2024 Cost and Return Estimates of Establishing, Producing, and Packing Honeycrisp Apples in Washington

Preface

The results presented in this WSU publication serve as a general guide for evaluating the feasibility of producing Honeycrisp apples on two training systems—angled V and vertical spindle—in Washington State as of 2024. This publication is not intended to be a definitive guide to production practices, but it is a helpful tool for 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
- Production and management 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.

Honeycrisp Production in Washington State

Over the past decade, shipments of Honeycrisp fresh apples from Washington State have seen a significant increase. In 2012–2013, there were approximately 5 million 40 lb boxes produced in Washington State, and in 2022–2023, it was approximately 12.6 million boxes. As of 2022–2023, Honeycrisp was the fifth largest cultivar grown in Washington State, with 12% of the total shipments, following the cultivars, Gala, Red Delicious, Granny Smith, and Fuji (WSTFA [Washington State Tree Fruit Association] 2024). Figure 1 illustrates the increase of Honeycrisp shipments.

Honeycrisp apples command a price premium above the more traditional apple cultivars grown in Washington but also exhibit a high degree of price volatility. Figure 2 shows that over the past decade (from 2012 to 2013 and 2022 to 2023) the average packinghouse door price for Honeycrisp has been $56.20 per 40 lb box with a standard deviation of $5.78. In comparison, Red Delicious averaged $17.70 (standard deviation $2.29), Gala $25.70 (standard deviation $2.82), Fuji $26.3 (standard deviation $3.15), and Granny Smith $25.40 (standard deviation $3.76) (WSTFA 2024).

Study Objectives

This publication is designed to enable owner-operators to estimate: (1) the costs of equipment, materials, supplies, and labor required to establish and produce a Honeycrisp orchard on two training systems—angled V and vertical spindle—and packing costs; and (2) the ranges of price and yield at which Honeycrisp production would be a profitable enterprise.

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

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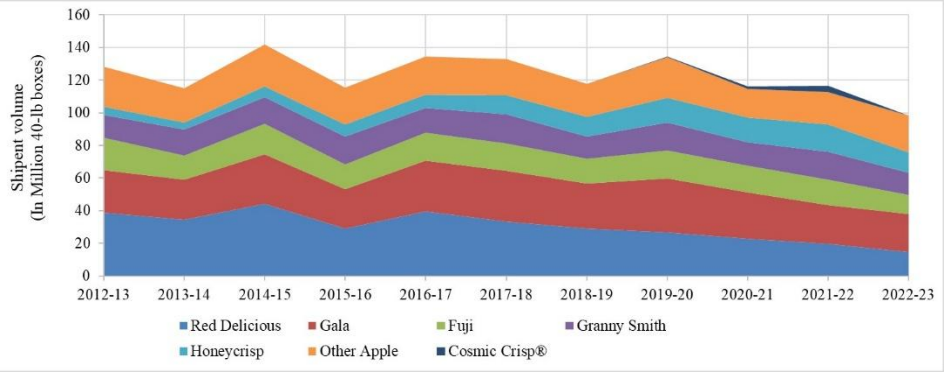

Figure 1. Shipment volume of Washington-grown apple cultivars from 2013 to 2014 and 2022 to 2023. Source: WSTFA (2024).

