

FINAL PROJECT REPORT

Project Title: Cost estimation and analysis of tree fruit production

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Total Project Funding: \$40,000

Budget History:

Item	Year 1: 2010-2011	Year 2: 2011-2012*	Total
Salaries	\$ 26,250	\$ 0	\$ 26,250
Benefits	\$ 8,190	\$ 0	\$ 8,190
Wages			
Benefits			
Equipment			
Supplies	\$ 500	\$ 0	\$ 500
Travel	\$ 3,000	\$ 0	\$ 3,000
Plot Fees			
Miscellaneous	\$ 2,060	\$ 0	\$ 2,060
Total	\$ 40,000	\$ 0	\$ 40,000

*A no-cost extension of the project was approved.

OBJECTIVES

1. *Develop orchard-level enterprise budgets for tree fruits, in particular, sweet cherries, organic apples (Gala), Honeycrisp apple, Anjou pear and Bartlett pear;*
2. *Develop a procedure for representing and analyzing costs of activities beyond the orchard level; and*
3. *Interact with the tree fruit industry and other Pacific Northwest university researchers.*

SIGNIFICANT FINDINGS

Objective 1: *Develop orchard-level enterprise budgets for tree fruits, in particular, sweet cherries, organic apples (Gala), Honeycrisp apple, D'Anjou pear, and Bartlett pear.*

The following enterprise budgets have been developed and published as Washington State University Extension Fact Sheets. They are available at the WSU School of Economic Sciences – Extension Economics website: http://extecon.wsu.edu/pages/Enterprise_Budgets, in both PDF and Excel® formats:

1. Galinato, S.P., R.K. Gallardo, and M.R. Taylor. 2009 Cost Estimates of Establishing and Producing Sweet Cherries in Washington. *Washington State University Extension Fact Sheet FS022E*, August 2010.
2. Galinato, S.P. and R. K. Gallardo. 2010 Estimated Cost of Producing Pears in North Central Washington. *Washington State University Extension Fact Sheet FS031E*, July 2011.
3. Galinato, S.P. and R.K. Gallardo. 2010 Cost Estimates of Producing Bartlett Pears in the Yakima Valley, Washington. *Washington State University Extension Fact Sheet FS034E*, July 2011.
4. Galinato, S.P., M.R. Taylor and D. Granatstein. 2010 Cost Estimates of Producing Organic Gala Apples in Washington. *Washington State University Extension Fact Sheet FS041E*, October 2011.
5. Galinato, S.P. and R.K. Gallardo. 2011 Cost Estimates of Establishing and Producing Honeycrisp Apples in Washington. *Washington State University Extension Fact Sheet FS062E*, January 2012.

The studies show that the net returns for all crops, except those of Anjou and Bartlett pears, are positive based on the assumed production specifications and costs. Break-even returns are highlighted in the pear budgets to illustrate the scenarios at which it would be profitable to produce pears in the short and long run. More details and data underlying the cost estimation can be found in the bulletins and supplementary Excel® workbooks.

Objective 2: *Develop a procedure for representing and analyzing costs of activities beyond the orchard level.*

We started this effort with the Honeycrisp apple enterprise budget, and requested producers in the focus group to provide values for main packinghouse charges. Results show that these charges represent 48 percent of total production costs, for Honeycrisp apples.

We obtained packing cost information of conventional and organic apples, sweet cherries, and pears, from the Washington State Department of Agriculture-Commission Merchants Program during 2004-2011. All packinghouses in the state of Washington are mandated by the Washington State Legislature (RCW 20.01) to report their packing costs. Because different packinghouses have different accounting of costs, reports varied across packinghouses and within the same packinghouse across years. We identified, to the best of our capacity, common cost categories across packinghouses and years, and aggregated categories to obtain an estimate of packinghouse charges per box or pound of fruit.

Our study shows that packinghouse charges represent approximately 48%, 43%, 35% and 41% of the total production costs of Gala, organic Gala apples, Sweetheart cherries, and Anjou pears respectively. For future enterprise budgets, collection on packinghouse charges will be part of the focus group discussion, and will be included in the Extension Factsheets.

Objective 3: *Interact with the tree fruit industry and other Pacific Northwest university researchers.*

The enterprise budgets were developed with input from knowledgeable and representative tree fruit producers in Washington State. The published extension factsheets were shared with researchers from Oregon State University to be used as input for the AgTools™ software. The published Extension Factsheets, from these studies, are posted in the WSU-SES Extension Economics website and are available, in both PDF and Excel®, for free to the public. Outreach efforts included nine regional presentations in the state of Washington and one in the state of New York:

