



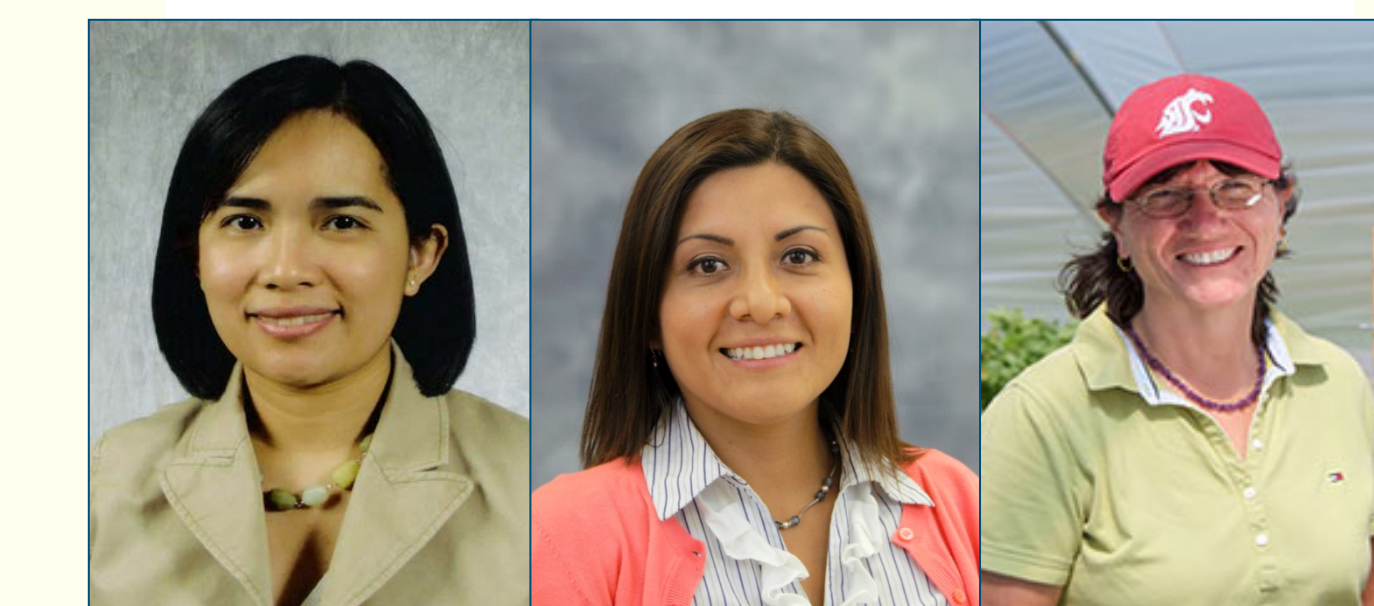
Cost Estimation of Establishing a Cider Apple Orchard in Western Washington

Suzette P. Galinato¹, R. Karina Gallardo², and Carol A. Miles³

¹IMPACT Center, School of Economic Sciences (SES), WSU, Pullman, WA

²SES, Center for Precision and Automated Agricultural Systems, Puyallup REC, WSU, Puyallup, WA

³Department of Horticulture, Mount Vernon NWREC, WSU, Mount Vernon, WA



Introduction

The volume of cider produced in the U.S. increased seven times from 775,031 gallons in 2007 to 5.2 million gallons in 2012. In Washington State, the total volume of cider produced grew by almost four times in this same period and was 0.17 million gallons in 2012. Cider is well suited to small-scale artisanal producers who rely on local markets. As of 2014, 30% of the cideries in the Pacific Northwest were in Western Washington.

Cider apple production promotes sustainability by preserving genetic diversity with specialty and heirloom apple varieties and through reduced pesticide inputs. Cider apple varieties that are well adapted to local conditions need less pesticide input, since minor surface blemishes are tolerated if yield and internal fruit quality are not affected. Cider apple production in western Washington is not limited by environment-induced diseases (e.g., scab) which otherwise limit apple production and yields.

WSU Mount Vernon NWREC has the oldest cider research and education programs in the country (first cider research orchard was planted in 1979). This project will strengthen the knowledge base for the expanding Washington cider industry. Future studies will provide cost estimates for establishing a cider apple orchard in central Washington.

Methodology

Data for this study were collected in 2013 by interviewing experienced cider apple growers in western Washington during focus group sessions. Focus group participants had:

- ✓ Knowledge and experience in growing cider apples.
- ✓ Good management practices for the region.

For the enterprise budget, baseline production specifications were established by focus group participants and the types of inputs were itemized based on the production system and the crop. (Table 1).

Table 1. Baseline production values for cider apple production in western Washington in 2013.

Field specification	Assumed values
Total production area	10 acres
Growing area	9 acres
Architecture	Central leader system
Rootstock	Dwarf – M9 series
Cider apple variety	Several varieties (e.g., Kingston Black, Yarlington Mill, Brown Snout, Dabinett, Porter's Perfection, Vilberie, Foxwelp)
In-row spacing	5 feet
Between-row spacing	12 feet
Density	726 trees/acre
Commercial life of planting	25 years (including 4 years of establishment)

Other assumptions:

- Apples may be used to produce own hard cider or sold to a hard cider making operation. Post-production costs such as extended storage, juicing, hauling to cidery, and pomace disposal are not included in this study.
- Cider will be 'hard cider.'
- Farmers are selling apples within 2 weeks of harvest. On-farm storage is pole barn with no climate control.
- Price received for cider apples is \$315/bin.
- Bins weigh 900 pounds each.
- Cultural tasks and harvest are done by hand..