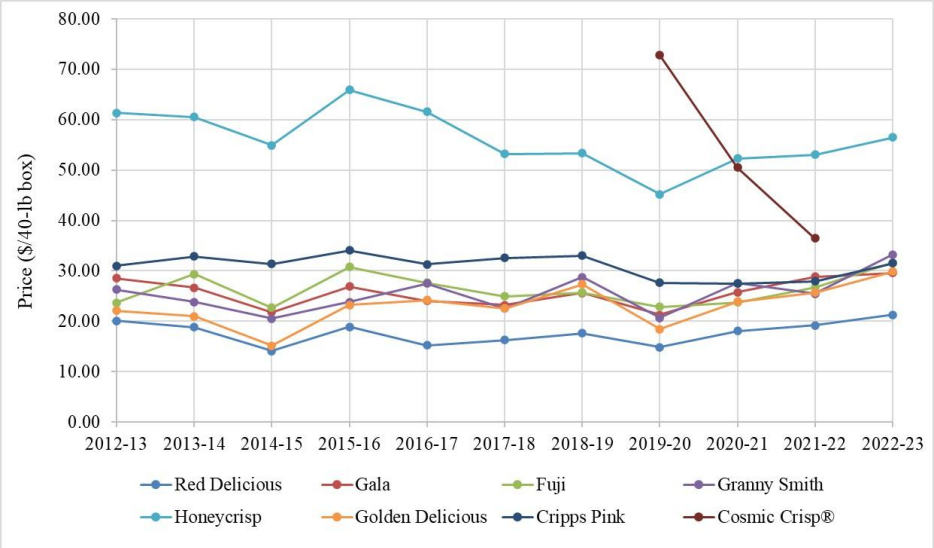

Figure 2. Packinghouse door prices for different fresh apple cultivars grown in Washington State, from 2012 to 2013 and 2022 to 2023. Source: WSTFA (2024).

Information Sources

The data used in this study were gathered from a group of experienced Honeycrisp owner-operators in Washington State, crop consultants, and Extension specialists. The owner-operators' production practices and input requirements form the baseline assumptions that are used to develop the enterprise budget. The values selected here represent levels that are anticipated to be expected over an orchard's life if no unforeseen conditions occur. Additional insights on pest, disease, and nutrient management programs are obtained from crop consultants and Extension specialists. 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 of mixed conventional tree fruits. 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 27-acre Honeycrisp block within a 300-acre orchard. It is assumed that 1 acre 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 26 acres. Table 1.1 presents the Honeycrisp block specifications for the angled V, while Table 1.2 outlines the specifications for the vertical spindle training system. The differences are in the architecture and spacing of planted trees and, thus, the tree density. On the angled V, the tree density is 1,815 trees per acre, while on the vertical spindle, it is 1,452 trees per acre.
3. Given the differences in the number of trees and per-acre bearing surface, the gross yield, cost of trellis system and labor requirements for pruning, training, and thinning are higher for angled V.
4. The total value of bare agricultural land (including senior water rights) is $20,000 per acre with annual property taxes of $200 per acre.
5. The irrigation system consists of under-tree double drip lines and a sprinkler system for under-tree cover crop or overhead cooling, with two separate sub-main lines. 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 for 2024 was $23.75 per hour, calculated using the base Washington adverse wage rate for 2024 of

$19.25 per hour (U.S. Department of Labor 2024), plus H2A fixed cost of $4.50 per hour. For fertilizer application and frost protection, the labor rate was $24.75 per hour, a dollar more than the manual labor rate. For chemical application and irrigation, the labor rate was $27.79 per hour, including overtime and H2A fixed cost. Harvest labor rates follow the Agricultural Wage and Practices Employer Survey, plus mandated paid rest breaks and paid overtime. These labor rates are assumed to be the same for all years of production.

8. The gross return used in the baseline analysis is $44 per 40 lb box or $440 per 825 lb bin in Year 4 and $660 per 825 lb bin in Year 5 and onwards.
9. Average pack-out for Honeycrisp is 50% in Year 4 and 72% in Year 5 and onward.
10. Warehouse packing charges assume an 825 lb bin.
11. Management salary is valued at $750 per acre.
12. 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 the orchard, equipment, and building purchases.

Table 1.1. Honeycrisp block specifications, angled V trellis system.

Block Specification	Description
Architecture	Train each level's branches straight down to the wire
In-Row Spacing	2 feet
Between-Row Spacing	10 feet
Rootstock	G-41
Productive Block Size	26 acres
Life of Planting	20 years
Tree Density	2,178 trees per acre
Trellis System	Angled V (30 degrees from the vertical line, with 7 wires per side; top wire is 11.5 feet off the ground, metal post every 30 ft)

Table 1.2. Honeycrisp block specifications, vertical spindle trellis system.

