

## FINAL PROJECT REPORT

**Project Title:** Cost estimation of producing red delicious apples in Washington State

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**Cooperators:** Tom Auvil (Washington Tree Fruit Research Commission, Wenatchee, WA)

**Percentage time per crop:** Apple: 100%

**Other funding sources:** None

**Total Project Funding:** \$6,727.00

### Budget History:

Item	Year 1: 2012
Salaries <sup>1</sup>	\$4,156
Benefits <sup>1</sup>	\$1,471
Wages	\$0
Benefits	\$0
Equipment	\$0
Supplies <sup>2</sup>	\$100
Travel <sup>3</sup>	\$1,000
Plot Fees	\$0
Miscellaneous	\$0
<b>Total</b>	<b>\$6,727</b>

**Footnotes:** <sup>1</sup> One-month salary at 95% FTE for research associate Suzette Galinato (\$4,156), plus \$1,471 in benefits. <sup>2</sup> Included food and beverages to be served during the meeting. <sup>3</sup> Included researchers' travel to attend the focus group meeting and to conduct additional meetings with growers for validation of data.

## OBJECTIVES

1. *Develop an up-to-date enterprise budget for Red Delicious apples that will reflect current modern practices; and*
2. *Disseminate the updated information with growers, other stakeholders in the tree fruit industry and researchers.*

## SIGNIFICANT FINDINGS

**Objective 1:** *Develop an up-to-date enterprise budget for Red Delicious apples that will reflect current modern practices.*

The last enterprise budget on Red Delicious was published by Washington State University in 1992. We updated the study to provide an estimate of the costs of producing Red Delicious in Washington State given current practices and market prices.

We organized focus group meetings with four Red Delicious growers (two in the Wenatchee/Basin area and two in the Yakima area) in March 2012. During the meetings, we established baseline assumptions on production that served as a guide in identifying the production cost categories and in estimating the associated costs, and gathered preliminary data. We also consulted two more Red Delicious growers (one in Yakima and another in Wenatchee/Basin) as well as other industry representatives (e.g., Washington Growers Clearing House Association managers, Yakima Valley Growers and Shippers Association, WSU tree fruit extension specialists) to help us validate the gathered data and define the most representative cost estimates for the state of Washington.

The final enterprise budget shows a positive net return estimate during full production, based on the assumed production specifications and costs. More details and data underlying the cost estimation are discussed in the following section.

**Objective 2:** *Disseminate the updated information with growers, other stakeholders in the tree fruit industry and researchers.*

The manuscript and supplementary spreadsheets of the enterprise budget were submitted to the Washington State University Extension for publication as a WSU Extension Fact Sheet. The fact sheet underwent external peer review and has been accepted for publication. It is currently in the editorial stage of review. The study will be published online and available for download from the WSU School of Economic Sciences – Extension Economics website: [http://extecon.wsu.edu/pages/Enterprise\\_Budgets](http://extecon.wsu.edu/pages/Enterprise_Budgets), in both PDF and Excel® formats.

## RESULTS & DISCUSSION

The assumed production specifications for a 25-acre Red Delicious block within a 300-acre diverse-cultivar orchard are presented in Table 1. Based on these specifications and growers' input, we estimated the costs associated with major activities in the production of Red Delicious apples. A detailed accounting of costs and net returns are presented in Table 2. Note that the yields reported (during Year 3 to Full Production) take into consideration an 85% pack-out. The price per bin refers to FOB price, which means no warehouse charge deduction.

Soil preparation and investment on trees comprised most of the total production costs during Year 1. The cost of orchard activities increase yearly as more labor hours on pruning, training and green fruit thinning and additional chemical application are required as trees start to mature and bear fruit.

Harvest activities begin in Year 3 through Full Production and the associated costs range between 5% and 8% of total production costs during the said period. The categories of maintenance and repairs, and other variable costs do not significantly vary every year beginning Year 3 (2-3% and 7-8% respectively). Warehouse packing charges comprise an increasing and significant portion of the total production costs — 34% in Year 3, 46% in Year 4, 53% in Year 5 and 58% during Full Production. The estimated total packing charge is \$185/bin given a pack-out of 85% and considering 850 pounds per bin and 40 pounds per box of apples (Table 3).

The study assumed that a Red Delicious orchard could achieve full production in the 6<sup>th</sup> year. Total production costs for Red Delicious during full production are estimated at \$22,102 per acre. Given a net yield of 59.5 bins per acre during full production and a price received of \$400/bin, the estimated net return is about \$1,698 per acre. A positive net return implies that a grower is able to cover all cash and opportunity costs, including returns on management and financial risk. Results thus indicate that Red Delicious production in Washington, under the planting assumptions cited in this study, is economically sustainable in the long run under current production conditions and assuming no catastrophic unexpected events.

