



# 2015 COST ESTIMATES OF ESTABLISHING AND PRODUCING RED RASPBERRIES IN WASHINGTON STATE

By

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TB21

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## Preface

The results presented in this WSU publication serve as a general guide for evaluating the feasibility of producing red raspberries 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 red raspberry operations depending on the following factors:

- Capital, labor, and natural resources
- Crop yields
- Cultivar ('Meeker' was assumed for this study)
- Type and size of machinery and irrigation systems
- Input prices
- Cultural practices
- Red raspberry prices
- Size of the farm operation
- Management skills

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

## Red Raspberry Production in Washington State

Washington State is a leading producer of processed red raspberry (*Rubus idaeus*). In 2014, red raspberry growers in the state produced approximately 72.8 million pounds of red raspberries that were valued at \$57.7 million (NASS 2015). Commercial production is concentrated in western Washington, with growers in Whatcom County representing approximately 93% of production (WRRC 2015). The majority of the fruit is transformed into processed products, including individually quick frozen (IQF) fruit, purees, and juices. Fruit that is processed into an IQF product retains the most value for growers.

Red raspberries grown in Washington are predominately the floricane-fruiting type. This type of red raspberry produces fruit early-to-mid summer, which is why floricane-fruiting

raspberries are also referred to as "summer-bearing" raspberries. Canes may reach an overall height of 6 to 13 feet, which necessitates a trellising system. Fruit is produced on the laterals of second-year floricanes and the fruiting season is largely influenced by cultivar. Yield also depends on cultivar, age of the planting, incidence of diseases, horticultural management practices, and environmental factors. The typical yield of red raspberry fields in Washington is 6,500 to 7,500 pounds per acre, but can exceed 10,000 pounds per acre.

In addition to floricanes, floricane-fruiting raspberries also produce primocanes. Primocanes are the first-year canes that are strictly vegetative, form flower initials under cooler conditions and short days, and overwinter to become flower- and fruit-producing floricanes. Therefore, a typical commercial planting of red raspberries in Washington has a mixture of both primocanes and floricanes after the first year of planting. After fruit production, floricanes begin to senesce and are selectively pruned out in the fall and winter. Pruning typically occurs from October through February, but the timing of pruning can be influenced by the availability of labor. Once floricanes are removed, the primocanes are trained to the top wire and arced to facilitate machine harvesting.

Production practices vary based on the size and philosophy of a grower operation. However, pest and disease management is a critical component of commercial production and entails use of protective pesticides to ensure a high-quality crop. Fungicides are used primarily to protect against fruit rots, such as Botrytis fruit rot caused by *Botrytis cinerea*. Another pest challenge shared among raspberry growers is spotted winged drosophila (*Drosophila suzukii*), or SWD. This pest was introduced in 2009 and lays eggs in ripening fruit. These eggs hatch and produce larvae that destroy the value of the fruit. The introduction of SWD has caused significant changes in insect management programs among red raspberry growers. Root rots are another challenge for red raspberry growers on heavier and slower-draining ground and are managed through pre-plant soil fumigation and application of fungicides. Weeds are also managed through application of herbicides and cultivation in alleyways. Contact herbicides are used for primocane suppression (also called "cane-burning"), which is the practice of removing the first few flushes of primocanes in the spring. This practice is believed to contribute to greater yields through reducing competition between emerging primocanes and flower or fruit producing floricanes.

Growers vary in their fertility and irrigation regimes. However, most growers apply granular fertilizers pre-planting and early in the growing season. Additional nutrient supplementation

may come from fertigation, which is the practice of applying liquid fertilizers through drip tape, and application of foliar nutrients (i.e., “foliar feeding”). Most growers drip irrigate and drip lines are usually buried or suspended above the ground. Irrigation scheduling varies by grower and may be based on temperature, time of the year, soil moisture, or online irrigation schedulers.

## 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 red raspberries; and (2) the ranges of prices and yields at which red raspberry production would be a profitable enterprise.

The primary use of this report is in identifying inputs, costs, and yields considered to be typical of a well-managed red raspberry operation. This publication does not necessarily represent any particular operation and 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 red raspberry growers in western 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 red raspberry’s productive life, if no unforeseen failures occur. Given that many factors affect production costs 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 60-acre field of ‘Meeker’ red raspberries within a 90-acre farm operation of diverse crops (e.g., blueberries, apples, blackberries, strawberries, vegetables and other horticultural crops). Table 1 shows the assumed specifications for red raspberry production.
2. Land rent is \$500 per acre.
3. The irrigation system is drip. Water is provided through a private well.

