2015 Cost Estimates of Establishing, Producing, and Packing Sweetheart Sweet Cherries in Washington State

Preface

The results presented in this WSU publication serve as a general guide for evaluating the feasibility of producing Sweetheart sweet cherries in Washington State as of 2015. 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 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
- Sweet cherry 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.

Sweetheart Sweet Cherry Production in Washington

Washington State is the number one producer of sweet cherries in the U.S. In 2014, the gross value of sweet cherries was about $385 million, ranking it seventh in terms of overall value of agricultural commodities produced in the state (WSDA 2015). The total planted acreage of sweet cherries has increased from 13,925 acres in 1986 to 38,115 acres in 2011 (NASS 2011). As of 2006 and 2011, Sweetheart was second to Bing in terms of its share in the total bearing acreage of sweet cherries in the state, which were 12% and 17% during those respective years.

In 2011, 6,569 acres were planted to Sweetheart sweet cherries — 53.4% of these bearing acres were located in Wenatchee, 27.5% in the Columbia Basin, 18.5% in the Yakima Valley, and 0.6% in other areas (NASS 2011).

Study Objectives

This publication is designed to enable growers to estimate: (1) the costs of equipment, materials, supplies, and labor required to establish and produce a Sweetheart sweet cherry orchard, and (2) the ranges of price and yield at which Sweetheart sweet cherry 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 Sweetheart sweet cherry orchards. This publication does not necessarily represent any particular orchard operation, and it 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.

Sources of Information

The data used in this study were gathered from a group of experienced Sweetheart cherry growers in 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 area growers anticipate over an orchard's life, if no unforeseen failures occur. Given that many factors affect production costs, pack-out, and returns, individual growers can use the Excel Workbook provided to make necessary modifications and 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 an 11-acre Sweetheart block within a 300-acre diverse cultivar orchard. It is assumed that one acre of this block is not used for the direct production of tree fruit; rather it is dedicated to roads, a pond, loading area, and the like. Therefore, the total productive area for this block is 10 acres. Table 1 shows the assumed Sweetheart block specifications.

3. The value of bare agricultural land (including water rights) is $12,000 per acre with annual property taxes of $120 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 hand and using ladders (no platforms).

7. Management is valued at $300 per acre. This value is representative of what the producer group felt as a fair return for an operator's management skills.

8. Interest on investment is 5%. Five percent is the median of the range of the average annual effective interest rates on non-real estate bank loans made to farmers from 2010 to 2015 (Federal Reserve Bank of Kansas City 2016).

Summary of Study Results

The estimated annual cost and returns for a 10-acre block of Sweetheart sweet cherries 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 cherries 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 rather than a variable cost because, like land, management has been committed to the production cycle of the crop.

The study assumed that a Sweetheart sweet cherry orchard could achieve full production in the sixth year. Based on the above assumptions, the total production costs for Sweetheart during full production are estimated at $27,514 per acre. The break-even price for Sweetheart cherries as of 2015 is estimated at $1.43 per lb (considering 80% pack-out). Table 3 shows the sensitivity of net returns to different price and yield combinations.

Most of the budget values given in Table 2 are based on more comprehensive underlying cost data, which are shown in Tables 4 through 7. Table 4 presents the annual capital requirements for a 10-acre Sweetheart block. Table 5 specifies the machinery and building requirements for the 300-acre diverse cultivar orchard. Interest costs and depreciation costs are listed in Tables 6 and 7, 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, or 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 25 years, which includes five years of establishment and 20 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 economic feasibility of investing in a Sweetheart 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 5% is used in the calculation of NPV and payback periods, and represents the opportunity cost of capital. Assuming a price of $2.05 per lb and a discount rate of 5%, the NPV of the investment over the lifetime of the orchard is $1.3 million (Table 8).

The estimated discounted payback period for the orchard investment can vary depending on the costs included in the calculation, and ranges from 4.73 to 6.56 years. If total cash costs are considered, which is the sum of total variable costs, miscellaneous supplies, land and property taxes, and farm insurance, the discounted payback period is 4.73 years. Whereas, if all production costs are included, which is the sum of total cash cost and fixed capital investment, the discounted payback period is 6.56 years. Table 8 shows the sensitivity of these calculations to different discount rates—3% through 8%. The range of the average annual effective interest rates on non-real estate bank loans made to farmers in the past six years (2010 to 2015) is between 4% and 6% according to the Federal Reserve Bank of Kansas City (2016). Alternative discount rates are included to further demonstrate the value of better (or worse) investments or possible impacts of inflation. The NPV and payback period calculations are shown in detail in Appendix 6 of the Excel Workbook.