1. Gallardo, R.K. 2012. Production Costs in Tree Fruit. What have we learned? Presentation given in Spanish at:
 - Kyle Mathison Orchards Employees. Wenatchee, WA. March 8.
 - WSU Douglas-Chelan County Extension Seminar on Pesticide Application, Spanish Section. Wenatchee, WA. February 7.
 - New York Fruit and Vegetable Expo. Syracuse, NY. January 26.
2. Gallardo, R.K. 2011. Economic Reality. Apples, Pears, Cherries. Are the Costs of Planting, Producing, Storing, Packing, and Shipping Being Adequately Covered by FOB Pricing? Presentation given at the WA Horticultural Association Annual Meetings. Wenatchee, WA. December 6.
3. Gallardo, R.K. 2011. “Production Costs for Sweetheart Cherries, Gala Apples and Anjou Pears, and Platform Use Survey Results,” Presentation in Spanish given to Visiting Chilean Growers as part of the Fruit Growing Technological Tour organized by WeCu, Inc. Wenatchee, WA. June 23.
4. Gallardo, R.K. 2011. “Cost of Establishing a Fruit Orchard and National Fruit Market Trends,” Presentation given at the Washington State Chapter of the American Society of Farm Managers and Rural Appraisers. Leavenworth, WA. May 5.
5. Gallardo, R.K. 2011. “What Does It Cost to Bartlett Pears? Recent Grower Based Study.” Presentation given at the Washington-Oregon Canning Pear Association Annual Meeting. Yakima, WA. February 15.
6. Gallardo, R.K. 2011. “What Does It Cost to Grow Cherries, Gala Apples and Anjou Pears? Recent Grower Based Studies.” Presentation given to Sales Personnel – Domex Superfresh Growers. Yakima, WA. February 14.
7. Gallardo, R.K. 2011. “What does it Cost to Grow Cherries? A Recent Grower Based Study.” Presentation given at the North Central Washington Stone Fruit Day. Wenatchee, WA. January 20.

RESULTS & DISCUSSION

Enterprise budgets

Based on assumed specifications related to production (orchard and block size, architecture, cultivar, life of planting and tree density) and producers’ input we estimated total costs and net returns for producing fruit crops in Washington State (Table 1). Note that prices considered for the estimation of net returns when packinghouse charges were not included, are FOB discounted prices (FOB minus packinghouse charges). The net returns are positive for all fruit crops studied except for pears. Hence we estimated the break-even returns to illustrate the scenarios at which it would be profitable to produce pears in the short and long run.

If the short-run break even return is not covered by the actual returns received it is uneconomical to produce the crop because the cash expenses are not being covered. Results in Table 1 show that given the actual production costs it is feasible to produce pears in the short run. However, long-run break even returns are not covered, meaning that there is no return on capital contributions equal to what could be earned in alternative uses (opportunity costs) and no return on management. For the other fruit crops (Sweetheart cherries, organic Gala and Honeycrisp apples) the net returns exceed the total production cost breakeven levels meaning that in addition to covering all cash and opportunity costs, the owner-operator will receive a return on management and on the financial risk assumed in fruit production.

Table 1. Estimated production costs* and returns by crop

Crop	Yield/acre*	Assumed Price per unit	Total production costs/acre	Net returns/acre	Break-even returns per unit
Sweetheart cherries	8 tons	\$2,800/ton	\$10,120	\$12,280	
D’Anjou pears	32 bins	\$250/bin	\$9,684	-\$1,684	\$167.01/bin (SR) \$302.63/bin (LR)
Bartlett pears	30.25 tons	\$255/ton	\$8,785	-\$1,072	\$150.93/ton (SR) \$290.42/ton (LR)
Organic Gala apples	50 bins	\$300/bin	\$11,407	\$3,593	
Honeycrisp apples**	60 bins	\$500/bin	\$19,754	\$10,246	

Note: *Refers to the yield and total production costs during the full production years.

**Total production costs and net returns of Honeycrisp already include warehouse packing charges. SR – short run (returns over variable costs); LR – long run (returns over total production costs).

Packing Costs

Packinghouses in the state of Washington are mandated to report packing cost charges to the Washington State Department of Agriculture-Commission Merchants Program. There is no established format to report these data, thus each packinghouse report charges following their very own guidelines and even the same packinghouse does not report the exact same cost centers across years. We used the following criteria to include the cost categories in our summary report for packinghouse charges: First, we used as a guide the categories producers indicated for the Honeycrisp and Red Delicious apple enterprise budgets. Second, we excluded charges on specific types of packing materials, and charges for which the units were not clear. Third, we identified and aggregated common cost categories across packinghouses so we could calculate the packing charge per box or per pound of fruit produced.

Tables 2 to 9 show the descriptive statistics of all cost categories found in the reports for apples (conventional and organic), sweet cherry and pears from 2004 to 2011. The panel data set was unbalanced meaning that the blocks of cost categories data for each year were different across packinghouses. In other words, for a given cost category in most cases, we do not have the data from all packinghouses and/or we do not have complete time series data. For example in Table 2, we found only 7 out of 43 packinghouses reported data on the category “Bin in Charge”, totaling 30 observations for the years 2004 to 2010. As another example, in Table 4, 4 packinghouses reported the cost category “Bin Handling Diverted Fruit” not consistently across years yielding only 6 observations.

