2022 COST ESTIMATES OF PRODUCING AND PACKING ORGANIC HONEYCRISP APPLES IN WASHINGTON

Preface

The results presented in this WSU publication serve as a general guide for evaluating the feasibility of producing organic Honeycrisp apples in Washington in 2022. The primary use of this publication is in identifying inputs, costs, and yields considered typical of well-managed organic Honeycrisp apple orchards. This publication is not intended to be a definitive guide to production practices, but it is intended to be helpful in estimating the physical and financial requirements of comparable plantings. Specific budget assumptions were adopted for this study, but these assumptions may not represent the conditions in all production and marketing situations since production costs and returns vary across 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
- Organic Honeycrisp prices
- Orchard size
- Management skills
- Biotic and abiotic orchard variables

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.

Organic Honeycrisp Production in Washington State

In 2020, there were 122,816 certified organic acres in Washington State; 39,021 (32%) of those were dedicated to tree fruit. Out of the 39,021 acres, 30,424 (78%) were dedicated to apples. According to a 2019 National Agricultural Statistics Service (NASS) survey, Washington produces 93% of the organic apples grown in the United States, with a value of $448 million (Granatstein 2021).

During the last eight years (2014–15 to 2021–22), on average, 10% of total apple shipments were organic. This percentage has increased from 7% in 2014–15 to 12% in 2021–22. Of all the organic apple varieties shipped, Honeycrisp was the third largest in volume, with 14% of all shipments, only after Gala at 35% and Fuji at 21%. The percent volume of organic Honeycrisp apples, with respect to the total organic apple shipments, has increased from 7% in 2014–15 to 21% in 2021–22. Figure 1 shows the annual changes of shipment volumes by different organic apple varieties. The volume of organic Honeycrisp apples has increased from 2014–15 at 0.691 million 40 lb boxes to 3.418 million 40 lb boxes in 2021–22 (Washington State Tree Fruit Association 2022).

Figure 2 shows the annual changes in the free on board (FOB) price of the different organic apple varieties. For the period of 2014–15 to 2021–22, the highest average FOB price was observed for organic Honeycrisp, with an average price of $67 (hereafter, all prices are per 40 lb box). This was followed by organic Cripps Pink at $44, other organic apples at $40.5, organic Granny Smith at $38.5, and organic Fuji at $37. Organic Cosmic Crisp was first commercially available in December 2019 and entered the market with prices received by growers higher than organic Honeycrisp. The three-year (2019–20, 2020–21, and 2021–22) average FOB price of organic Cosmic Crisp was $68.5. For the same three-year period, this price was higher than the price of organic Honeycrisp at $66.5 (Washington State Tree Fruit Association 2022).

