



2012 Cost Estimates of Establishing, Producing, and Packing Red Delicious Apples in Washington

WASHINGTON STATE UNIVERSITY EXTENSION FACT SHEET • FS099E

Preface

The information in this publication serves as a general guide for establishing and producing Red Delicious apples in Washington as of 2012. Specific assumptions are included in this publication, but these assumptions may not fit every situation since production costs and returns vary among orchard operations, due to the following factors:

- Capital, labor, and natural resources
- Crop yields
- Type and size of machinery, irrigation, and frost control systems
- Input prices
- Cultural practices
- Apple prices
- Orchard size
- Management skills

Cost estimations also vary depending on the intended use of the enterprise budget. To avoid drawing unwarranted conclusions for any particular orchard, readers must closely examine the assumptions made in this guide, and then adjust the costs and/or returns as appropriate for their orchard operation.

Red Delicious Apple Production in Washington

Red Delicious has historically been the dominant apple variety produced in Washington State, in terms of planted acreage and the number of shipments for the fresh market, both domestic and export. Despite a significant decrease in acreage (from 121,175 acres in 1986 to 43,379 acres in 2011), Red Delicious remains the dominant apple variety, and comprises 26% of the state's total apple acreage. The Yakima Valley leads in Red Delicious bearing acres with 47%, followed by the Columbia Basin with 34.5%, Wenatchee with 14.7%, and other areas at 4.2% (USDA National Agricultural Statistics Service, 2011).

In the 2010-2011 marketing season, Red Delicious accounted for 31% of total fresh apple shipments from Washington

(Washington Growers Clearing House Association, 2011). Red Delicious is also considered the state's primary export apple variety, accounting for approximately 48% of total Washington apples exported to other countries in 2009-2010 (Washington Apple Commission, 2010).

Study Objectives

The objectives of this publication are to: (1) assist growers in estimating the costs of equipment, materials, supplies, and labor required to establish, and produce a Red Delicious orchard, and (2) develop an Excel workbook that allows the user to examine the ranges of price and yield at which Red Delicious production would be a profitable enterprise.

The primary use of this publication is in identifying inputs, costs, and yields considered to be typical of well-managed Red Delicious orchards. This publication does not necessarily represent any particular orchard operation and is not intended to be a definitive guide to production practices. However, it describes current industry trends and 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 Red Delicious growers in Washington State. Their production practices and input requirements form the baseline assumptions that were used to develop the enterprise budget. Additionally, the data represent what these growers anticipate over the 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 estimate their own costs and returns.

Budget Assumptions

1. This budget is based on a 26-acre block within a 300-acre diverse cultivar orchard. The total productive area for the block is 25 acres; and it is assumed that one acre is dedicated to roads, a pond, loading area, and the like (see Table 1).
2. The value of bare agricultural land (including water rights) is \$8,000 per acre with annual property taxes of \$100 per acre.

3. 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.
4. The pond is installed in Year 1.
5. Warehouse packing charges assume an 850 lb bin. There is no pre-sorting of apples in the field.
6. Labor is assumed to be hand and ladder, without the use of platforms.
7. Management is valued at \$300 per acre. This value is representative of what the producer-group felt as a fair return to an operator's management skills.
8. Interest on investment is 5%.

Summary of Results

The estimated annual cost and returns for a 25-acre block of Red Delicious apples in Washington is presented in Table 2. Production costs are classified into variable costs and fixed costs. Variable costs comprise orchard operations, harvest activities, materials, maintenance, repairs, and packing costs. Fixed costs (which are incurred whether or not apples are produced) include depreciation on capital, interest, taxes, insurance, management, and amortized establishment costs. Management is treated as a fixed cost rather than a variable cost because, like land, management has been committed to the production cycle of the crop.

The study assumes that a Red Delicious orchard could achieve full production in the 6th year. Based on the above assumptions, the total production costs for Red Delicious apples during full production are estimated at \$22,102 per acre. The sensitivity of net returns to different price and yield scenarios is shown in Table 3. Different combinations of price and yield levels suggest that when both levels are high (prices at \$400/bin and yields from 50 to 70 bins/acre), positive returns are likely.