From the information in Tables 2 to 9, we identified and aggregated common packing cost categories, so we could calculate a packing cost per box or per pound of fruit. Tables 10-13 show the aggregated averages and ranges of packinghouse charges. The Wenatchee Valley Traffic Association Executive

Director, in consultations with anonymous packinghouse representatives, verified the adequacy of the aggregations. Table 14 presents the summary of charges by crop. The estimated packing charges are then added to the production costs of Gala apples, organic apples, Sweetheart cherries and Anjou pears. Note that this might be a caveat in the study, as different from orchard level production costs; aggregated packinghouse charges were not specific to a fruit cultivar, but an aggregation across cultivars. Figure 1 compares the total production costs and net returns with and without the inclusion of packing costs. Given the budget assumptions for fruit production and the packinghouse charges considered, break-even returns for fruit crops have changed. See Table 15. When packing costs are included, returns for Gala apples and Anjou pears cover all cash expenses but not all opportunity costs, management and financial risk. This implies that these fruit operations might not be economically sustainable in the long run. Returns for organic Gala apples and Sweetheart cherries decreased by 71% and 61%, respectively, however all cost categories (cash expenses, opportunity costs, management, and financial risk) are covered as net returns per acre remain positive, see Figure 1. In sum, this study provides an illustration of the importance of including packinghouse charges when analyzing the profitability of fruit production, as these costs impact considerably the net returns received.

Table 2. Warehouse Packing Charges per Bin, All Categories, Conventional Apple.

Charges	Obs	No. of Packinghouses Reporting Data	Years with Data (Unbalanced)	Average	Std. Dev.	Min	Max
Bin In Charge	30	7	2004-2010	\$57.48	19.97	\$31.50	\$96.47
Receiving Charge	20	5	2004-2010	\$50.69	37.15	\$2.50	\$95.00
Handling	15	4	2004-2010	\$23.34	7.33	\$3.03	\$32.67
Sorting	17	4	2004-2010	\$29.31	12.41	\$12.50	\$50.00
Washing	7	2	2004-2010	\$7.43	2.44	\$6.00	\$11.00
Washing and Sorting	33	7	2004-2010	\$27.38	19.07	\$2.50	\$57.50
Drenching	21	6	2004-2010	\$4.85	1.45	\$3.25	\$10.00
Waxing	30	7	2004-2010	\$5.97	2.93	\$3.50	\$14.00
Regular Storage	60	14	2004-2010	\$36.35	25.72	\$14.00	\$98.00
CA Storage	79	16	2004-2010	\$33.60	21.20	\$5.00	\$98.00
Storage	39	8	2004-2010	\$19.37	8.97	\$2.00	\$30.86
MCP Treatment	28	5	2004-2010	\$12.23	4.52	\$4.50	\$22.00
Receiving, Washing, Sorting and Storage	15	5	2004-2010	\$54.98	24.99	\$24.50	\$100.00
Storage and Handling-CA	6	2	2005, 2007-2010	\$29.41	5.85	\$25.00	\$38.14
Storage and Handling-Regular	6	2	2005, 2007-2010	\$21.41	2.47	\$18.00	\$24.64
Cull/Processor Charge	12	2	2004-2010	\$11.63	6.09	\$5.00	\$20.00
Line Spray	3	2	2007-2008	\$5.93	0.26	\$5.63	\$6.08
Presize and Special Handling Fee	4	2	2007-2010	\$49.13	39.51	\$15.00	\$86.75
Packinghouse ID (1-43)	301					1	43
Year (2004-2010)	301					2004	2010

Table 3. Warehouse Packing Charges per Box, All Categories, Conventional Apple.

Charges	Obs	No. of Packinghouses	Years with Data (Unbalanced)	Average	Std. Dev.	Min	Max
Apple Commission	3	2	2007-2008	\$0.05	0.04	\$0.03	\$0.10
Assessment Fee	5	3	2004, 2007-2010	\$0.12	0.04	\$0.08	\$0.15
Industry Charge	20	5	2004-2010	\$3.84	3.20	\$0.35	\$8.25
Inspection	16	3	2004-2010	\$0.57	0.58	\$0.08	\$1.75
Selling Charge	11	3	2004-2010	\$0.79	0.16	\$0.45	\$1.00
Sticker Charge	9	3	2004-2010	\$0.37	0.07	\$0.31	\$0.54
Packinghouse ID (1-12)	301					1	12
Year (2004-2010)	301					2004	2010

Table 4. Warehouse Packing Charges per Bin, All Categories, Organic Apple.

Charges	Obs	No. of Packinghouses Reporting Data	Years with Data	Average	Std. Dev.	Min	Max
Assessment/ Inspections/Advertising	1	1	2004	\$0.39	.	\$0.39	\$0.39
Bin Handling-Diverted Fruit	6	1	2004-2009	\$16.32	8.95	\$5.00	\$24.40
Bin Handling-Orchard Run	6	1	2004-2009	\$16.32	8.95	\$5.00	\$24.40
Bin in Charge-26 Box	1	1	2004	\$66.30	.	\$66.30	\$66.30
Bin in Charge-Plastic	1	1	2004	\$68.30	.	\$68.30	\$68.30
Bin Running Charge	5	1	2004-2007, 2009	\$44.00	4.18	\$40.00	\$50.00
Cold Storage	5	1	2004-2007, 2009	\$36.80	0.45	\$36.00	\$37.00
Early, Mid and Late	4	1	2008-2010	\$87.58	7.24	\$76.83	\$92.50
Packing	6	1	2004-2009	\$4.13	0.31	\$3.80	\$4.63
Regular Storage	4	1	2006, 2008-2010	\$81.23	7.63	\$70.90	\$87.00
Repacking	2	1	2004-2005	\$2.25	0.00	\$2.25	\$2.25
Shipping	4	1	2006-2009	\$0.35	0.00	\$0.35	\$0.35
Wash, wax, and sort (CA. Storage)	4	1	2008-2011	\$98.13	6.94	\$92.75	\$108.25
Wash, wax, and sort (Reg. Storage)	4	1	2008-2011	\$87.75	6.22	\$82.75	\$96.75
Wash, wax, and sort (Special. Storage)	4	1	2008-2011	\$97.75	6.22	\$92.75	\$106.75
Packinghouse ID (1-4)	32					1	4
Year (2004-2010)	32					2004	2011

Table 5. Warehouse Packing Charges per Box, All Categories, Pears.