WASHINGTON STATE UNIVERSITY
EXTENSION

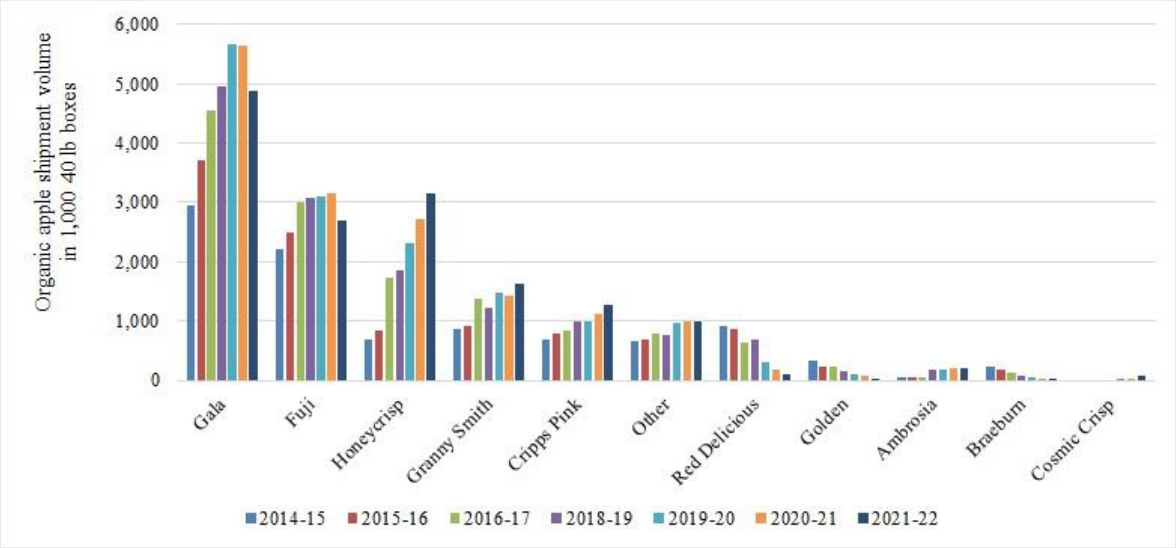

Figure 1. Organic apple shipment volume by variety, Washington State, 2014–15 to 2021–22. *Source*: Washington State Tree Fruit Association (2022).

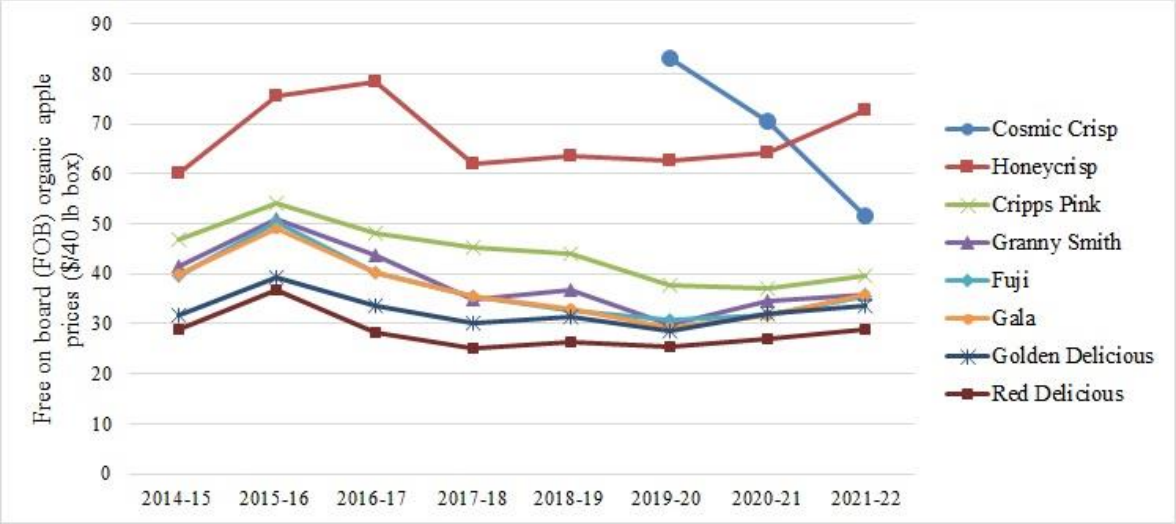

Figure 2. Organic apple FOB price by variety, Washington State, 2014–15 to 2021–22. *Source*: Washington State Tree Fruit Association (2022).

Study Objectives

This publication is designed to enable growers to estimate: (1) the costs of equipment, materials, supplies, and labor required to produce organic Honeycrisp apples, including packing costs, and (2) the ranges of price and yield at which Honeycrisp production would be a profitable enterprise.

Information Sources

The data used in this study were collected from information shared by a group of experienced Honeycrisp apple growers in Washington in 2022. They are mostly representative of the Columbia Basin and North Central Washington. Their production practices and input requirements form the baseline assumptions that were used to develop the enterprise budget.

Additionally, the data represent what these owner-operators anticipate would occur over an orchard's life if no unforeseen failures occur. The pesticide programs are based on what most growers were spraying for and the most common products they 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 own costs and returns.

