical Thinning ^{e,f}	0.00	0.00	340.19	341.80	340.19	341.20	
Growth Regulator ^{e,f}			350.48	350.68	350.48	350.68	
Ripening Regulator ^f			500.00	500.00	500.00	500.00	
Fertilizer ^{e,f}	86.22	86.22	126.30	126.30	126.30	126.30	
Sunburn Protection— Netting ^g			1,200.00	1,200.00	1,200.00	1,200.00	
Frost Protection (labor) ^e			8.02	8.02	8.02	8.02	
Beehives			55.00	55.00	55.00	55.00	
General Farm Labor ^h	100.00	100.00	100.00	100.00	100.00	100.00	
Irrigation Water & Electric Charge	350.00	350.00	350.00	365.00	365.00	365.00	
<u>Harvest Activitiesⁱ</u>							
Picking Labor			983.85	1,405.50	1,827.15	2,248.80	
Other Labor (checkers, tractor drivers, supervisors)			280.00	400.00	520.00	640.00	
Hauling Apples			245.00	350.00	455.00	560.00	
<u>Warehouse Packing Charges^j</u>			8,032.50	11,475.00	14,917.50	18,360.00	
<u>Maintenance and Repairs</u>							
Maintenance & Repair	300.00	300.00	300.00	315.00	315.00	340.00	
Fuel & Lube	300.00	300.00	300.00	300.00	300.00	300.00	
<u>Other Variable Costs</u>							
Overhead (5% of variable costs) ^k	739.07	172.09	819.22	1,029.88	1,260.63	1,485.84	
Interest (5% of variable costs) ^l	776.03	180.70	860.18	1,081.38	1,323.67	1,170.10	

	Establishment Years					Full Production ^a	Your Costs
	Year 1	Year 2	Year 3	Year 4	Year 5		
Total Variable Costs	16,296.60	3,794.69	18,063.70	22,708.90	27,796.97	32,372.67	
Fixed Costs (\$/acre):							
<u>Depreciation</u>							
Irrigation System	140.00	140.00	140.00	140.00	140.00	140.00	
Sunburn Protection— Netting	400.00	400.00	400.00	400.00	400.00	400.00	
Machinery, Equipment & Building	231.17	231.17	231.17	231.17	231.17	231.17	
Mainline & Pump	30.00	30.00	30.00	30.00	30.00	30.00	
Pond	48.00	48.00	48.00	48.00	48.00	48.00	
Trellis	287.50	287.50	287.50	287.50	287.50	287.50	
Wind Machine			112.61	112.61	112.61	112.61	
<u>Interest</u>							
Irrigation System	105.00	105.00	105.00	105.00	105.00	105.00	
Sunburn Protection— Netting	200.00	200.00	200.00	200.00	200.00	200.00	
Land ^m	900.00	900.00	900.00	900.00	900.00	900.00	
Machinery, Equipment & Building	82.65	82.65	82.65	82.65	82.65	82.65	
Mainline & Pump	22.50	22.50	22.50	22.50	22.50	22.50	
Pond	60.00	60.00	60.00	60.00	60.00	60.00	
Trellis	143.75	143.75	143.75	143.75	143.75	143.75	
Wind Machine			84.46	84.46	84.46	84.46	
Establishment Costs (5%)		1,004.36	1,433.84	1,944.95	2,425.27		
<u>Other Fixed Costs</u>							
Miscellaneous Supplies	150.00	150.00	300.00	300.00	300.00	300.00	
Land & Property Taxes	170.00	170.00	170.00	170.00	170.00	170.00	
Insurance Cost (all farm)	120.00	120.00	175.00	175.00	175.00	175.00	
Management Cost	700.00	700.00	700.00	700.00	700.00	700.00	
Amortized Establishment Costs ⁿ						5,579.02	
Total Fixed Costs	3,790.56	4,794.92	5,626.46	6,137.57	6,617.89	9,771.64	
TOTAL COSTS	<u>20,087.16</u>	<u>8,589.61</u>	<u>23,690.16</u>	<u>28,846.47</u>	<u>34,414.87</u>	<u>42,144.31</u>	
ESTIMATED NET RETURNS	<u>(20,087.16)</u>	<u>(8,589.61)</u>	<u>(10,222.16)</u>	<u>(9,606.47)</u>	<u>(9,402.87)</u>	<u>(11,360.31)</u>	

**Accumulated Establishment
Costs**

	20,087.16	28,676.77	38,898.93	48,505.40	57,908.27
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^a The full production year is representative of all the remaining years the orchard is in full production (Year 6 to Year 20).

^b Estimated net production considers an average pack-out of 80%; or 18.5 box/bin.

^c These prices reflect the return before any expenses are subtracted. Bin size is 925 lb.