Charges	Obs	No. of Packinghouses Reporting Data	Years with Data	Average	Std. Dev.	Min	Max
Cull charge	5	1	2006-2010	\$0.65	0.07	\$0.55	\$0.70
In-house advertising/promotion	2	1	2007-2008	\$0.33	0.02	\$0.31	\$0.34
Inspection Costs	2	1	2007-2008	\$0.08	0.00	\$0.08	\$0.08
Pear Assessment	2	1	2007-2008	\$0.57	0.16	\$0.46	\$0.68
Research	2	1	2007-2008	\$0.03	0.00	\$0.03	\$0.03
Seconds	1	1	2007	\$2.30	.	\$2.30	\$2.30
Selling charge	2	1	2007-2008	\$0.52	0.03	\$0.50	\$0.54
Standard Bag Pack	4	2	2005-2007, 2011	\$4.60	0.64	\$4.25	\$5.55
Standard Box	5	1	2004-2007, 2009	\$4.80	0.21	\$4.70	\$5.18
Standard Carton	8	1	2004-2011	\$3.49	0.29	\$3.10	\$3.74
Standard Tight Fill	3	1	2004, 2006, 2009	\$4.08	0.14	\$4.00	\$4.25
Standard Tray Pack	12	5	2004-2011	\$4.70	0.64	\$3.70	\$5.90
Standard Wrap Pack	3	2	2007-2008, 2011	\$5.85	0.38	\$5.50	\$6.25
Stickers	2	1	2007-2008	\$0.40	0.02	\$0.38	\$0.41
Packinghouse ID (1-8)	64					1	8
Year (2004-2011)	64					2004	2011

Table 6. Warehouse Packing Charges per Pound, All Categories, Pears.

Charges	Obs	No. of Packinghouses Reporting Data	Years with Data (Unbalanced)	Average	Std. Dev.	Min	Max
Culls from Packing	5	2	2004-2007, 2011	\$0.01	0.001	\$0.01	\$0.01
Culls from Packing, Percentage							
0%-10%	9	3	2004-2005, 2008-2011	\$0.02	0.005	\$0.01	\$0.02
10%-20%	9	3	2004-2005, 2008-2011	\$0.03	0.007	\$0.02	\$0.04
20%-25%	9	3	2004-2005, 2008-2011	\$0.04	0.010	\$0.03	\$0.06
25%-30%	9	3	2004-2005, 2008-2011	\$0.05	0.007	\$0.04	\$0.06
over 30%	9	3	2004-2005, 2008-2011	\$0.06	0.005	\$0.05	\$0.06
Orchard Run Bins Delivered to Warehouse	4	1	2004-2007	\$0.01	0.001	\$0.01	\$0.01
Orhard Runs Bins Direct from Orchard Processor	4	1	2004-2007	\$0.01	0.000	\$0.01	\$0.01
Packing	4	1	2004-2007	\$0.13	0.030	\$0.12	\$0.18
Regular Storage	4	1	2004-2007	\$0.02	0.001	\$0.02	\$0.02
Sorting and Bin Usage	4	1	2004-2007	\$0.04	0.002	\$0.04	\$0.04
Storage	4	1	2004-2007	\$1.10	0.086	\$1.00	\$1.21
Packinghouse ID (1-6)	47					1	6
Year (2004-2011)	47					2004	2011

Table 7. Warehouse Packing Charges per Bin, All Categories, Pears.