Budget Assumptions

1. The area of the total farm operation is 300 acres of mixed conventional and organic tree fruits. Bearing acres include: 225 acres of apples (75% of total area), 88 acres of which are organic and 137 acres are conventional; 48 acres of sweet cherries (16%); and 27 acres of pears (9%).
2. The total organic apple acreage in this farm is comprised of 33 acres of organic Honeycrisp and 55 acres of organic Gala.
3. This budget is based on a 33-acre organic Honeycrisp block within a 300-acre orchard. It is assumed that 2 acres 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 31 acres. Table 1 shows the assumed organic Honeycrisp block specifications, which are generally accepted across all growers interviewed.
4. The total value of bare agricultural land (including water rights) is $20,000 per acre with annual property taxes of $200 per acre.
5. The irrigation system consists of overhead cooling and under tree drip lines, with two separate sub-mainlines. Water is provided through a public irrigation district.
6. The pond is installed in Year 1.
7. Cultural practices and harvest activities are done by using a combination of manual labor, ladders, and labor-enhancing equipment. The hourly manual labor rate is calculated using the Washington adverse wage rate for 2022 at $17.41/hour. In this analysis, we add 25% to reflect medical leave and all administrative costs for H2A employees, including housing, amounting to $21.76/hour. Activities such as chemical application, irrigation, and frost protection cost $23.01/hour (i.e., base of $18.41/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 the same for all years of production.
8. Weed control costs in this budget are based on flaming and hand weeding. An alternative weed control method is the use of fabric, which has 8–10 years of useful life and costs about $1,400/acre for materials and installation and $16/hour per acre for labor to close and open the fabric during the growing season. If this alternative is chosen, the fabric will be installed during Year 3 of production.
9. Conventional apple production practices are used in the first 2.5 years. Organic production practices begin in August of the third year so that by the fifth year, the harvested apples will be certified organic.
10. The organic certification process begins in Year 2 with the discontinuation of all prohibited materials before harvest. The application for transition status is submitted in January of Year 3 along with a new application fee ($375). A renewal fee, based on a range of gross annual income, is paid in Year 4 and onward.
11. The gross return or FOB price is $624/bin in Year 3 through Year 4, and $936/bin from Year 5 through full production (when apples are certified organic). The FOB price is based on 2021–2022 prices.
12. The average pack-out for organic Honeycrisp is 75%. The estimated net yields per acre (i.e., yield after pack-out) are 11.25 bins, 22.5 bins, 37.5 bins, and 48.75 bins from Year 3 to Full Production, respectively.
13. Warehouse packing charges assume a 690 lb bin.
14. Management is valued at $700 per acre.
15. 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

The estimated annual cost and returns for a 31-acre block of organic Honeycrisp apples in Washington are shown in Table 2. 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 organic Honeycrisp are produced. These costs will generally be calculated for the whole farm enterprise and allocated across each unit of production. The fixed costs include depreciation on capital, interest, taxes, insurance, management, and amortized establishment costs. Management is treated as a fixed cost rather than a variable cost because, like land, management has been committed to the production cycle of the crop.

Table 1. Organic Honeycrisp block specifications.

Architecture	Randomly trained with 18-inch radius from tree center
In-row Spacing	3 feet
Between-row Spacing	10 feet
Rootstock	Geneva series—G969, G210, G890, G41
Productive Block Size	31 acres
Life of Planting	15 years
Tree Density	1,452 trees per acre
Trellis System	Vertical trellis system

Table 2. Cost and returns per acre of producing organic Honeycrisp apples on a 31-acre orchard block in Washington.