4. The horticultural practices of pruning and training are done by hand, whereas plant protective practices (e.g., application of pesticides) are done by machine. Fertilizers are also machine applied and may also be applied through fertigation systems. Harvest is done by machine.
5. Management is valued at \$200 per acre. This value is representative of what the producer group felt as a fair return for an operator’s management skills.
6. Interest on investment is 6%.

## Summary of Study Results

Table 2 shows the estimated annual costs and returns for a 60-acre field of ‘Meeker’ red raspberries in western Washington. The components of the major costs shown in this table are provided in more detail in the Excel Workbook described below. Production costs are classified into variable costs and fixed costs. Variable costs comprise field and harvest activities, materials and application costs, maintenance and repairs, fuel and lube, and fees. Fixed costs are incurred whether or not the crop is produced. These costs will generally be calculated for the whole farm enterprise and be allocated for the unit of production. The fixed costs include land rent, depreciation and interest costs on fixed capital, 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 amortized establishment costs assume a total productive life of six years, which includes two years of establishment and four years of full production. The amortized establishment costs must be recaptured during the full production years in order for an enterprise to be profitable.

The study assumed that ‘Meeker’ red raspberries could achieve full production in the third year. Based on the above assumptions, the total production costs for ‘Meeker’ red raspberries during full production are estimated at \$5,586 per acre. The break-even price for ‘Meeker’ during full production is about \$0.49 per pound. 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 Appendix Tables 1 through 4 of the Excel Workbook described below.

Table 4 specifies the machinery, equipment, building and irrigation requirements for the 90-acre farm operation. Depreciation and interest costs of fixed capital are also listed in Table 4. 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. 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 6% interest rate.

The economic feasibility of investing in a red raspberry operation is further assessed by using the net present value (NPV) and discounted payback period. Discounting is a method to estimate the present value of future payments by using a discount rate, which represents the time value of money or the opportunity cost of capital. NPV is the sum of the discounted cash flows from the first year to the last year of the planting's productive life (i.e., six 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.

Given the production-related assumptions in this study, the NPV or expected profits (in present-day dollars) over the lifetime of the red raspberry operation is \$0.85 million, given a discount rate of 4%. The estimated discounted payback period for the investment can vary depending on the costs included in the calculation and ranges from 1.9 to 4.0 years. If one includes total cash costs, which is the sum of total variable costs and land rent, the discounted payback period is 1.9 years. Whereas, if one includes all production costs, which is the sum of total cash cost, management cost, and fixed capital investment, the discounted payback period is 4.0 years. Table 5 shows the sensitivity of the NPV calculations to different discount rates: 4%, 5%, and 6% (based on the range of the average annual effective interest rates on non-real estate bank loans made to farmers from 2010 to 2015 according to the Federal Reserve Bank of Kansas City 2016).

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 entire population of red raspberry growers. An interactive Excel Workbook 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 (Table 4 and Appendixes 1 through 5 for establishment costs and returns, full production costs and returns, harvester and other production cost-related data, and NPV and payback period calculators) are available at the [WSU School of Economic Sciences Extension website](http://www.wsu.edu/extension/economic_sciences).

Growers can modify select values and thus use the Excel Workbook to evaluate their own red raspberry enterprise.

## References

Federal Reserve Bank of Kansas City. 2016. [Agricultural Finance Databook: Tables](http://www.frbkc.org/publications/quarterly-bulletin/2016-04/2016-04-01-tables).

NASS (National Agricultural Statistics Service). 2015. [Non-citrus Fruits and Nuts, 2014 Summary](http://nass.usda.gov/publications/2015/11/05/2015-11-05-non-citrus-fruits-and-nuts-2014-summary). 5 Nov. 2015. USDA.

WRRC (Washington Red Raspberry Commission). 2015. [2014 Washington Raspberry Assessments](http://www.wrrc.org/2015-washington-red-raspberry-assessments).

## Acknowledgements

The authors wish to thank the Washington Red Raspberry Commission for funding this study. The authors wish to thank the WSU Extension publication reviewers for their helpful comments. Assistance provided by red raspberry growers in developing the enterprise budget is also greatly appreciated.