Charges	Obs	No. of Packinghouses Reporting Data	Years with Data (Unbalanced)	Average	Std. Dev.	Min	Max
Bin Handling-Diverted Fruit	3	1	2005-2007	\$15.00	8.66	\$5.00	\$20.00
Bin Handling-Orchard Run	3	1	2005-2007	\$15.00	8.66	\$5.00	\$20.00
Bin In 26 Box Bin	5	1	2006-2010	\$51.16	3.16	\$46.00	\$53.20
Bin In Phillipphi Bin	5	1	2006-2010	\$45.66	3.16	\$40.50	\$47.70
Bin Pre-Cooling	3	1	2005-2007	\$2.00	0.00	\$2.00	\$2.00
Bin Rental	8	2	2004-2007, 2009-2011	\$7.99	2.68	\$2.58	\$11.15
Bin Running Charge	5	1	2004-2007, 2009	\$38.60	2.66	\$35.00	\$42.50
Bottom Pads	6	1	2004-2005, 2008-2011	\$0.50	0.00	\$0.50	\$0.50
Bottom Sleeves	6	1	2004-2005, 2008-2011	\$0.40	0.00	\$0.40	\$0.40
CA Storage	10	3	2004-2007, 2009	\$22.36	11.60	\$1.20	\$30.50
Chemicals	5	1	2004-2007, 2009	\$8.20	0.45	\$8.00	\$9.00
Cull Handling	5	1	2004-2007, 2009	\$5.00	0.00	\$5.00	\$5.00
Drenching	5	1	2004-2007, 2009	\$5.00	0.00	\$5.00	\$5.00
Full Wrap	7	1	2004-2006, 2008-2011	\$7.60	1.57	\$6.00	\$9.35
In Charge	8	2	2005-2010	\$57.93	22.45	\$31.50	\$80.50
Loose Bin washed and Sorted	9	3	2004-2005, 2008-2011	\$50.26	11.08	\$33.00	\$62.50
Loose Bin washed and Sorted 12" Plastic Bin	1	1	2011	\$28.00	.	\$28.00	\$28.00
Loose Bin washed and Sorted 24" Wood Bin	1	1	2011	\$65.00	.	\$65.00	\$65.00
Loose Half Bin Washed and Sorted	2	1	2008, 2010	\$20.64	1.17	\$19.81	\$21.47
Packing	7	2	2004-2007	\$22.90	22.77	\$4.55	\$47.25
Packing and Selling	7	1	2004-2010	\$0.24	0.02	\$0.20	\$0.26
Packing Lug	2	1	2009-2010	\$6.70	0.00	\$6.70	\$6.70
Pre-Storage Treatment-DPA&Drench	6	1	2004-2005, 2008-2011	\$5.00	0.39	\$4.50	\$5.25
Pre-Storage Treatment-Smartfresh	6	1	2004-2005, 2008-2011	\$10.00	0.00	\$10.00	\$10.00
Receiving	5	1	2006-2010	\$89.80	6.42	\$80.00	\$96.00
Regular Storage	20	4	2004-2011	\$18.71	12.95	\$1.25	\$38.00
Repacking	1	1	2004	\$2.25	.	\$2.25	\$2.25
Shipping	3	1	2005-2007	\$0.37	0.06	\$0.30	\$0.40
Sorting	12	2	2004-2011	\$23.89	11.64	\$13.00	\$52.02
Sorting, Sizing, Handling	3	1	2005-2007	\$38.67	1.15	\$37.34	\$39.34
Storage & Handling - CA	1	1	2008	\$38.14	.	\$38.14	\$38.14
Storage & Handling - RG	1	1	2008	\$24.64	.	\$24.64	\$24.64
Storage, Sorting, Handling	2	1	2007, 2009	\$69.50	6.36	\$65.00	\$74.00
Summer storage	4	1	2008-2011	\$28.86	0.00	\$28.86	\$28.86
Washing	5	1	2004-2007, 2009	\$6.00	0.00	\$6.00	\$6.00
Washing & Sorting	1	1	2008	\$24.64	.	\$24.64	\$24.64
Waxing	6	2	2004-2009	\$5.88	0.30	\$5.27	\$6.00
Winter storage	4	1	2008-2011	\$30.86	0.00	\$30.86	\$30.86
Packinghouse ID (1-16)	120					1	15
Year (2004-2011)	120					2004	2011

Table 8. Warehouse Packing Charges per Bin, All Categories, Sweet Cherry.

Charges	Obs	No. of Years with Data Packinghouses Reporting Data	(Unbalanced)	Average	Std. Dev.	Min	Max
Bin Rental	4	1	2004-2007	\$2.03	0.62	\$1.10	\$2.40
Hauling	3	1	2005-2007	\$2.17	0.29	\$2.00	\$2.50
Hydro-cooling	8	2	2005-2010	\$3.06	0.62	\$2.50	\$4.00
Reefer Hauling	1	1	2007	\$3.50	.	\$3.50	\$3.50
Packinghouse ID (1-3)	18					1	3
Year (2005-2010)	18					2005	2010

Table 9. Warehouse Packing Charges per Pound, All Categories, Sweet Cherry.