Block Specification	Description
Architecture	Train each level's branches straight down to the wire
In-Row Spacing	3 feet
Between-Row Spacing	10 feet
Rootstock	G-41
Productive Block Size	26 acres
Life of Planting	20 years
Tree Density	1,452 trees per acre
Trellis System	Vertical spindle (height 11.5 feet, 7 wires, metal post every 30 ft)

Summary of Study Results

A detailed budget is presented for the establishment and production of Honeycrisp apple trees trained on an angled V system and vertical spindle system. Production costs are classified into variable costs and fixed costs. Variable costs comprise orchard operations, harvest activities, materials, maintenance and repairs, and packing costs (Tables 2.1 and 2.2). Fixed costs are incurred whether apples are produced (Tables 3.1 and 3.2). These costs will generally be calculated for the whole farm enterprise and allocated on a per-acre basis. The fixed costs include interest, taxes, insurance, management, amortized establishment costs, and depreciation on capital. Fixed capital includes land, irrigation system, netting for sunburn protection, machinery, equipment and building, main line and pump, pond, trellis, and wind machine. 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. Total fixed costs are increasing every year due to the interest cost of establishment that is incurred beginning the second year of production.

This study assumes that a Honeycrisp apple orchard in either system could achieve full production in the sixth year of operation. Based on the above assumptions, the total production costs on an angled V trellis system are estimated at $50,592 per acre (Table 4.1) and $43,533 per

acre on vertical spindle system (Table 4.2) during full production.

The returns over variable costs are positive: $2,077 per acre for the angled V and $362 per acre for the vertical spindle system. These returns cover operating costs. However, these returns do not cover total production costs, including opportunity costs. Opportunity costs are the returns on investment that would have been received if the investment had been in the next-best alternative activity. Interest costs and management costs in the enterprise budget are accounted for, where the latter may represent the unpaid time and labor of the owner-operator.

Table 2.1. Variable costs ($ per acre) of establishing, producing, and packing Honeycrisp on an angled V trellis system in a 26-acre orchard block.

Activity	Year 1	Year 2	Year 3	Year 4	Year 5	Years 6 to 20 (Full Production, Annual Average)
Soil Preparation	1,520	0	0	0	0	0
Trees (including labor)	19,938	0	0	0	0	0
Pruning and Training [a]	1,734	1,568	1,283	689	1,021	1,306
Thinning [b]	0	0	863	1,053	1,124	1,425
Chemicals [c,d]	349	819	2,133	2,293	2,293	2,293
Fertilizer [c,d]	90	90	294	294	294	294
Irrigation Water and Electric Charge	350	350	350	365	365	365
Irrigation Labor [d]	361	361	361	361	361	361
Sunburn Protection [e]	0	0	0	150	150	150
Frost Protection (labor) [d]	10	10	10	10	10	10
Beehives	0	0	65	65	65	65
General Farm Labor [f]	300	300	300	300	300	300
Picking Labor [g]	0	0	0	3,038	4,030	5,022
Other Labor (checkers, tractor drivers, supervisors) [g]	0	0	0	539	715	891
Hauling Apples [g]	0	0	0	539	715	891
Warehouse Packing Charges [h]	0	0	0	9,751	15,535	19,359
Maintenance and Repair	360	360	360	425	425	425
Fuel and Lube	270	270	270	270	270	270
Overhead [i]	1,264	206	314	1,007	1,384	1,671
Interest (5% of Variable Costs) [j]	1,327	217	330	1,057	1,453	1,316
Total Variable Costs	**27,873**	**4,551**	**6,933**	**22,206**	**30,510**	**36,414**

Note: Numbers are rounded to the nearest whole number.

[a] Hand labor rate is $23.75 per hour and includes all applicable taxes and benefits.

[b] There is neither hand thinning nor chemical thinning for Honeycrisp.

[c] Includes materials and labor.

[d] Tractor or machinery labor for chemical application and irrigation is $27.79 per hour. Labor for fertilizer application and frost protection is $24.75 per hour and includes all applicable taxes and benefits.

[e] Labor cost to deploy and pull back.

[f] General farm labor rate is a lump sum per acre and is applied to miscellaneous or all other labor. It includes applicable taxes and benefits.

[g] Picking rate = $62 per bin; checkers' and tractor drivers' rate = $11 per bin; hauling rate = $11 per 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.