**Table 1. Red Raspberry Production Specifications**

Row Width	10 feet
In-row Spacing	28 inches
Cultivar	Meeker
Life of Planting	6 years (Years of establishment = 2; Years of full production = 4)
Planting Density (plants/acre)	2,000
Harvest Pickings per Year	18 passes by machine

**Table 2. Estimated Cost and Returns per Acre of Establishing and Producing 'Meeker' Red Raspberries on a 60-Acre Field**

	Establishment		Full
	Year 1	Year 2	Production <sup>A</sup>
Estimated Production (lb/acre) <sup>B</sup>	0.00	9,800.00	11,300
Gross Return (\$/lb) <sup>C</sup>	1.14	\$1.14	\$1.14
<b>TOTAL RETURNS (\$/acre)</b>	<b>\$0.00</b>	<b>\$11,172.00</b>	<b>\$12,882.00</b>
<i>Variable Costs</i>			
Soil Preparation	181.00	0.00	0.00
Plants	1,537.50	0.00	0.00
Custom Work	1,362.00	0.00	0.00
Chemicals <sup>D</sup>	43.60	364.26	364.26
Fertilizer <sup>D</sup>	344.34	356.11	356.11
General Farm Supplies	989.30	11.50	11.50
Labor <sup>E</sup>	1,139.00	2,063.70	2,063.70
Other Variable Cost <sup>F</sup>	889.76	627.76	587.55
<b>Total Variable Costs</b>	<b>6,486.50</b>	<b>3,423.33</b>	<b>3,383.11</b>
<b>Total Fixed Costs<sup>G</sup></b>	<b>1,539.49</b>	<b>2,021.05</b>	<b>2,202.77</b>
<b>TOTAL COSTS (\$/acre)</b>	<b>8,025.98</b>	<b>5,444.37</b>	<b>5,585.89</b>
<b>ESTIMATED NET RETURNS (\$/acre)</b>	<b>-8,025.98</b>	<b>5,727.63</b>	<b>7,296.11</b>

Notes:

A. The full production year is representative of the full production years (Year 4 to Year 6).

B. Represents the average yield over 4 years of full production.

C. Represents the return at the farm (before processing charges).

D. Cost of materials.

E. Includes general farm labor, piece rate labor, spray crew and harvest labor.

F. Includes maintenance and repair, fuel and lube, commission fee, overhead and interest on operating capital.

G. Includes depreciation and interest on fixed capital, interest on establishment, and other fixed costs (machinery/equipment rental, land rent, management cost, and amortized establishment cost).



**Table 3. Estimated Net Returns<sup>A</sup> Per Acre at Various Prices and Yields of 'Meeker' Red Raspberries during Full Production (\$/acre)**

Yield (lb/acre) <sup>B</sup>	Price (\$/lb) <sup>C</sup>					
	\$0.74	\$0.84	\$0.94	\$1.04	\$1.14	\$1.24
4,100	-\$2,512	-\$2,102	-\$1,692	-\$1,282	-\$872	-\$462
5,000	-\$1,851	-\$1,351	-\$851	-\$351	\$149	\$649
5,900	-\$1,190	-\$600	-\$10	\$580	\$1,170	\$1,760
6,800	-\$529	\$151	\$831	\$1,511	\$2,191	\$2,871
7,700	\$132	\$902	\$1,672	\$2,442	\$3,212	\$3,982
8,600	\$793	\$1,653	\$2,513	\$3,373	\$4,233	\$5,093
9,500	\$1,454	\$2,404	\$3,354	\$4,304	\$5,254	\$6,204
10,400	\$2,115	\$3,155	\$4,195	\$5,235	\$6,275	\$7,315
11,300	\$2,776	\$3,906	\$5,036	\$6,166	\$7,296	\$8,426
12,200	\$3,437	\$4,657	\$5,877	\$7,097	\$8,317	\$9,537

Notes:

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

A. Net return is what the grower receives after all production expenses have been accounted.

B. Represents the average yield over 4 years of full production.

C. Price represents gross return.

**Table 4. Machinery, Equipment, Building and Irrigation Requirements for a 90-Acre Farm<sup>A</sup>**

Capital Investment	Quantity	Total Cost	Useful Life (years)	Salvage value <sup>B</sup>	Depreciation <sup>C</sup>	Interest <sup>D</sup>	Annual Repair and Maintenance
<b>Building/Well</b>							
Shed/Barn	1	\$73,600.00	25	\$0.00	\$2,944.00	\$2,208.00	\$736.00
Private Well	1	\$10,000.00	25	\$0.00	\$400.00	\$300.00	\$100.00
<b>Equipment</b>							
Tiller	1	\$6,500.00	12	\$650.00	\$487.50	\$214.50	\$252.00
Sub Soiler	1	\$2,000.00	12	\$200.00	\$150.00	\$66.00	\$200.00
Cultivator	1	\$2,500.00	12	\$250.00	\$187.50	\$82.50	\$200.00
Sprayer	1	\$12,500.00	15	\$1,250.00	\$750.00	\$412.50	\$400.00
Cane Chopper	1	\$7,000.00	10	\$700.00	\$630.00	\$231.00	\$300.00
6-Foot Disk (for raspberries)	1	\$7,000.00	10	\$700.00	\$630.00	\$231.00	\$150.00
Harvester	4	\$720,000.00	30	\$72,000.00	\$21,600.00	\$23,760.00	\$4,500.00
Post Pounder	1	\$5,800.00	10	\$580.00	\$522.00	\$191.40	\$100.00
Hand Washing Station	3	\$1,800.00	10	\$0.00	\$180.00	\$54.00	\$200.00
Miscellaneous Equipment and Supplies	1	\$65,000.00	10	\$6,500.00	\$5,850.00	\$2,145.00	\$0.00
<b>Irrigation System</b>							
Electrical Service/Connections	1	\$14,000.00	25	\$0.00	\$560.00	\$420.00	\$140.00
Pump and Check Valve	1	\$5,800.00	20	\$290.00	\$275.50	\$182.70	\$58.00
Filter and Injection Pump	1	\$2,200.00	20	\$110.00	\$104.50	\$69.30	\$22.00
Controller, Control Wires, and Valves	1	\$7,000.00	20	\$350.00	\$332.50	\$220.50	\$70.00
PVC Pipe and Plumbings	1	\$23,000.00	20	\$1,150.00	\$1,092.50	\$724.50	\$230.00
Trenching, Pipe and Fitting Installation	1	\$15,000.00	20	\$0.00	\$750.00	\$450.00	\$150.00
Drip Tape	1	\$18,000.00	7	\$0.00	\$2,571.43	\$540.00	\$180.00
<b>Vehicles</b>							
Tractor 75HP	1	\$45,000.00	15	\$4,500.00	\$2,700.00	\$1,485.00	\$600.00
Delivery Truck (used)	1	\$20,000.00	10	\$6,000.00	\$1,400.00	\$780.00	\$2,000.00
Pickup Truck (used)	1	\$12,000.00	10	\$3,600.00	\$840.00	\$468.00	\$1,200.00
4-Wheeler	1	\$5,000.00	10	\$1,250.00	\$375.00	\$187.50	\$20.00
<b>Rentals</b>							
Tractor 200HP	1	\$50.00					
Fert. Spreader & Side Dresser	2	\$600.00					
<b>Total</b>		<b>\$997,750.00</b>			<b>\$41,988.43</b>	<b>\$32,915.40</b>	<b>\$11,808.00</b>
<b>Total per acre</b>					<b>\$466.54</b>	<b>\$365.73</b>	<b>\$131.20</b>

Notes:

A. Building, machinery, equipment and irrigation system are utilized in growing crops in the 90-acre farm, which include red raspberries. The costs of fixed capital are allocated on the entire farm operation.

B. Salvage Value refers to the estimated value of an asset at the end of its useful life. In general, a salvage value will be a positive value. However, it may be zero if the asset will be used until it is completely worn out and will have no scrap value at the end of its useful life.

C. The depreciation cost is calculated as straight line depreciation:  $(\text{Total Purchase Price} - \text{Salvage Value}) \div \text{Years of Use}$ .

D. Annual interest cost is calculated as:  $(\text{Total Purchase Price} + \text{Salvage Value}) \div 2 \times \text{Interest Rate}$ .

**Table 5. NPV and Payback Periods given  
Different Discount Rates**

<b>Discount Rate</b>	<b>NPV</b>	<b>Payback Period of Total Cash Cost<sup>A</sup> (years)</b>	<b>Payback Period of Total Cost<sup>B</sup> (years)</b>
4%	\$850,066	1.92	4.03
5%	\$780,328	1.93	4.10
6%	\$714,538	1.94	4.16

Notes:

A. Cash cost is the sum of total variable cost and land rent. 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.





Use pesticides with care. Apply them only to plants, animals, or sites as listed on the label. When mixing and applying pesticides, follow all label precautions to protect yourself and others around you. It is a violation of the law to disregard label directions. If pesticides are spilled on skin or clothing, remove clothing and wash skin thoroughly. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

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