^d Hand labor rate is \$18.79/hour and includes all applicable taxes and benefits.

^e Tractor/machinery, irrigation, and frost protection labor rate is \$20.04/hour and includes all applicable taxes and benefits.

^f Includes materials and labor.

^g Labor cost only.

^h General farm labor rate is a lump sum per acre and applied to miscellaneous/all other labor. Rate includes applicable taxes and benefits.

ⁱ Picking rate = \$28.11/bin; checkers' and tractor drivers' rate = \$8/bin; hauling rate = \$7/bin. (Hauling refers to transportation cost from the orchard to the warehouse. It is assumed that warehouse will cover additional transportation expenses [if any] when the orchard is located in remote areas.)

^j Packing charges include receiving charges per bin plus total box charges per bin. Pack-out number of boxes per bin is 18.5.

^k Captures indirect costs of operations in the orchard that fluctuate with the level of production but are not accounted by the variable costs already identified. Also captures unforeseeable expenses.

^l Interest expense on full year during establishment years and for three-quarters of a year during full production.

^m Land cost is approximated by using the 5% interest rate multiplied by the land value of \$18,000 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 5 amortized at 5% for 15 years.

Table 3. Estimated net returns (\$) per acre at various prices and yields of Gala during full production^a.

Net Yield (bin/acre) ^b	FOB Price (\$/bin) ^c				
	\$425	\$454	\$481	\$510	\$540
56	-\$15,375	-\$13,751	-\$12,239	-\$10,615	-\$8,935
64	-\$14,944	-\$13,088	-\$11,360	-\$9,504	-\$7,584
72	-\$14,514	-\$12,426	-\$10,482	-\$8,394	-\$6,234
80	-\$14,084	-\$11,764	-\$9,604	-\$7,284	-\$4,884
88	-\$13,654	-\$11,102	-\$8,726	-\$6,174	-\$3,534

^a Includes amortized establishment costs. Net return is what the owner-operator receives after all costs (for example, production expenses and packing costs) have been accounted. The net price and net yield assumed in the baseline budget (Table 2) was \$481/bin and 64 bins per acre.

^b Assumes a 925-pound bin. Takes into account an average pack-out equivalent to 80%.

^c Divide the prices in \$/bin by 18.5 to obtain equivalent prices in \$/40 lb box.

A further analysis of break-even returns is presented in Table 4. This analysis shows that the first break-even return is \$27.34/40 lb box. This is the minimum return for the owner-operator to cover the operation's variable costs. Returns lower than this figure suggest that it is uneconomical to produce Gala apples. The second break-even return is at \$27.89/40 lb box; this is needed to cover the total cash costs (the equivalent to total variable costs plus land and property taxes, insurance cost, and miscellaneous supplies). This second break-even return is needed for the operation to be financially viable in the short run. The third break-even return is at \$28.94/40 lb box; this is the return needed for owner-operators to cover the cash costs plus depreciation of machinery and buildings. This third break-even return is needed for the operation to be financially viable in the long run. The fourth break-even return is at \$35.59/40 lb box. If this return is realized, the owner-operator would recover all out-of-pocket expenses (cash costs); plus realize a competitive return on equity capital invested in land, trees, machinery, equipment, and buildings. Failure to obtain this break-even return level means that the owner-operator will not receive a return on capital contributions equal to what could be earned in alternative uses.

Most of the budget values given in Table 2 are based on more comprehensive underlying cost data, which are shown in Tables 5 through 8. Table 5 presents the annual capital requirements for a 40-acre Gala block. Table 6 specifies the

machinery and building requirements for the 300-acre diverse cultivar orchard. 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. The amortized establishment costs assume a total productive life of 20 years, which includes five years of establishment and 15 years of full production. The amortized establishment costs must be recaptured during the full production years in order for an enterprise to be profitable. 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 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 the population of apple operations in Washington State. An interactive Excel Workbook, described below, is provided to enable individual owner-operators to estimate their returns based on the costs of their production.

Table 4. Break-even return (\$/lb) for different levels of enterprise costs during full production of Gala.

	Cost (\$/acre)	Break-Even Return (\$/bin)^a	Your Cost (\$/acre)	Your Break-Even Return (\$/bin)
1. Total Variable Costs	32,372.67	505.82 ^b	_____	_____
2. Total Cash Costs ^c = Total Variable Costs + Land & Property Taxes + Insurance Cost + Miscellaneous Supplies	33,017.67	515.90 ^d	_____	_____
3. Total Cash Costs + Depreciation Costs	34,266.95	535.42 ^e	_____	_____
4. Total Cost = Total Cash Costs + Depreciation Costs + Interest Costs ^f + Management Cost	42,144.31	658.50 ^g	_____	_____

Net Yield (bin/acre) = 64.00

Notes: The net price and net yield assumed in the baseline budget (Table 2) was \$481/925 lb bin and 64 bins per acre.