[h] Packing charges include receiving charges per bin plus total box charges per bin. Pack-out number of boxes per bin is 15.

[i] Overhead is calculated as five percent of variable costs. 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.

[j] Interest of operating capital is calculated as five percent of the sum of variable costs and overhead. The interest expense is for a full year during establishment years and for three-quarters of a year during full production.

Table 2.2. Variable costs ($ per acre) of establishing, producing, and packing Honeycrisp on vertical spindle trellis system in a 26-acre orchard block.

Activity	Year 1	Year 2	Year 3	Year 4	Year 5	Years 6 to 20 (Full Production, Annual Average)
Soil Preparation	1,520	0	0	0	0	0
Trees (including labor)	15,950	0	0	0	0	0
Pruning and Training [a]	1,235	1,211	1,235	594	879	1,069
Thinning [b]	0	0	721	887	1,124	1,425
Chemicals [c,d]	349	819	2,133	2,293	2,293	2,293

Activity	Year 1	Year 2	Year 3	Year 4	Year 5	Years 6 to 20 (Full Production, Annual Average)
Fertilizer [c,d]	90	90	294	294	294	294
Irrigation Water and Electric Charge	350	350	350	365	365	365
Irrigation Labor [d]	361	361	361	361	361	361
Sunburn Protection [e]	0	0	0	150	150	150
Frost Protection (labor) [d]	10	10	10	10	10	10
Beehives	0	0	65	65	65	65
General Farm Labor [f]	300	300	300	300	300	300
Picking Labor [g]	0	0	0	2,418	3,224	4,030
Other Labor (checkers, tractor drivers, supervisors) [g]	0	0	0	429	572	715
Hauling Apples [g]	0	0	0	429	572	715
Warehouse Packing Charges [h]	0	0	0	7,761	12,428	15,535
Maintenance and Repair	360	360	360	425	425	425
Fuel and Lube	270	270	270	270	270	270
Overhead [i]	1,040	189	305	853	1,167	1,401
Interest (5% of Variable Costs) [j]	1,092	198	320	895	1,225	1,103
Total Variable Costs	**22,927**	**4,158**	**6,723**	**18,798**	**25,723**	**30,526**

Note: Numbers are rounded to the nearest whole number.

[a] Hand labor rate is $23.75 per hour and includes all applicable taxes and benefits.

[b] There is neither hand thinning nor chemical thinning for Honeycrisp.

[c] Includes materials and labor.

[d] Tractor or machinery labor for chemical application and irrigation is $27.79 per hour. Labor for fertilizer application and frost protection is $24.75 per hour and includes all applicable taxes and benefits.

[e] Labor cost to deploy and pull back.

[f] General farm labor rate is a lump sum per acre and is applied to miscellaneous or all other labor. It includes applicable taxes and benefits.

[g] Picking rate = $62 per bin; checkers' and tractor drivers' rate = $11 per bin; hauling rate = $11 per 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.

[h] Packing charges include receiving charges per bin plus total box charges per bin. Pack-out number of boxes per bin is 15.

[i] Overhead is calculated as five percent of variable costs. 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.

[j] Interest of operating capital is calculated as five percent of the sum of variable costs and overhead. The interest expense is for a full year during establishment years and for three-quarters of a year during full production.

Table 3.1. Fixed cash and noncash costs—depreciation, interest, and other fixed costs ($ per acre) of establishing, producing, and packing Honeycrisp on angled V trellis system in a 26-acre orchard block.