	Establishment Years					Full
	Year 1	Year 2	Year 3	Year 4	Year 5	Production[a]
Estimated Net Production (bins/acre)[b]			11.25	22.50	37.50	48.75
Estimated FOB Price ($/bin)[c]			624.00	624.00	936.00	936.00
Total Returns ($/acre)			7,020.00	14,040.00	35,100.00	45,630.00
Variable Costs ($/acre):						
Establishment						
Soil Preparation	1,367.01					
Trees (including labor)	14,814.47					
Orchard Activities						
Pruning and Training[d]	304.64	631.04	739.84	652.80	826.88	979.20
Thinning[e]	108.80	278.38	343.66	670.06	1,322.86	1,523.20
Chemicals[f,g]	1,169.00	1,234.00	2,121.70	2,137.41	2,153.11	2,168.82
Fertilizer[f,g]	165.00	234.03	234.03	399.03	564.03	729.03
Weed Control[d]	609.28	609.28	609.28	609.28	609.28	609.28
Irrigation Water and Electric Charge	350.00	350.00	350.00	365.00	365.00	365.00
Irrigation Labor[g]	230.10	230.10	230.10	230.10	230.10	230.10
Sunburn Protection[h]				800.00	800.00	800.00
Frost Protection (labor)[g]			23.01	23.01	23.01	23.01
Beehives			65.00	65.00	65.00	65.00
General Farm Labor[i]	225.00	225.00	225.00	225.00	225.00	225.00
Harvest Activities[j]						
Picking Labor			421.65	843.30	1,405.50	1,827.15
Other Labor (checkers, tractor drivers, supervisors)			146.25	292.50	487.50	633.75
Hauling Apples			105.00	210.00	350.00	455.00
Warehouse Packing Charges[k]			3,285.00	6,570.00	10,950.00	14,235.00
Maintenance and Repairs						
Maintenance and Repair	295.00	295.00	330.00	330.00	330.00	330.00
Fuel and Lube	240.00	270.00	280.00	320.00	360.00	360.00
Other Variable Costs						
Organic Certification Fees			11.00	83.33	125.00	166.67
Crop Insurance			375.00	375.00	375.00	375.00
Overhead (5% of Variable Costs)[l]	993.91	217.84	475.48	737.12	1,053.36	1,305.01
Interest (5% of Variable Costs)[m]	1,043.61	228.73	518.55	796.90	1,131.03	1,027.70
Total Variable Costs	21,915.82	4,803.40	10,889.55	16,734.84	23,751.67	28,432.91
Fixed Costs ($/acre):						
Depreciation						
Irrigation System	152.00	152.00	152.00	152.00	152.00	152.00
Sunburn Protection—Reflective Ground Cloth	160.00	160.00	160.00	160.00	160.00	160.00
Machinery, Equipment, and Building	261.92	261.92	261.92	261.92	261.92	261.92
Mainline and 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	350.00	350.00	350.00	350.00	350.00	350.00
Wind Machine			120.49	120.49	120.49	120.49
Interest						
Irrigation System	114.00	114.00	114.00	114.00	114.00	114.00
Sunburn Protection—Reflective Ground Cloth	80.00	80.00	80.00	80.00	80.00	80.00
Land[n]	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00
Machinery, Equipment, and Building	92.04	92.04	92.04	92.04	92.04	92.04
Mainline and Pump	22.50	22.50	22.50	22.50	22.50	22.50

	Establishment Years					Full
	Year 1	Year 2	Year 3	Year 4	Year 5	Production[a]
Pond	60.00	60.00	60.00	60.00	60.00	60.00
Trellis	175.00	175.00	175.00	175.00	175.00	175.00
Wind Machine			90.37	90.37	90.37	90.37
Establishment Costs (5%)		1,281.56	1,771.59	2,249.96	2,693.51	
Other Fixed Costs						
Miscellaneous Supplies	190.00	190.00	190.00	190.00	190.00	190.00
Land and Property Taxes	200.00	200.00	200.00	200.00	200.00	200.00
Insurance Cost (all farm)	80.00	80.00	80.00	80.00	80.00	80.00
Management Cost	700.00	700.00	700.00	700.00	700.00	700.00
Amortized Establishment Costs[o]						6,364.08
Total Fixed Costs	3,715.46	4,997.02	5,697.90	6,176.28	6,619.83	10,290.40
TOTAL COSTS	25,631.28	9,800.42	16,587.45	22,911.12	30,371.50	38,723.31
ESTIMATED NET RETURNS	(25,631.28)	(9,800.42)	(9,567.45)	(8,871.12)	4,728.50	6,906.69
Accumulated Establishment Costs	25,631.28	35,431.70	44,999.15	53,870.27	49,141.77	