Potential net returns are sensitive to different combinations of crop yield and Table 4 shows the sensitivity of net returns to different price and yield scenarios. Different combinations of price and yield levels suggest that when both levels are high (e.g., price at \$400/bin and net yields from 50 to 90 bins/acre), positive returns are likely.

***Table 1. Red Delicious Block Specifications.***

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Architecture	Three dimensional system (planar canopy), randomly trained with 24" radius from tree center.
In-row spacing	4 feet
Between row spacing	12 feet
Variety & Root stock	M106
Block size (productive)	25 acres
Life of planting	30 years
Tree density	900 trees per acre

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**Table 2. Cost and Returns per Acre of Establishing, Producing and Packing Red Delicious on a 25-Acre Orchard Block.**

	Establishment Years					Full Production <sup>[1]</sup>
	Year 1	Year 2	Year 3	Year 4	Year 5	
Estimated Net Production (bins/acre) <sup>[2]</sup>			12.75	25.50	42.50	59.50
Estimated FOB Price (\$/bin) <sup>[3]</sup>			400.00	400.00	400.00	400.00
<b>Total Returns (\$/acre)</b>			<b>5,100.00</b>	<b>10,200.00</b>	<b>17,000.00</b>	<b>23,800.00</b>
<b>Variable Costs (\$/acre):</b>						
<u>Establishment</u>						
Soil Preparation	376.50					
Trees (including labor)	6,163.20					
<u>Orchard Activities</u>						
Pruning & Training <sup>[4]</sup>	132.00	264.00	324.00	300.00	420.00	420.00
Green Fruit Thinning <sup>[4]</sup>			216.00	276.00	540.00	540.00
Irrigation Labor <sup>[5]</sup>	130.00	130.00	130.00	130.00	130.00	130.00
Chemicals <sup>[5],[6]</sup>	526.00	565.00	656.00	856.00	1,056.00	1,082.00
Fertilizer <sup>[5],[6]</sup>	150.00	150.00	190.00	151.00	101.00	101.00
Frost Protection (Labor) <sup>[5]</sup>				5.20	5.20	5.20
Beehives			45.00	45.00	45.00	45.00
General Farm Labor <sup>[7]</sup>	125.00	125.00	300.00	300.00	300.00	300.00
Irrigation/Electric Charge	137.50	137.50	187.50	187.50	187.50	187.50
<u>Harvest Activities<sup>[8]</sup></u>						
Picking Labor			240.00	480.00	800.00	1,120.00
Other Labor (checkers, tractor drivers)			45.00	90.00	150.00	210.00
Hauling Apples			75.00	150.00	250.00	350.00
<u>Warehouse Packing Charges<sup>[9]</sup></u>			2,756.09	5,512.17	9,186.96	12,861.74
<u>Maintenance and Repairs</u>						
Machinery Repair	125.00	125.00	125.00	125.00	125.00	125.00
Fuel & Lube	85.00	95.00	125.00	180.00	180.00	180.00
Wind Machine & Alarm System Repair					24.00	48.00
Mainline, Pump & Pond Maintenance						8.93
<u>Other Variable Costs</u>						
Overhead (5% of VC)	397.51	79.58	270.73	439.39	675.03	885.72
Interest (5% of VC) <sup>[10]</sup>	417.39	83.55	284.27	461.36	708.78	697.50
<b>Total Variable Costs</b>	<b>8,765.10</b>	<b>1,754.63</b>	<b>5,969.58</b>	<b>9,688.63</b>	<b>14,884.47</b>	<b>19,297.59</b>
<b>Fixed Costs (\$/acre):</b>						
<u>Depreciation</u>						
Irrigation System	64.95	64.95	64.95	64.95	64.95	64.95
Mainline & Pump	16.67	16.67	16.67	16.67	16.67	16.67
Pond	10.00	10.00	10.00	10.00	10.00	10.00
Trellis	48.70	48.70	48.70	48.70	48.70	48.70
Wind Machine				72.25	72.25	72.25
Machinery & Building Annual Replacement Cost	100.00	100.00	100.00	100.00	100.00	100.00
<u>Interest</u>						
Irrigation System	59.54	59.54	59.54	59.54	59.54	59.54
Land	400.00	400.00	400.00	400.00	400.00	400.00
Machinery & Buildings	55.41	55.41	55.41	55.41	55.41	55.41
Mainline & Pump	12.50	12.50	12.50	12.50	12.50	12.50
Pond	7.50	7.50	7.50	7.50	7.50	7.50
Trellis	36.53	36.53	36.53	36.53	36.53	36.53
Wind Machine				66.23	66.23	66.23
Establishment Costs (5%)		503.51	681.68	826.50	916.44	
<u>Other Fixed Costs</u>						
Miscellaneous Supplies	100.00	100.00	100.00	100.00	100.00	100.00
Land & Property Taxes	80.00	80.00	80.00	80.00	80.00	80.00
Insurance Cost (all farm)	105.00	105.00	145.00	145.00	145.00	145.00
Management Cost	300.00	300.00	300.00	300.00	300.00	300.00
Amortized Establishment Costs <sup>[11]</sup>						1,320.66
<b>Total Fixed Costs</b>	<b>1,305.18</b>	<b>1,808.69</b>	<b>2,026.85</b>	<b>2,310.15</b>	<b>2,400.09</b>	<b>2,804.32</b>
<b>TOTAL COSTS</b>	<b>10,070.27</b>	<b>3,563.32</b>	<b>7,996.44</b>	<b>11,998.78</b>	<b>17,284.57</b>	<b>22,101.91</b>
<b>ESTIMATED NET RETURNS</b>	<b>(10,070.27)</b>	<b>(3,563.32)</b>	<b>(2,896.44)</b>	<b>(1,798.78)</b>	<b>(284.57)</b>	<b>1,698.09</b>
<b>Accumulated Establishment Costs</b>	<b>10,070.27</b>	<b>13,633.59</b>	<b>16,530.02</b>	<b>18,328.81</b>	<b>18,613.38</b>	