Fixed Cash or Noncash Cost		Year 1	Year 2	Year 3	Year 4	Year 5	Years 6 to 20 (Full Production, Annual Average)
Cash:	Miscellaneous Supplies	190	190	190	190	190	190
Cash:	Land and Property Taxes	200	200	200	200	200	200
Cash:	Insurance Cost (crop and farm)	600	600	600	600	600	600
Depreciation:	Irrigation System	160	160	160	160	160	160
Depreciation:	Sunburn Protection—Netting	500	500	500	500	500	500
Depreciation:	Machinery, Equipment, and Building	307	307	307	307	307	307
Depreciation:	Main Line and Pump	30	30	30	30	30	30
Depreciation:	Pond	60	60	60	60	60	60
Depreciation:	Trellis	650	650	650	650	650	650
Depreciation:	Wind Machine	134	134	134	134	134	134
Interest:	Irrigation System	120	120	120	120	120	120
Interest:	Sunburn Protection—Netting	250	250	250	250	250	250
Interest:	Land [a]	1,000	1,000	1,000	1,000	1,000	1,000
Interest:	Machinery, Equipment, and Building	106	106	106	106	106	106
Interest:	Main Line and Pump	23	23	23	23	23	23
Interest:	Pond	75	75	75	75	75	75
Interest:	Trellis	325	325	325	325	325	325
Interest:	Wind Machine	100	100	100	100	100	100
Interest:	Establishment Cost	0	1,673	2,263	3,002	4,002	0
Other Fixed Cost:	Management Cost	750	750	750	750	750	750

Fixed Cash or Noncash Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Years 6 to 20 (Full Production, Annual Average)
Other Fixed Cost: Amortized Establishment Costs [b]	0	0	0	0	0	8,598
Total Fixed Cost	**5,580**	**7,253**	**7,843**	**8,582**	**9,582**	**14,178**

Note: Numbers are rounded to the nearest whole number.

[a] Land cost is approximated by using the 5% interest rate multiplied by the land value of $20,000 per acre.

[b] 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 3.2. Fixed cash and noncash costs—depreciation, interest, and other fixed costs ($ per acre) of establishing, producing, and packing Honeycrisp on vertical spindle trellis system in a 26-acre orchard block.

Fixed Cash or Noncash Cost		Year 1	Year 2	Year 3	Year 4	Year 5	Years 6 to 20 (Full Production, Annual Average)
Cash:	Miscellaneous Supplies	190	190	190	190	190	190
Cash:	Land and Property Taxes	200	200	200	200	200	200
Cash:	Insurance Cost (crop and farm)	600	600	600	600	600	600
Depreciation:	Irrigation System	160	160	160	160	160	160
Depreciation:	Sunburn Protection—Netting	500	500	500	500	500	500
Depreciation:	Machinery, Equipment, and Building	307	307	307	307	307	307
Depreciation:	Main Line and Pump	30	30	30	30	30	30
Depreciation:	Pond	60	60	60	60	60	60
Depreciation:	Trellis	417	417	417	417	417	417
Depreciation:	Wind Machine	134	134	134	134	134	134
Interest:	Irrigation System	120	120	120	120	120	120
Interest:	Sunburn Protection—Netting	250	250	250	250	250	250
Interest:	Land [a]	1,000	1,000	1,000	1,000	1,000	1,000
Interest:	Machinery, Equipment, and Building	106	106	106	106	106	106
Interest:	Main Line and Pump	23	23	23	23	23	23
Interest:	Pond	75	75	75	75	75	75
Interest:	Trellis	208	208	208	208	208	208
Interest:	Wind Machine	100	100	100	100	100	100
Interest:	Establishment Cost	0	1,408	1,948	2,643	3,547	0
Other Fixed Cost:	Management Cost	750	750	750	750	750	750
Other Fixed Cost:	Amortized Establishment Costs [b]	0	0	0	0	0	7,778
Total Fixed Cost		**5,230**	**6,638**	**7,177**	**7,872**	**8,777**	**13,008**

Note: Numbers are rounded to the nearest whole number.

[a] Land cost is approximated by using the 5% interest rate multiplied by the land value of $20,000 per acre.

[b] 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 4.1. Summary of estimated costs and returns ($ per acre) of establishing, producing, and packing Honeycrisp on angled V trellis system in a 26-acre orchard block.