[a] The full production year is representative of all the remaining years the orchard is in full production (Year 6 to Year 15).
[b] Estimated net production considers an average pack-out of 75% or about thirteen 40 lb boxes per bin.
[c] These prices reflect the return before any expenses are subtracted. Bin size is 690 lb. The estimated FOB price jumps from $624 in Years 3–4 to $936 in Year 5 due to the completion of the process to certify the apples as organic by this period.
[d] Hand labor rate is $21.76/hour and includes all applicable taxes and benefits.
[e] Hand thinning and chemical thinning labor cost.
[f] Includes materials and labor.
[g] Tractor/machinery, irrigation, and frost protection labor rate is $23.01/hour and includes all applicable taxes and benefits.
[h] Labor cost to install and pull back.
[i] General farm labor rate is a lump sum per acre and applied to miscellaneous/all other labor. Rate includes applicable taxes and benefits.
[j] Picking rate = $28.11/bin; checkers and tractor drivers' rate = $9.75/bin; hauling rate = $7/bin (hauling refers to transportation cost from the orchard to the warehouse). It is assumed that the warehouse will cover additional transportation expenses (if any) when the orchard is located in remote areas.
[k] Packing charges include receiving charges per bin plus total box charges per bin. Pack-out number of boxes per bin is about 20.
[l] Captures indirect costs of operations in the orchard that fluctuate with the level of production but are not accounted for by the variable costs already identified. Also captures unforeseeable expenses.
[m] Interest expense on full year during establishment years and for three-quarters of a year during full production.
[n] Land cost is approximated by using the 5% interest rate multiplied by the land value of $20,000 per acre.
[o] 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 10 years.

This study assumed that an organic Honeycrisp apple orchard could achieve full production in the sixth year. Based on the above assumptions, the total returns per acre during the first two crop years (Year 3 and Year 4) when the orchard is in transition to organic are $7,020 and $14,040, respectively. The total costs are about $16,587 per acre in Year 3 and $22,911 per acre in Year 4, which respectively generate net losses of about $9,567 per acre and $8,871 per acre.

When organic Honeycrisp is certified starting Year 5, the FOB price increases from $624 to $936 per bin. The total returns in Year 5 and during full production are $35,100 per acre and $45,630 per acre, respectively. The respective total production costs are estimated at $30,372 per acre and $38,723 per acre. Further, the net returns are about $4,729 per acre in Year 5 and $6,907 per acre during full production.

Table 3 shows the estimated net returns per acre at various prices and yields of organic Honeycrisp. For this analysis, the FOB prices considered are $866–$1,006 per 690-pound bin, and the net yields are about 34–60 bins per acre, given a 75% pack-out. A gross yield-price combination of 60 bins per acre or greater and $866 per bin or higher would result in positive net returns for the owner-operator based on the study's production and cost assumptions.

Table 4 shows the break-even return given different yield levels during full production. As of 2022, the first break-even return of organic Honeycrisp apples was about $583 per bin. This is the minimum return needed for the owner-operator to cover the operation's variable costs. Returns lower than this figure suggest that it is more profitable not to operate (shutdown price) than to produce organic Honeycrisp. The second break-even return is about $593 per bin, which is needed to cover the total cash costs and to be economically viable in the short run. The third break-even return is $616 per bin, which is needed 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 $794 per bin. 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, organic Honeycrisp apple orchard, 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 31-acre organic Honeycrisp block. Table 6 specifies the machinery and building requirements for the 300-acre multi-crop orchard. 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 that are calculated over the asset's useful life. These expenses represent the loss in an asset's value due to use, age, and obsolescence.

The economic feasibility of investing in an organic Honeycrisp orchard is further assessed by using the net present value (NPV) and discounted payback period. NPV is the sum of the discounted cash flows throughout the planting's productive life (i.e., 25 years). NPV provides an indicator of an investment's feasibility by estimating and converting its future profits into present-day dollars given the cost and length of the investment, time value of money, and how long it takes for an investment to return a profit. The discounted payback period gives the number of years it would take to recoup an investment from discounted cash flows.

Discounting is a method used to estimate the present value of future payments. A discount rate of 4% is used in the calculation of NPV and payback periods, and it represents the opportunity cost of capital. The mean of the quarterly average effective interest rate on non-real estate bank loans made to farmers from 2018 to 2022 is around 4% (Federal Reserve Bank of Kansas City 2023), and this rate is used as the baseline discount rate.