Most of the budget values given in Table 2 are based on more comprehensive underlying cost data, which are shown in Tables 4 to 7. Table 4 presents the annual capital requirements for a 25-acre Red Delicious block. Table 5 specifies the machinery and building requirements for the 300-acre diverse cultivar orchard. Interest costs and depreciation 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 percent interest rate. The amortized establishment costs assume a total productive life of 30 years, which includes 5 years of establishment and 25 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 include the annual replacement cost of machinery and building, which is the amount a producer

would pay to replace machinery and equipment annually, on average. The use of replacement prices may overstate costs currently being experienced by growers. However, the replacement cost provides an indication of the earnings needed to replace depreciable assets. Recent increases in prices paid for machinery and equipment mean that the depreciation claimed on older purchases substantially understates the amount of capital required to replace that asset. When looking at the long-term viability of the enterprise, it is important to consider the ability of the enterprise to replace its depreciable assets on a replacement cost basis.

Excel Workbook

An Excel spreadsheet version of this enterprise budget (Table 2), as well as associated data underlying the per acre cost calculations (Tables 4-7, plus tables with establishment costs, full production costs, packing costs and an amortization calculator) are available at the WSU School of Economic Sciences Extension website: http://extecon.wsu.edu/pages/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. Red Delicious Block Specifications

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

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

	Establishment Years					Full Production ¹	Your Costs
	Year 1	Year 2	Year 3	Year 4	Year 5		
Estimated Net Production (bins/acre) ²			12.75	25.50	42.50	59.50	
Estimated FOB Price (\$/bin) ³			400.00	400.00	400.00	400.00	
Total Returns (\$/acre)			5,100.00	10,200.00	17,000.00	23,800.00	
Variable Costs (\$/acre):							
<u>Establishment</u>							
Soil Preparation	376.50						
Trees (including labor)	6,163.20						
<u>Orchard Activities</u>							
Pruning & Training ⁴	132.00	264.00	324.00	300.00	420.00	420.00	
Green Fruit Thinning ⁴			216.00	276.00	540.00	540.00	
Irrigation Labor ⁵	130.00	130.00	130.00	130.00	130.00	130.00	
Chemicals ^{5,6}	526.00	565.00	656.00	856.00	1,056.00	1,082.00	
Fertilizer ^{5,6}	150.00	150.00	190.00	151.00	101.00	101.00	
Frost Protection (Labor) ⁵				5.20	5.20	5.20	
Beehives			45.00	45.00	45.00	45.00	
General Farm Labor ⁷	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 Activities⁸</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 Charges⁹</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) ¹⁰	417.39	83.55	284.27	461.36	708.78	697.50	
Total Variable Costs	8,765.10	1,754.63	5,969.58	9,688.63	14,884.47	19,297.59	
Fixed Costs (\$/acre):							
<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 ¹¹						1,320.66	
Total Fixed Costs	1,305.18	1,808.69	2,026.85	2,310.15	2,400.09	2,804.32	
TOTAL COSTS	10,070.27	3,563.32	7,996.44	11,998.78	17,284.57	22,101.91	
ESTIMATED NET RETURNS	(10,070.27)	(3,563.32)	(2,896.44)	(1,798.78)	(284.57)	1,698.09	
Accumulated Establishment Costs	10,070.27	13,633.59	16,530.02	18,328.81	18,613.38		

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

²Estimated net production considers an average pack-out of 85%.

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

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

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

⁶Includes materials and labor.

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

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

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

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

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

Table 3. Estimated Net Returns (\$) per Acre at Various Prices and Yields of Red Delicious during Full Production¹

Net Yield (bins/acre) ²	FOB Price (\$/bin) ³				
	250	300	350	400	450
20	(6,585.34)	(5,585.34)	(4,585.34)	(3,585.34)	(2,585.34)
30	(6,747.77)	(5,247.77)	(3,747.77)	(2,247.77)	(747.77)
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

Notes:

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

¹Includes amortized establishment costs.

²Assumes an 850-pound bin. Takes into account an average pack-out of 85%.