Returns and Costs	Year 1	Year 2	Year 3	Year 4	Year 5	Years 6 to 20 (Full Production, Annual Average)
Estimated Net Production (bins/acre) [a]	0	0	0.00	24.50	46.80	58.32
Estimated FOB Price in $/bin [b]	440	440	440	440	660	660
Estimated FOB Price in $/40 lb box [b]	44	44	44	44	44	44
Total Returns	**0**	**0**	**0**	**10,780**	**30,888**	**38,491**
Total Variable Costs	27,873	4,551	6,933	22,206	30,510	36,414
Total Cash Costs [c]	28,863	5,541	7,923	23,196	31,500	37,404
Total Cash Costs and Depreciation	30,704	7,382	9,763	25,037	33,340	39,245
Total Fixed Costs	5,580	7,253	7,843	8,582	9,582	14,178
Total Production Costs [d]	33,453	11,804	14,775	30,787	40,092	50,592

Returns and Costs	Year 1	Year 2	Year 3	Year 4	Year 5	Years 6 to 20 (Full Production, Annual Average)
Returns over Variable Costs [e]	**-27,873**	**-4,551**	**-6,933**	**-11,426**	**378**	**2,077**
Returns over Cash Costs [e]	**-28,863**	**-5,541**	**-7,923**	**-12,416**	**-612**	**1,087**
Returns over Cash Costs and Depreciation [e]	**-30,704**	**-7,382**	**-9,763**	**-14,257**	**-2,452**	**-754**
Net Returns [f]	**-33,453**	**-11,804**	**-14,775**	**-20,007**	**-9,204**	**-12,101**

Note: Numbers are rounded to the nearest whole number, except the net production and FOB price per bin.
[a] Estimated net production considers an average pack-out of 50% or about 10 boxes per bin in Year 4, and 72% or about 15 boxes per bin in Year 5 and onward.
[b] FOB means free on board. FOB prices are packinghouse door prices. They reflect the return before any expenses are subtracted. Bin size is 825 lb. Both the per-bin price and per-40 lb box price are provided for convenience, but the per-bin price is used to calculate the Total Returns.
[c] Total cash costs are the sum of total variable costs and fixed cash costs—land and property taxes, insurance cost, and miscellaneous supplies.
[d] Total production costs are the sum of total variable costs and total fixed costs.
[e] The returns over variable costs, cash costs, and cash costs and depreciation are calculated as the difference between total returns and the respective costs. Numbers that are red and preceded by a minus symbol denote negative returns.
[f] Net returns are calculated as the difference between total returns and total production costs.

Table 4.2. Summary of estimated costs and returns ($ per acre) of establishing, producing, and packing Honeycrisp on vertical spindle trellis system in a 26-acre orchard block.

Returns and Costs	Year 1	Year 2	Year 3	Year 4	Year 5	Years 6 to 20 (Full Production, Annual Average)
Estimated Net Production (bins/acre) [a]	0	0	0.00	19.50	37.44	46.80
Estimated FOB Price in $/bin [b]	440	440	440	440	660	660
Estimated FOB Price in $/40 lb box [b]	44	44	44	44	44	44
Total Returns	**0**	**0**	**0**	**8,580**	**24,710**	**30,888**
Total Variable Costs	22,927	4,158	6,723	18,798	25,723	30,526
Total Cash Costs [c]	23,917	5,148	7,713	19,788	26,713	31,516
Total Cash Costs and Depreciation	25,524	6,755	9,320	21,395	28,320	33,123
Total Fixed Costs	5,230	6,638	7,177	7,872	8,777	13,008
Total Production Costs [d]	28,156	10,796	13,901	26,670	34,500	43,533
Returns over Variable Costs [e]	**-22,927**	**-4,158**	**-6,723**	**-10,218**	**-1,013**	**362**
Returns over Cash Costs [e]	**-23,917**	**-5,148**	**-7,713**	**-11,208**	**-2,003**	**-628**
Returns over Cash Costs and Depreciation [e]	**-25,524**	**-6,755**	**-9,320**	**-12,815**	**-3,610**	**-2,235**
Net Returns [f]	**-28,156**	**-10,796**	**-13,901**	**-18,090**	**-9,790**	**-12,645**

Note: Numbers are rounded to the nearest whole number, except the net production and FOB price per bin.
[a] Estimated net production considers an average pack-out of 50% or about 10 boxes per bin in Year 4, and 72% or about 15 boxes per bin in Year 5 and onward.
[b] FOB means free on board. FOB prices are packinghouse door prices. They reflect the return before any expenses are subtracted. Bin size is 825 lb. Both the per-bin price and per-40 lb box price are provided for convenience, but the per-bin price is used to calculate the Total Returns.
[c] Total cash costs are the sum of total variable costs and fixed cash costs—land and property taxes, insurance cost, and miscellaneous supplies.
[d] Total production costs are the sum of total variable costs and total fixed costs.
[e] The returns over variable costs, cash costs, and cash costs and depreciation are calculated as the difference between total returns and the respective costs. Numbers that are red and preceded by a minus symbol denote negative returns.
[f] Net returns are calculated as the difference between total returns and total production costs.