Table 2 footnotes:

[1] The full production year is representative of all the remaining years the orchard is in full production (Year 6 to Year 30).

[2] Estimated net production considers an average packout of 85%.

[3] These prices reflect gross FOB prices (no warehouse charges deduction).

[4] Hand labor rate is \$12/hour and includes all applicable taxes and benefits.

[5] Tractor/machinery, irrigation and frost protection labor rate is \$13/hour and includes all applicable taxes and benefits. Rate includes all applicable taxes and benefits.

[6] Includes materials and labor.

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

[8] Picking rate = \$16/bin; Checkers & tractor drivers rate = \$3/bin; Hauling rate = \$5/bin.

[9] Charges per bin consider receiving charges per bin plus charges per box. To estimate the charges per box we considered an 85% packout.

[10] Interest expense on full year during establishment years and for 3/4 of a year during full production.

[11] Represents the costs incurred during the establishment years (minus revenues during those years) that must be recaptured during the full production years.

***Table 3. Estimated Warehouse Packing Charges***

<u>Packing Charges</u>	<u>Cost per unit</u>
<i>Charges per bin</i>	
Receiving Charge	\$77.50
<i>Total</i>	<i>\$77.50</i>
 <i>Charges per box</i>	
Industry Charge	\$0.33
Marketing Charge	\$0.88
General Packing Charge	\$4.68
<i>Total</i>	<i>\$5.88</i>
 <b><u>Total Packing Charges Per Bin*</u></b>	 <b><u>\$183.74</u></b>

\*Charges per bin consider receiving charges per bin plus charges per box. To estimate the charges per box we considered an 85% packout. It is assumed further that there are 850 pounds per bin, and 40 pounds per box of apples.

**Table 4. Estimated Net Returns (\$) per Acre at Various Prices and Yields of Red Delicious during Full Production<sup>[1]</sup>**

Net Yield (bins/acre) <sup>[2]</sup>	FOB Price (\$/bin) <sup>[3]</sup>				
	250	300	350	400	450
40	(6,910.19)	(4,910.19)	(2,910.19)	(910.19)	1,089.81
50	(7,072.61)	(4,572.61)	(2,072.61)	427.39	2,927.39
60	(7,235.03)	(4,235.03)	(1,235.03)	1,764.97	4,764.97
70	(7,397.45)	(3,897.45)	(397.45)	3,102.55	6,602.55
80	(7,559.87)	(3,559.87)	440.13	4,440.13	8,440.13
90	(7,722.29)	(3,222.29)	1,277.71	5,777.71	10,277.71

Notes:

Shaded area denotes a positive profit based on the combination of yield and price.

[1] Includes amortized establishment costs.

[2] Assumes an 850-pound bin. Takes into account an average packout of 85%.

[3] Price represents gross FOB price (no warehouse charges deduction).

## **EXECUTIVE SUMMARY**

In this study, we estimated the costs on establishing, producing and packing Red Delicious apples in Washington. We collaborated with experienced and knowledgeable growers of Red Delicious apples in defining the baseline assumptions on production and in estimating the production costs. Results show an estimated total production cost for Red Delicious of \$22,102 per acre, and net return of \$1,698 per acre during full production. These amounts were estimated under production specifications assumed for the study (density of 900 trees per acre, M106 rootstock, 25-acre block), net yield during full production at 59.5 bins per acre (considering 85% packout), FOB price of \$400 per bin, and given packinghouse charges.

The positive net return implies that a grower of Red Delicious apples is able to cover all cash and opportunity costs in producing this apple variety, including returns on management and financial risk. Therefore, under the planting assumptions, current production conditions and no catastrophic unexpected events, it is economically sustainable in the long run to produce Red Delicious apples in Washington.