Given a 4% discount rate, the net present value of the investment is about $1.5 million (Table 9). The estimated discounted payback period for the orchard investment will vary depending on the costs included in the calculation. If one includes total cash costs, which is the sum of total variable costs, miscellaneous supplies, land and property taxes, and farm insurance, the discounted payback period is 6.50 years. Whereas, if one includes all production costs, which is the sum of total cash cost, management cost, and fixed capital investment, the discounted payback period is 10.19 years.

Table 9 also shows the sensitivity of the NPV and payback period calculations to different discount rates—3%, 4%, 5%, and 6%, which represent the range of the average annual effective interest rates on non-real estate bank loans made to farmers in the past 5 years (2018 to 2022). The calculations are shown in detail in Appendix 6 of the Excel Workbook.

Table 3. Estimated net returns[a] per acre at various prices and yields of organic Honeycrisp during full production.

Gross Yield (bins/acre)[b]	**Net Yield (bins/acre)[b]**	**FOB Packinghouse Door Price Equivalent ($/bin)**				
		$866	**$901**	**$936**	**$971**	**$1,006**
		Estimated Net Returns ($/acre)				
45	33.75	-$3,747	-$2,566	-$1,384	-$203	$978
50	37.5	-$1,937	-$624	$688	$2,001	$3,313
55	41.25	-$126	$1,317	$2,761	$4,205	$5,649
60	45	$1,684	$3,259	$4,834	$6,409	$7,984
65	48.75	$3,494	$5,200	$6,907	$8,613	$10,319
70	52.5	$5,304	$7,142	$8,979	$10,817	$12,654
75	56.25	$7,115	$9,084	$11,052	$13,021	$14,990
80	60	$8,925	$11,025	$13,125	$15,225	$17,325
Overhead Cost		*5%*				
Interest Cost		*5%*				

Note: Shaded area denotes positive net returns based on the combination of net yield and price.

[a] Includes amortized establishment costs. Net return is what the grower receives after all costs (for example, production expenses and packing costs) have been accounted.

[b] Assumes a 690-pound bin. Considers an average pack-out of 75%.

Table 4. Break-even return of organic Honeycrisp apples for different levels of enterprise costs during full production.

		Cost ($/acre)	Break-even Return ($/bin)[a]
1.	Total Variable Costs	28,432.91	583.24[b]
2.	Total Cash Costs[c] = Total Variable Costs + Land and Property Taxes + Insurance Cost + Miscellaneous Supplies	28,902.91	592.88[d]
3.	Total Cash Costs + Depreciation Costs	30,025.32	615.90[e]
4.	Total Cost = Total Cash Costs + Depreciation Costs + Interest Costs[f] + Management Cost	38,723.31	794.32[g]

[a] Break-even return is calculated as cost divided by net yield during full production.
[b] If the return is below this level, organic Honeycrisp 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 31-acre organic Honeycrisp block.

	Establishment Years					Full
	Year 1	Year 2	Year 3	Year 4	Year 5	Production[a]
Annual Requirements ($)						
Land (33 acres)	660,000					
Trellis System	217,000					
Reflective Ground Cloth—Sunburn Protection				99,200		
Irrigation System	141,360					
Mainline and Pump	27,900					
Pond	74,400					
Wind Machine			112,057			
Operating Expenses[b]	715,660	185,175	373,846	555,050	772,572	917,690
Total Requirements ($)	1,836,320	185,175	485,903	654,250	772,572	917,690
Receipts ($)	0	0	217,620	435,240	1,088,100	1,414,530
Net Requirements ($)	1,836,320	185,175	268,283	219,010	(315,528)	(496,840)

[a] The full production year is representative of all the remaining years the orchard is in full production (Year 6 to Year 15).
[b] Operating expenses is 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	45,000	5	225,000
Tractor-40HP, 4WD	25,000	2	50,000
4-Wheeler	7,500	3	22,500
Speed Sprayer	25,000	5	125,000
Weed Spray Boom and Tank	7,000	1	7,000
Mower—Rotary (7 ft)	5,000	1	5,000
Flail Mower	8,000	1	8,000
Forklift	25,000	2	50,000
Bin Trailer	7,500	3	22,500
Pickup Truck	35,000	1	35,000
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			**1,030,000**

Notes: These are the machinery, equipment, and building requirements for the 300-acre farm, which include organic Honeycrisp 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 31-acre organic Honeycrisp block.