Most of the budget values given in Tables 2.1–4.1 and Tables 2.2–4.2 are based on more comprehensive underlying cost data, which are provided in the Excel Workbook described in the next section. 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, or a combination of the two. Depreciation costs are annual, noncash 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.

Table 5.1 and Table 5.2 show the sensitivity of net returns during full production to different combinations of price and yields given the different trellis systems. For this analysis,

the free on board (FOB) prices considered are the minimum, average, median, and maximum average annual FOB prices between 2019 and 2024 (WSTFA 2024), plus a couple additional price scenarios. The net yields are about 51–69 bins per acre, given a 72% pack-out. None of the gross yield and price combinations in either trellis system would result in positive net returns for the owner-operator, based on the study's production and cost assumptions.

Table 6.1 and Table 6.2 show the break-even (BE) return given different yield levels during full production in the different trellis systems. As of 2024, the first break-even returns of Honeycrisp are about $624 per bin and $652 per bin for the angled V or spindle systems, respectively. These values represent the minimum return needed for the owner-operator to cover the operation's variable costs in the two scenarios. Returns lower than these figures suggest that it is more profitable not to operate (shutdown price) than to produce Honeycrisp for the fresh market. The second break-even returns are about $641 per bin (angled V) and $673 per bin (spindle), which is needed to cover the total cash costs and to be economically viable in the short run. The third break-even returns are $673 per bin (angled V) and $708 per bin (spindle), which is needed to cover the cash costs plus 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 returns are about $867 per bin (angled V) and $930 per bin (spindle). When this return is received, the owner-operator would recover all out-of-pocket expenses plus realize a competitive return on equity capital invested in land, 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.

The key results of the enterprise budget are formed using 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 apple operations in Washington State, as well as those outside of Washington State. An interactive Excel Workbook is provided to enable individual owner-operators to estimate their returns based on the costs of their production.

Table 5.1. Estimated net returns[a] per acre at various prices and yields of Honeycrisp during full production on angled V trellis system.

Gross Yield (bins/acre) [b]	Net Yield (bins/acre) [b]	Net Returns ($/acre) at $480/Bin (or $32/box) [c,d]	Net Returns ($/acre) at $704/Bin (or $47/box) [c,d]	Net Returns ($/acre) at $752/Bin (or $50/box) [c,d]	Net Returns ($/acre) at $784/ Bin (or $52/box) [c,d]
65	47	-22,498	-12,015	-9,769	-8,271
69	50	-22,523	-11,395	-9,010	-7,421
73	53	-22,548	-10,775	-8,252	-6,570
77	55	-22,574	-10,155	-7,494	-5,720
81	58	-22,599	-9,535	-6,736	-4,869
85	61	-22,624	-8,915	-5,977	-4,019
89	64	-22,649	-8,295	-5,219	-3,168

Note: Net yield and net returns are rounded to the nearest whole number.

[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 for.

[b] Assumes an 825 lb bin. Considers an average pack-out of 72%.

[c] The number of 40 lb boxes per bin is 15.

[d] From left to right, the assumed FOB prices are the minimum, average, median, and maximum annual FOB prices of Honeycrisp between 2019 and 2024 (Source: WSTFA 2024). Both prices in terms of bin and 40 lb box are provided for convenience, but the price per bin is used to calculate the net returns.

Table 5.2. Estimated net returns[a] per acre at various prices and yields of Honeycrisp during full production on vertical spindle trellis system.