^a Break-even return is calculated as cost divided by net yield during full production.

^b If the return is below this level, Gala apples are uneconomical to produce.

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

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

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

^f Interest costs include some actual cash interest payments.

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

Table 5. Summary of annual capital requirements for a 52-acre Gala block.

	Establishment Years					Full Production^a
	Year 1	Year 2	Year 3	Year 4	Year 5	
Annual Requirements (\$)						
Land (55 acres)	990,000					
Trellis System	299,000					
Netting—Sunburn Protection ^b	416,000					
Irrigation System	218,400					
Mainline & Pump	46,800					
Pond	124,800					
Wind Machine			175,667			
Operating Expenses ^c	906,703	256,604	1,009,252	1,250,803	1,515,383	1,753,319
Total Requirements (\$)	3,001,703	256,604	1,184,919	1,250,803	1,515,383	1,753,319
Receipts (\$)	0	0	700,336	1,000,480	1,300,624	1,600,768
Net Requirements (\$)	3,001,703	256,604	484,583	250,323	214,759	152,551

^a The full production year is representative of all the remaining years the orchard is in full production (Year 6 to Year 20).

^b The use of netting is becoming widespread; however, up-to-date sunburn protectant sprays or overhead cooling are still the predominant sunburn methods.

^c 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 cultivar orchard.

	Purchase Price (\$) ^a	Number of Units	Total Cost (\$)
Housing for Manager	135,000	1	135,000
Machine Shop/Shed ^b	150,000	1	150,000
Tractor-70HP, 4WD	32,500	5	162,500
Tractor-40HP, 4WD	25,000	2	50,000
4-Wheeler	7,500	3	22,500
Speed Sprayer	20,000	5	100,000
Weed Spray Boom & Tank	7,000	1	7,000
Mower—Rotary (7 ft)	5,000	1	5,000
Flail Mower	8,000	1	8,000
Fork Lift	25,000	2	50,000
Bin Trailer	7,500	3	22,500
Pickup Truck	20,000	1	20,000
Ladder (8 ft)	100	100	10,000
Platforms	40,000	3	120,000
Miscellaneous Equipment ^c	50,000	1	50,000
Shop Equipment ^d	15,000	1	15,000
Total Cost			927,500

Notes: Machinery, equipment, and building requirements are utilized in growing diverse crops in the 300-acre farm, which include Gala apples. 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 two mobile portable toilets, box blade, straight blade, quick connect loader, mechanical weeder, detachable bucket for loading fertilizer, gopher baiter, soil aerator, utility trailer, and two ladder trailers.

^d Includes compressor, welder, pressure washer, and miscellaneous tools.

Table 7. Annual interest costs per acre for a 52-acre Gala block (\$/acre).

	Total Purchase Price (\$)	Salvage Value (\$) ^a	Number of Acres	Total Interest Cost (\$)	Interest Cost per Acre (\$) ^b
Irrigation System ^c	218,400	0	52	5,460	105.00
Sunburn Protection—Netting ^c	416,000	0	52	10,400	200.00
Land	990,000	N/A	55	49,500	900.00
Machinery, Equipment & Building ^{d,e}	927,500	64,250	300	24,794	82.65
Mainline & Pump ^c	46,800	0	52	1,170	22.50
Pond ^c	124,800	0	52	3,120	60.00
Trellis ^c	299,000	0	52	7,475	143.75
Wind Machine ^c	175,667	0	52	4,392	84.46
<i>Interest Rate</i>	<i>5.0%</i>				

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

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

^c The irrigation system, mainline 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 (52 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, diverse cultivar farm. Thus, the corresponding interest costs are divided by the total area (300 acres) to derive the interest cost per acre.

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

Table 8. Annual depreciation costs per acre for a 52-acre Gala block (\$/acre).

	Total Purchase Price (\$)	Number of Acres	Total Value per Acre (\$)	Years of Useful Life	Depreciation Cost per Acre (\$/yr)^a
Irrigation System	218,400	52	4,200.00	30	140.00
Sunburn Protection—Netting	416,000	52	8,000.00	20	400.00
Mainline & Pump	46,800	52	900.00	30	30.00
Pond	124,800	52	2,400.00	50	48.00
Trellis	299,000	52	5,750.00	20	287.50
Wind Machine	175,667	52	3,378.21	30	112.61
Machinery, Equipment & Building ^b					231.17

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

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 5 for establishment costs, full production costs, calculation of salvage value and depreciation costs, amortization calculator, and production-related data) are available at the [WSU School of Economic Sciences Extension website](#).

Owner-operators can modify select values and thus use the Excel Workbook to evaluate their own production costs and returns.

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