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

Table 4. Summary of Annual Capital Requirements for a 25-acre Red Delicious Block

	Establishment Years					Full Production ¹
	Year 1	Year 2	Year 3	Year 4	Year 5	
Annual Requirements (\$)						
Land (26 acres)	208,000.00					
Trellis System	36,525.00					
Irrigation System	54,125.00					
Mainline & Pump	12,500.00					
Pond	7,500.00					
Wind Machine			60,208.00			
Operating Expenses	231,252.39	55,990.72	162,364.54	255,340.76	385,236.82	495,564.73
Total Requirements (\$)	549,902.39	55,990.72	222,572.54	255,340.76	385,236.82	495,564.73
Receipts (\$)	0.00	0.00	127,500.00	255,000.00	425,000.00	595,000.00
Net Requirements (\$)	549,902.39	55,990.72	95,072.54	340.76	(39,763.18)	(99,435.27)

Notes:

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

The net yield of Red Delicious apples from Year 3 to Full Production are 12.75 bins/ac, 25.5 bins/ac, 42.5 bins/ac and 59.5 bins/ac, respectively.

FOB price (without warehouse charges deduction) is assumed at \$400/bin.

Table 5. Machinery, Equipment and Building Requirements for a 300-acre Diverse Cultivar Orchard

	Purchase Price (\$)	Number of Units	Total Cost (\$)
Housing for manager	110,000	1	110,000
Machine shop/shed*	50,000	1	50,000
Tractor-70HP, 4WD	32,500	5	162,500
Tractor-40HP, 4WD	25,000	2	50,000
4 wheeler	4,000	3	12,000
Speed sprayer	20,000	4	80,000
Weed spray boom & tank	7,000	1	7,000
Mower-rotary (9-ft)	7,000	1	7,000
Flail mower	8,000	1	8,000
Fork lift	25,000	2	50,000
Bin trailer	6,000	3	18,000
Pick-up	20,000	1	20,000
Ladder (8-ft)	100	50	5,000
Miscellaneous equipment**	20,000	1	20,000
Shop equipment***	5,000	1	5,000
Total Cost			604,500

Note: Purchase price corresponds to new machinery, equipment or building.

*Includes pesticide storage.

**Includes mobile portable toilet (2), box blade, straight blade, quick connect loader, gopher baiter, soil aerator, utility trailer and ladder trailer (2).

***Includes compressor, welder, pressure washer and miscellaneous tools.

Table 6. Interest Costs per Acre for a 25-acre Red Delicious Block

	Total Purchase Price (\$)	Salvage Value (\$)	Number of Acres	Total Interest Cost (\$)	Interest Cost Per Acre (\$)
Irrigation System	54,125	5,413	25	1,488	59.54
Land	208,000	208,000	26	10,400	400.00
Machinery, Equipment & Building	604,500	60,450	300	16,624	55.41
Mainline & Pump	12,500	0	25	313	12.50
Pond	7,500	0	25	188	7.50
Trellis	36,525	0	25	913	36.53
Wind Machine	60,208	6,021	25	1,656	66.23
<i>Interest Rate</i>	5.0%				
<i>Salvage Value*</i>	10.0%				

Notes:

Interest Cost is calculated as: (Total Purchase Price + Salvage Value)/2 x 5%.

*Salvage Value refers to the estimated value of an asset at the end of its useful life. It is calculated as: Total Purchase Price x 10%. Salvage Value is not applied to land because land is not a depreciable asset.

Table 7. Depreciation Costs per Acre for a 25-acre Red Delicious Block

	Total Purchase Price (\$)	Number of Acres	Total Value Per Acre (\$)	Years of Use	Depreciation Cost Per Acre (\$/yr)
Irrigation System	54,125	25	2,165.00	30	64.95
Mainline & Pump	12,500	25	500.00	30	16.67
Pond	7,500	25	300.00	30	10.00
Trellis	36,525	25	1,461.00	30	48.70
Wind Machine	60,208	25	2,408.32	30	72.25
Machinery, Equipment & Building Annual Replacement Cost*					100.00

Notes:

The depreciation cost (except for Machinery, Equipment, and Building) is calculated as *straight line depreciation*: (Total Purchase Price – Salvage Value)/Years of Use.

*An estimate of average annual replacement costs, rather than depreciation costs, is used for machinery, equipment and buildings. Replacement prices may overstate costs growers experience, but they indicate the earnings needed to replace depreciable assets. When looking at long-term enterprise viability, it is important to consider the ability of the enterprise to replace depreciable assets.

Acknowledgements

The authors wish to thank the Red Delicious apple growers who assisted in developing the enterprise budget, the Washington Tree Fruit Research Commission for funding this study, and the participating Extension Publication reviewers for their helpful comments.



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