Gross Yield (bins/acre) [b]	Net Yield (bins/acre) [b]	Net Returns ($/acre) at $480/Bin (or $32/box) [c,d]	Net Returns ($/acre) at $704/Bin (or $47/box) [c,d]	Net Returns ($/acre) at $752/Bin (or $50/box) [c,d]	Net Returns ($/acre) at $784/Bin (or $52/box) [c,d]
65	47	-21,069	-10,586	-8,340	-6,842
69	50	-21,094	-9,966	-7,582	-5,992
73	53	-21,120	-9,346	-6,823	-5,141
77	55	-21,145	-8,726	-6,065	-4,291
81	58	-21,170	-8,106	-5,307	-3,440
85	61	-21,195	-7,486	-4,548	-2,590
89	64	-21,220	-6,866	-3,790	-1,740

Note: Net yield and net returns are rounded to the nearest whole number.

[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 for.

[b] Assumes an 825 lb bin. Considers an average pack-out of 72%.

[c] The number of 40 lb boxes per bin is 15.

[d] From left to right, the assumed FOB prices are the minimum, average, median, and maximum annual FOB prices of Honeycrisp between 2019 and 2024 (Source: WSTFA 2024). Both prices in terms of bin and 40 lb box are provided for convenience, but the price per bin is used to calculate the net returns.

Table 6.1. Break-even return for different levels of enterprise costs during full production of Honeycrisp on angled V trellis system.

Levels of Enterprise Costs	Cost ($ per acre)	Break-Even Return ($ per bin) [a]	Break-Even Return ($ per 40 lb box) [a]
1. Total Variable Costs	36,414.23	624.39	41.63 [b]
2. Total Cash Costs [c]	37,404.23	641.36	42.76 [d]
3. Total Cash Costs + Depreciation Costs	39,245.03	672.93	44.86 [e]
4. Total Costs [f]	50,592.20	867.49	57.83 [g]

Note: Number of boxes per bin is 15. Bin size is 825 lb.

[a] Break-even (BE) return is calculated as BE Return = Cost divided by Net yield during full production (i.e., 58.32 bins per acre). The BE Return per 40 lb box is calculated as the per bin value divided by 15. 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, Honeycrisp apples are uneconomical to produce.

[c] Total Cash Costs are the sum of total variable costs, land and property taxes, insurance cost, and miscellaneous supplies. 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] This refers to the total production costs, which are the sum of total cash costs, depreciation costs, interest costs, and management cost. 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 6.2. Break-even return for different levels of enterprise costs during full production of Honeycrisp on vertical spindle trellis system.

Levels of Enterprise Costs	Cost ($ per acre)	Break-Even Return ($ per bin) [a]	Break-Even Return ($ per 40 lb box) [a]
1. Total Variable Costs	30,525.62	652.26	43.48 [b]
2. Total Cash Costs [c]	31,515.62	673.41	44.89 [d]
3. Total Cash Costs + Depreciation Costs	33,122.91	707.75	47.18 [e]
4. Total Costs [f]	43,533.41	930.20	62.01 [g]

Note: Number of boxes per bin is 15. Bin size is 825 lb.

[a] Break-even (BE) return is calculated as BE Return = Cost divided by Net yield during full production (i.e., 46.80 bins per acre). The BE Return per 40 lb box is calculated as the per bin value divided by 15. 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, Honeycrisp apples are uneconomical to produce.
[c] Total Cash Costs are the sum of total variable costs, land and property taxes, insurance cost, and miscellaneous supplies. 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] This refers to the total production costs, which are the sum of total cash costs, depreciation costs, interest costs, and management cost. 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.

Excel Workbook

The supporting data for Honeycrisp on the two trellis systems can be found in the following Excel Workbooks: Appendix 1.1 Honeycrisp Apples Grown on Angled V Trellis System and Appendix 1.2 Honeycrisp Apples Grown on Vertical Spindle Trellis System. These workbooks are available for download on the WSU School of Economic Sciences Extension Crop Enterprise Budgets website. The workbooks include the enterprise budgets (Table 2.1 and Table 2.2), as well as associated data underlying the per-acre cost calculations (Appendix Tables 1 through 9 for capital requirements, calculation of interest cost, establishment costs, full production costs, calculation of salvage value and depreciation costs, amortization calculator, and production-related data).

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

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