The key results of this enterprise budget are formed by production-related assumptions established for the study. Production costs and returns for individual growers may differ, thus the results cannot be generalized to represent the population of farmers. An interactive Excel Workbook, described below, is provided to enable individual growers to estimate their returns based on the costs of their production.

Excel Workbook

An Excel spreadsheet version of this enterprise budget (Table 2), as well as associated data underlying the per acre cost calculations (Tables 4 through 7, and Appendixes 1 through 6 for establishment costs, full production costs, calculation of salvage value and depreciation costs, amortization calculator; production-related data, and NPV and payback period calculators) are available at the WSU School of Economic Sciences Extension website: http://ses.wsu.edu/enterprise_budgets/.

Growers can modify select values and use the Excel Workbook to evaluate their own production costs and returns.

References

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Table 1. Sweetheart Block Specifications

Architecture	Central leader, three-dimensional
In-row Spacing	10 feet
Between-row Spacing	16 feet
Rootstock	Sweetheart on Mazzard rootstock
Block Size (productive)	10 acres
Life of Planting	25 years
Tree Density	272 trees per acre (5% of total number of trees are Lapins as pollenizers)
Trellis System	No support or trellis

Table 2. Cost and Returns per Acre of Establishing, Producing and Packing Sweetheart on a 10-Acre Orchard Block

	Establishment Years					Full
	Year 1	Year 2	Year 3	Year 4	Year 5	Production[A]
Estimated Net Production, Fresh (lb/acre)[B]			1,600.00	8,000.00	14,400.00	19,200.00
Estimated Price, Fresh ($/lb)[C]			2.05	2.05	2.05	2.05
Estimated Net Production, Cull (lb/acre)			400.00	2,000.00	3,600.00	4,800.00
Estimated Price, Cull ($/lb)			0.20	0.20	0.20	0.20
TOTAL RETURNS ($/acre)			**3,360.00**	**16,800.00**	**30,240.00**	**40,320.00**
Variable Costs						
Establishment[D]	4,528.00					
Orchard Activities[E]	987.00	1,697.00	2,320.50	2,842.50	3,116.50	3,316.50
Harvest Activities[F]			580.00	2,900.00	5,220.00	6,960.00
Warehouse Packing Charge			1,000.00	5,000.00	9,000.00	12,000.00
Maintenance and Repairs[G]	270.00	307.00	312.00	342.00	397.00	397.00
Other Variable Costs[H]	592.96	205.41	641.26	1,345.64	2,027.16	2,233.43
Total Variable Costs	6,377.96	2,209.41	4,853.76	12,430.14	19,760.66	24,906.93
Total Fixed Costs[I]	**1,820.65**	**2,230.59**	**2,635.11**	**2,841.55**	**2,765.13**	**2,607.00**
TOTAL COSTS ($/acre)	**8,198.62**	**4,440.00**	**7,488.86**	**15,271.69**	**22,525.79**	**27,513.92**
ESTIMATED NET RETURNS ($/acre)	**-8,198.62**	**-4,440.00**	**-4,128.86**	**1,528.31**	**7,714.21**	**12,806.08**

Notes:

A. The full production year is representative of all the remaining years the orchard is in full production (Year 6 to Year 25).
B. Estimated net production considers an average pack-out of 80%.
C. These prices reflect gross FOB prices (price before packing charges).
D. Includes costs of soil preparation and planting (trees and labor).
E. Includes pruning and training, green fruit thinning, irrigation labor, chemicals, fertilizer, frost protection (labor), beehives, general farm labor, and irrigation and electric charge.
F. Includes picking labor and other labor (checkers, tractor drivers).
G. Includes maintenance and repair, and fuel and lube.
H. Includes crop insurance (starting Year 3), overhead, and interest on operating capital.
I. Includes depreciation and interest on fixed capital, interest on establishment, and other fixed costs (miscellaneous supplies, land and property taxes, farm insurance, management cost, and amortized establishment cost).