Charges	Obs	No. of Packinghouses Reporting Data	Years with Data (Unbalanced)	Average	Std. Dev.	Min	Max
Excess cull charge	14	2	2004-2010	\$0.06	0.05	\$0.01	\$0.10
In Charge	22	4	2004-2010	\$0.30	0.14	\$0.14	\$0.50
In Charge-Non Rainier Varieties (per lb delivered)	4	1	2004-2007	\$0.26	0.05	\$0.19	\$0.30
Material Charge	4	1	2008-2011	\$0.15	0.00	\$0.15	\$0.15
Out Charge	3	1	2008-2010	\$0.20	0.00	\$0.20	\$0.20
Overhead Charge	4	1	2008-2011	\$0.30	0.00	\$0.30	\$0.30
Cull Charge	9	3	2008-2011	\$0.65	0.57	\$0.15	\$1.25
Cull Charge by Proportion of Culls							
5%-7%	3	2	2005-2006, 2008	\$0.04	0.02	\$0.02	\$0.06
8%-10%	4	2	2004-2006, 2008	\$0.08	0.02	\$0.06	\$0.10
11%-13%	4	2	2004-2006, 2008	\$0.12	0.02	\$0.10	\$0.15
14%-16%	4	2	2004-2006, 2008	\$0.16	0.04	\$0.12	\$0.20
17%-19%	4	2	2004-2006, 2008	\$0.20	0.04	\$0.17	\$0.25
20%-22%	4	2	2004-2006, 2008	\$0.24	0.05	\$0.19	\$0.30
23%-25%	4	2	2004-2006, 2008	\$0.27	0.07	\$0.20	\$0.35
26%-28%	4	2	2004-2006, 2008	\$0.31	0.09	\$0.21	\$0.40
29%-31%	4	2	2004-2006, 2008	\$0.35	0.10	\$0.24	\$0.45
32%-34%	3	2	2004, 2006, 2008	\$0.41	0.14	\$0.25	\$0.50
35%-37%	3	2	2004, 2006, 2008	\$0.45	0.16	\$0.26	\$0.55
38%-40%	3	2	2004, 2006, 2008	\$0.50	0.18	\$0.29	\$0.60
41%-43%	3	2	2004, 2006, 2008	\$0.54	0.19	\$0.32	\$0.66
44%-46%	3	2	2004, 2006, 2008	\$0.59	0.21	\$0.35	\$0.72
47%-49%	3	2	2004, 2006, 2008	\$0.64	0.22	\$0.39	\$0.79
50%-52%	1	1	2008	\$0.80	.	\$0.80	\$0.80
Cull Charge by Proportion of Culls							
10.1%-12%	6	1	2006-2011	\$0.02	0.00	\$0.02	\$0.02
12.1%-14%	7	2	2005-2011	\$0.06	0.06	\$0.04	\$0.20
14.1%-16%	7	2	2005-2011	\$0.07	0.06	\$0.05	\$0.20
16.1%-18%	7	2	2005-2011	\$0.10	0.07	\$0.07	\$0.25
18.1%-20%	7	2	2005-2011	\$0.11	0.06	\$0.08	\$0.25
20.1%-22%	7	2	2005-2011	\$0.14	0.07	\$0.12	\$0.30
22.1%-24%	7	2	2005-2011	\$0.17	0.06	\$0.15	\$0.30
24.1%-26%	7	2	2005-2011	\$0.21	0.06	\$0.19	\$0.35
26.1%-28%	7	2	2005-2011	\$0.24	0.05	\$0.22	\$0.35
28.1%-30%	7	2	2005-2011	\$0.27	0.04	\$0.26	\$0.35
Percent of Fruit Packed							
92%-100%	4	1	2004-2006, 2010	\$0.29	0.07	\$0.22	\$0.38
90%-91%	4	1	2004-2006, 2011	\$0.29	0.07	\$0.22	\$0.39
85%-89%	4	1	2004-2006, 2012	\$0.30	0.07	\$0.23	\$0.40
80%-84%	4	1	2004-2006, 2013	\$0.31	0.07	\$0.24	\$0.41
70%-79%	4	1	2004-2006, 2014	\$0.32	0.07	\$0.25	\$0.42
69% or less	4	1	2004-2006, 2015	\$0.34	0.07	\$0.27	\$0.45
Advertising (packed)	2	1	2007-2008	\$0.20	0.01	\$0.19	\$0.20
Advertising (processed)	2	1	2007-2008	\$0.01	0.00	\$0.01	\$0.01
Fumigation Charge	5	2	2004-2007	\$0.76	1.07	\$0.03	\$2.50
Hydro-cooling (Packed)	2	1	2007-2008	\$0.01	0.00	\$0.01	\$0.01
Inbound Charge (packed & processed)	2	1	2007-2008	\$0.25	0.01	\$0.24	\$0.26
Industry Charge (per lb delivered)	5	2	2005-2006, 2008-2010	\$0.02	0.00	\$0.02	\$0.03
Inspection Costs	2	1	2007-2008	\$0.01	0.00	\$0.01	\$0.01
Packing and Selling	7	1	2004-2010	\$0.46	0.01	\$0.45	\$0.47
Packing Charge (per lb of packed weight)	13	3	2004-2010	\$0.24	0.13	\$0.13	\$0.50
Packing Charge (per lb delivered)	18	4	2004-2010	\$0.20	0.07	\$0.07	\$0.33
Packing Supplies	2	1	2004-2005	\$0.50	0.00	\$0.50	\$0.50
Selling	2	1	2005, 2008	\$0.03	0.01	\$0.02	\$0.04
Sorting (Packed)	9		2006-2011	\$0.30	0.05	\$0.22	\$0.35
Sorting (Packed), Percentage							
87%-100%	7	1	2004, 2006-2011	\$0.00	0.00	\$0.00	\$0.00
84%-86%	7	1	2004, 2006-2011	\$0.01	0.00	\$0.01	\$0.01
81%-83%	7	1	2004, 2006-2011	\$0.02	0.00	\$0.02	\$0.02
78%-80%	7	1	2004, 2006-2011	\$0.02	0.00	\$0.02	\$0.02
75%-70%	7	1	2004, 2006-2011	\$0.03	0.00	\$0.03	\$0.03
72%-74%	7	1	2004, 2006-2011	\$0.03	0.00	\$0.03	\$0.03
69%-71%	7	1	2004, 2006-2011	\$0.04	0.00	\$0.04	\$0.04
66%-68%	7	1	2004, 2006-2011	\$0.04	0.00	\$0.04	\$0.04
Transportation Charge	1	1	2007	\$0.01	.	\$0.01	\$0.01
Packinghouse ID (1-14)	112					1	14
Year (2004-2011)	112					2004	2011

Table 10. Total Average Warehouse Packing Charges, Conventional Apple.