	Total Purchase Price ($)	Salvage Value ($)[a]	Number of Acres	Total Interest Cost ($)	Interest Cost per Acre ($)[b]
Irrigation System[c]	141,360	0	31	3,534	114.00
Sunburn Protection—Reflective Ground Cloth[c]	99,200	0	31	2,480	80.00
Land	660,000	N/A	33	33,000	1,000.00
Machinery, Equipment, and Building[d,e]	1,030,000	74,500	300	27,613	92.04
Mainline and Pump[c]	27,900	0	31	698	22.50
Pond[c]	74,400	0	31	1,860	60.00
Trellis[c]	217,000	0	31	5,425	175.00
Wind Machine[c]	112,057	0	31	2,801	90.37
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 and wind machine are used for the direct production of the fruit. Hence, their respective interest costs are divided by the production area (i.e., 31 acres) to get the interest cost per acre.

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

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

Table 8. Annual depreciation costs per acre for a 31-acre organic Honeycrisp block.

	Total Purchase Price ($)	Number of Acres	Total Value per Acre ($)	Years of Useful Life	Depreciation Cost per Acre ($/yr)[a]
Irrigation System	141,360	31	4,560.00	30	152.00
Sunburn Protection—Reflective Ground Cloth	99,200	31	3,200.00	20	160.00
Mainline and Pump	27,900	31	900.00	30	30.00
Pond	74,400	31	2,400.00	50	48.00
Trellis	217,000	31	7,000.00	20	350.00
Wind Machine	112,057	31	3,614.73	30	120.49
Machinery, Equipment, and Building[b]					261.92

[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.

Table 9. NPV and payback periods of the Honeycrisp orchard investment given different discount rates.

Discount Rate[a]	NPV	Payback Period of Total Cash Cost[b] (years)	Payback Period of Total Cost[c] (years)
3%	$1,869,974	6.41	9.83
4%	$1,523,222	6.50	10.19
5%	$1,216,102	6.59	10.61
6%	$943,743	6.70	11.08

[a] The average annual effective interest rates on non-real estate bank loans made to farmers in the past five years (2018 to 2022) are used as the basis of the discount rates.
[b] Cash cost is the sum of total variable cost, miscellaneous supplies, land and property taxes, and insurance cost. Excludes interest on operating capital.
[c] Total cost is the sum of total cash cost, management cost, and fixed capital investment. Excludes interest on operating capital and interest on fixed capital.

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 organic Honeycrisp apple operations in Washington. An interactive Excel Workbook, described below, is provided to enable individual owner-operators to estimate their returns based on the costs of their production.

Excel Workbook

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

Acknowledgments

The authors acknowledge the information provided by a group of anonymous organic Honeycrisp apple growers and packinghouse owners-operators, pesticide consultants, and WSU Extension educators. This study was funded by the project named A Systems-Based Approach to Enhance Quality, Safety, and Shelf-Life of Organic Tree Fruit in the Pacific Northwest, funded by the U.S. Department of Agriculture, National Institute of Food and Agriculture, Organic Agriculture Research and Extension Initiative (USDA, NIFA, OREI). Award number 2021-51300-34913.

References

Federal Reserve Bank of Kansas City. 2023. National Survey of Terms of Lending to Farmers.

Granatstein, D. 2021. Current Status of Certified Organic Agriculture in Washington State: 2020. Washington State University Extension.

Washington State Tree Fruit Association. 2022. Annual Crop Summary: 2014–2022 Production and Marketing Season.

By
R. Karina Gallardo, Professor and Extension Specialist, School of Economic Sciences, Puyallup Research and Extension Center, Center for Precision and Automated Agricultural Systems, Washington State University
Suzette P. Galinato, Extension Assistant Professor, Agriculture and Natural Resources, Washington State University

WSU PEER REVIEWED

TB91E

WASHINGTON STATE UNIVERSITY
EXTENSION