Table 3. Estimated Net Returns[A] ($) per Acre at Various Prices and Yields of Sweetheart Sweet Cherries during Full Production

Net Yield	Price ($/lb)[C]						
(lb/acre)[B]	$1.00	$1.25	$1.50	$1.75	$2.00	$2.25	$2.50
9,600	-$7,107	-$4,707	-$2,307	$93	$2,493	$4,893	$7,293
12,800	-$7,189	-$3,989	-$789	$2,411	$5,611	$8,811	$12,011
16,000	-$7,271	-$3,271	$729	$4,729	$8,729	$12,729	$16,729
19,200	-$7,354	-$2,554	$2,246	$7,046	$11,846	$16,646	$21,446
22,400	-$7,436	-$1,836	$3,764	$9,364	$14,964	$20,564	$26,164
25,600	-$7,519	-$1,119	$5,281	$11,681	$18,081	$24,481	$30,881
28,800	-$7,601	-$401	$6,799	$13,999	$21,199	$28,399	$35,599

Notes:
Shaded area denotes a positive profit based on the combination of yield and price.
A. Includes cull value. Culls comprise what remains after packing (20%).
B. Takes into account an average pack-out equivalent to 80%.
C. Price represents gross return (i.e., the return before all expenses, including packing charges, are subtracted).

Table 4. Summary of Annual Capital Requirements for a 10-Acre Sweetheart Block

	Establishment Years					Full
	Year 1	Year 2	Year 3	Year 4	Year 5	Production[A]
Annual Requirements ($)						
Land (11 acres)	132,000					
Irrigation System	28,000					
Mainline & Pump	7,000					
Pond	3,000					
Wind Machine			31,290			
Operating Expenses	71,130	29,444	55,888	131,651	204,957	256,419
Total Requirements ($)	241,130	29,444	87,177	131,651	204,957	256,419
Receipts ($)	0	0	33,600	168,000	302,400	403,200
Net Requirements ($)	241,130	29,444	53,577	-36,349	-97,443	-146,781

Note:
A. The full production year is representative of all the remaining years the orchard is in full production (Year 6 to Year 25).

Table 5. 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
Pick-up	20,000	1	20,000
Ladder (8 ft)	130	100	13,000
Miscellaneous Equipment[C]	50,000	1	50,000
Shop Equipment[D]	15,000	1	15,000
Total Cost			**810,500**

Notes:
Machinery, equipment, and building requirements are utilized in growing diverse crops in the 300-acre farm, which include Bing sweet cherries. 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/repair.
C. Includes mobile portable toilet (2), box blade, straight blade, quick connect loader, mechanical weeder, detachable bucket for loading fertilizer, gopher baiter, soil aerator, utility trailer, and ladder trailer (2).
D. Includes compressor, welder, pressure washer, and miscellaneous tools.

Table 6. Interest Costs per Acre for a 10-Acre Sweetheart Block

	Total Purchase Price ($)	Salvage Value ($)[A]	Number of Acres	Total Interest Cost ($)	Interest Cost Per Acre ($)[B]
Irrigation System[C]	28,000	0	10	700	70.00
Land	132,000	N/A	11	6,600	600.00
Machinery, Equipment, & Building[D,E]	810,500	52,550	300	21,576	71.92
Mainline & Pump[C]	7,000	0	10	175	17.50
Pond[C]	3,000	0	10	75	7.50
Wind Machine[C]	31,290	0	10	782	78.22

Notes:

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.
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 (25 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 Appendix 3 of Excel Workbook for a detailed calculation of the salvage value.

Table 7. Depreciation Costs per Acre for a 10-Acre Sweetheart Block

	Total Purchase Price ($)	Number of Acres	Total Value Per Acre ($)	Years of Use	Depreciation Cost Per Acre ($/yr)[A]
Irrigation System	28,000	10	2,800.00	30	93.33
Mainline & Pump	7,000	10	700.00	30	23.33
Pond	3,000	10	300.00	50	6.00
Wind Machine	31,290	10	3,128.96	30	104.30
Machinery, Equipment, & Building[B]					196.07

Notes:

A. The depreciation cost is calculated as straight-line depreciation: (Total Purchase Price – Salvage Value)/Years of Use.

B. See Appendix 3 of Excel Workbook for the calculation of the depreciation cost.

Table 8. NPV and Payback Periods given Different Discount Rates

Discount rate	NPV	Payback period of Total Cash Cost[A] (years)	Payback period of Total Cost[B] (years)
3%	$1,824,127	4.66	6.35
4%	$1,563,335	4.69	6.45
5%	$1,342,844	4.73	6.56
6%	$1,155,616	4.76	6.67
7%	$995,959	4.80	6.79
8%	$859,250	4.83	6.92

Notes:

A. Cash cost is the sum of total variable cost, miscellaneous supplies, land & property taxes, and insurance cost. Excludes interest on operating capital.

B. 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.