Charges	Obs	Average	Std. Dev.	Min	Max
Charges per bin					
Receiving	50	\$54.76	27.97	\$2.50	\$96.47
Handling, sorting, washing, drenching, and waxing	123	\$16.95	15.50	\$2.50	\$57.50
Storage (Regular, CA, MCP)	218	\$28.62	20.88	\$2.00	\$98.00
Other (cull processor charge, line spray, presize and special handling fee)	19	\$18.63	23.43	\$5.00	\$86.75
<i>Sub-total charge (per bin)</i>		<i>\$118.96</i>	<i>44.81</i>	<i>\$12.00</i>	<i>\$338.72</i>
Charges per box					
Industry charges (WAC, assessments)	28	\$2.77	3.19	\$0.03	\$8.25
Inspection	16	\$0.57	0.58	\$0.08	\$1.75
Selling Charge	11	\$0.79	0.16	\$0.45	\$1.00
Sticker Charge	9	\$0.37	0.07	\$0.31	\$0.54
<i>Sub-total charge (per box)</i>		<i>\$4.50</i>	<i>3.24</i>	<i>\$0.87</i>	<i>\$11.54</i>
Total charge per 925-lb bin		\$208.91	47.10	\$29.40	\$569.52
Number of packed boxes per 925-lb bin		20			
Average charge per box		\$10.45	3.94	\$1.47	\$28.48

Table 11. Total Average Warehouse Packing Charges, Organic Apple.

Charges	Obs	Average	Std. Dev.	Min	Max
Bin running charge	12	\$16.32	8.53	\$5.00	\$24.40
Wash, wax, and sort	9	\$94.92	7.64	\$82.75	\$108.25
Storage	9	\$56.54	23.88	\$36.00	\$87.00
Packing, repacking	8	\$3.66	0.91	\$2.25	\$4.63
Total charge per 925-lb bin		\$171.44	26.50	\$126.00	\$224.28
Number of packed boxes per 925-lb bin		18			
Average charge per box		\$9.52	1.47	\$7.00	\$12.46

Table 12. Total Average Warehouse Packing Charges, Pears.

Charges	Obs	Average	Std. Dev.	Min	Max
Charges per bin					
Bin handling	49	\$26.35	28.78	\$0.40	\$96.00
Storage	52	\$19.03	12.15	\$1.20	\$38.14
Washing, sorting, sizing	34	\$30.71	18.37	\$6.00	\$65.00
Packing (packing, selling, repacking, packing lug, full wrap)	24	\$9.62	14.86	\$0.20	\$47.25
<i>Sub-total charge (per bin)</i>		<i>\$85.71</i>	<i>39.16</i>	<i>\$7.80</i>	<i>\$246.39</i>
Charges per box					
Inspection Costs	2	\$0.08	0.00	\$0.08	\$0.08
Pear Assessment	2	\$0.57	0.16	\$0.46	\$0.68
Selling charge	2	\$0.52	0.03	\$0.50	\$0.54
Packing material (bag pack, box, carton, tight fill, standard tray pack, wrap pack)	35	\$4.47	0.80	\$3.10	\$6.25
Stickering	2	\$0.40	0.02	\$0.38	\$0.41
<i>Sub-total charge (per box)</i>		<i>\$6.04</i>	<i>0.82</i>	<i>\$4.52</i>	<i>\$7.96</i>
Pounds per box		44			
Pounds per bin		1100			
Total charge per box		\$9.46	1.77	\$4.83	\$17.82

Table 13. Total Average Warehouse Packing Charges, Sweet Cherry.

Charges	Obs	Average	Std. Dev.	Min	Max
Charges per Bin					
Bin Rental	4	\$2.03	0.62	\$1.10	\$2.40
Hauling	4	\$2.83	0.29	\$2.00	\$2.50
Hydro-cooling	8	\$3.06	0.62	\$2.50	\$4.00
<i>Sub-total charge (per bin)</i>		<i>\$7.92</i>	<i>0.93</i>	<i>\$5.60</i>	<i>\$8.90</i>
Charges per pound					
Excess cull charge	14	\$0.06	0.05	\$0.01	\$0.10
Industry Charge (per lb delivered)	5	\$0.02	0.001	\$0.02	\$0.03
Packing and selling (includes sorting and packing supplies)	51	\$0.27	0.13	\$0.02	\$0.50
<i>Sub-total charge (per pound)</i>		<i>\$0.35</i>	<i>0.14</i>	<i>\$0.06</i>	<i>\$0.63</i>
Pounds per bin		300			
Total charge per pound		\$0.37	0.14	\$0.07	\$0.66

Table 14. Summary of Warehouse Packing Charges per Unit.

Crop	Unit	Average	Std. Dev.	Min	Max
Conventional apples	box	\$10.45	3.94	\$1.47	\$28.48
Organic apples	box	\$9.52	1.47	\$7.00	\$12.46
Pears	box	\$9.46	1.77	\$4.83	\$17.82
Sweet cherries	pound	\$0.37	0.14	\$0.07	\$0.66

Table 15. Estimated production costs and returns (including packinghouse charges) by crop.

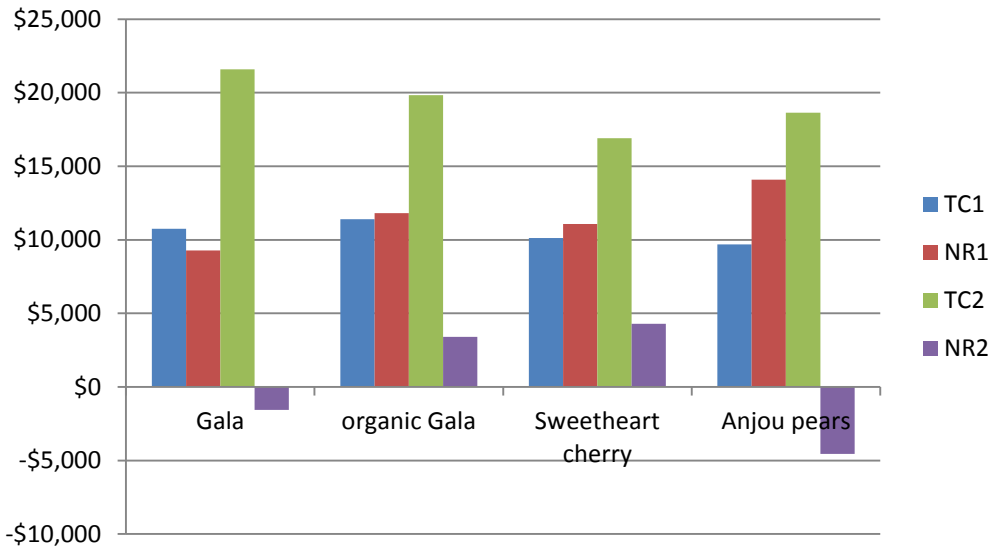
Crop	Yield/acre*	Assumed FOB/unit**	Total production costs/acre	Net returns/acre	Break-even returns per unit
Gala	50 bins	\$400.80/bin	\$21,597.05	-\$1,557.05	\$343.91/bin (SR) \$431.94/bin (LR)
Organic Gala	50 bins	\$464.58/bin	\$19,830.02	\$3,398.98	
Sweetheart cherries	8 tons	\$2,650/ton	\$16,897.04	\$4,302.96	
Anjou pears	32 bins	\$440/bin	\$18,637.10	-\$4,557.10	\$428.48/bin (SR) \$582.41/bin (LR)

Note: *Refers to the yield and total production costs during the full production years.

**FOB average obtained from the Washington Growers Clearing House Association for Gala (2009), Sweetheart cherries (2009), Anjou (2010) and organic Gala (2010).

SR – short run (returns over variable costs); LR – long run (returns over total production costs).

Figure 1. Total Production Costs and Net Returns With and Without Warehouse Packing Charges.



Note: TC1 and NR1 are total production costs and net returns without packing costs. TC2 and NR2 are total production costs and net returns calculated after accounting for packing costs. The estimated net returns in this figure uses FOB average for the price of the tree fruit.

EXECUTIVE SUMMARY

In this study we gathered production costs at the orchard level for Sweetheart sweet cherries, organic Gala and Honeycrisp apples, and Anjou and Bartlett pears. The methodology used to develop these studies was to form a focus group consisting of 4 to 5 producers, representing most important production regions in the state (Yakima, Columbia Basin, and Wenatchee).

During the focus group, production assumptions of what would be the typical growing scenario were made. Cost categories were then identified and producers provided values for each category by consensus. Results indicate that cherry and apple operations in the state of Washington are covering all cash and opportunity production costs, including returns on management and financial risk. This implies that, under current production conditions and assuming no catastrophic unexpected events, apple and sweet cherry operations are economically sustainable in the long run. However, this is not observed in pears, where operations are covering all cash but not all opportunity costs (i.e., returns on management and financial risk). This implies that pear operations might not be economically sustainable in the long run under current production conditions.

We collected data on packinghouse charges from the Washington State Department of Agriculture-Commission Merchants Program. After a long process of data tabulation and analysis, and with the support of industry representatives, we identified major categories of packinghouse charges for conventional and organic apples, sweet cherries, and pears. Packinghouse charges were not reported exclusively for a fruit cultivar. Nonetheless, we added this information to the orchard level production costs for conventional and organic Gala apples, Sweetheart sweet cherries, and Anjou pears. Results show that when taking into consideration packinghouse charges, returns for Gala apples and Anjou pears do not cover all opportunity and management costs. In other words, when packinghouse charges are included, the owner-operator is not receiving a return on management and on the financial risk assumed in fruit production, implying that the operation might not be economically sustainable in the long run. Sweetheart cherry's net returns decreased by 61% and organic Gala by about 71% when packing costs are taken into account, yet net returns remain positive. In sum, this study provides an illustration of the importance of including packinghouse charges when analyzing the profitability of fruit production, as these costs impact considerably the net returns received.