Participating growers identified main production categories and estimated costs of production. A consensus was reached on average cost by production category.

- **Variable costs:** soil preparation, fertilizer and chemical applications, planting, other labor, harvest and postharvest activities, maintenance and repairs of irrigation system, machinery and/or equipment, overhead, and interest on operating capital.
- **Fixed costs:** depreciation and interest on physical capital, interest and tax on land, farm insurance, and farm management.

Costs were tabulated and reviewed by focus group participants, other cider apple growers in the region and tree fruit extension specialists.

Analysis of Economic Feasibility

COST AND RETURNS PER ACRE

- Total production cost during full production is about \$12,920/acre (Table 2).
- Given the baseline assumptions about production, the producer starts to receive positive net returns after Year 4.
- In Table 3, the break-even return represents the amount required to cover the cost of production and is calculated considering different levels of cost recovery. The return must be \$281/bin in order for a producer to cover all out-of-pocket expenses *plus* realize a competitive return on equity capital invested in land, trees, machinery, equipment, and buildings.

Table 2. Estimated costs and returns of cider apple production in western Washington in 2013 (\$/acre).

	Year 1	Year 2	Year 3	Year 4	Full production ²
Estimated gross yield (bins/acre)			5	12	46
Estimated price (\$/bin)			\$315	\$315	\$315
Total Returns			\$1,575	\$3,780	\$14,490
Variable cost					
Establishment ¹	\$5,764				
Orchard activities ⁴	\$1,562	\$2,198	\$2,752	\$3,400	\$3,408
Harvest ⁵			\$405	\$972	\$3,726
Maintenance and repair ⁶	\$170	\$195	\$260	\$300	\$330
Other ⁷	\$768	\$245	\$350	\$479	\$667
Total Variable Cost	\$8,264	\$2,638	\$3,767	\$5,151	\$8,131
Fixed cost					
Depreciation ⁸	\$730	\$730	\$730	\$730	\$730
Interest ⁹	\$1,226	1,772	2,063	2,346	\$1,226
Other ¹⁰	\$685	\$685	\$685	\$685	\$2,833
Total Fixed Cost	\$2,642	\$3,187	\$3,478	\$3,762	\$4,789
Total Cost	\$10,905	\$5,825	\$7,245	\$8,913	\$12,920
Estimated Net Returns	-\$10,905	-\$5,825	-\$5,670	-\$5,133	\$1,570

Numbers may not add up due to rounding.

²Full production year is representative of all the remaining years the orchard is in full production (Year 5-25).

³Soil preparation and trees (including labor).

⁴Pruning and training; green fruit thinning; irrigation labor; fertilizer; manual pest control; beehive; general farm labor; and irrigation/electric charge.

⁵Cost of picking (labor).

⁶Machinery repair; fuel and lube; and irrigation system maintenance (including parts and labor)

⁷Overhead; and interest costs.

⁸Depreciation cost of irrigation system, trellis; machinery; equipment and building.

⁹Interest cost of irrigation system; land; machinery; equipment and building; trellis; and establishment.

¹⁰Miscellaneous supplies; land and property taxes; insurance cost (all farm); management cost; and amortized establishment cost (incurred during the establishment years that must be recaptured during the full production years).

Table 3. Breakeven Return (\$/bin) for different levels of enterprise costs during full production.

Levels of enterprise costs	Break-even return (\$/bin) ²
1. Total variable costs	\$177 ¹
2. Total cash costs = Total variable costs + Land & property taxes + Insurance cost + Miscellaneous supplies	\$185 ³
3. Total cash costs + Depreciation costs	\$201 ⁴
4. Total cost = Total cash costs + Depreciation costs + Interest costs + Management cost	\$281 ⁵

¹The break-even return is calculated as: Cost divided by Yield.

²If the return is below this level, cider apples are uneconomical to produce.

³The second break-even return allows the producer to stay in business in the short run.

⁴The third break-even return allows the producer to stay in business in the long run.

⁵The fourth break-even return is the **total cost break-even return**. Only when this break-even return is received can the grower recover all out-of-pocket expenses *plus* opportunity costs.

SENSITIVITY OF POTENTIAL PROFIT TO CROP YIELD AND PRICE

- Assuming all other factors are constant, net returns during full production are positive at higher yield and price combinations (Table 4).

Table 4. Estimated net returns² (\$) per acre at various prices and yields of cider apples during full production.

Gross yield (bins/acre)	Price per bin					
	\$300	\$320	\$340	\$360	\$380	\$400
20	-\$4,626	-\$4,226	-\$3,826	-\$3,426	-\$3,026	-\$2,626
25	-\$3,567	-\$3,067	-\$2,567	-\$2,067	-\$1,567	-\$1,067
30	-\$2,508	-\$1,908	-\$1,308	-\$708	-\$108	\$492
35	-\$1,450	-\$750	-\$50	\$650	\$1,350	\$2,050
40	-\$391	\$409	\$1,209	\$2,009	\$2,809	\$3,609
45	\$668	\$1,568	\$2,468	\$3,368	\$4,268	\$5,168
50	\$1,727	\$2,727	\$3,727	\$4,727	\$5,727	\$6,727

Area shaded in grey denotes a positive profit based on the combination of yield and price.

² Net returns take into account out-of-pocket expenses and opportunity costs.

³ Assumes a 900-pound bin.

- At the base price of \$315/bin, the producer will recover the cash cost of investment in the cider apple orchard at 6.40 years. The payback period can vary given different price levels: 7.77 years at \$270/bin; 5.71 years at \$360/bin; and 5.30 years at \$405/bin (Figure 1).
- If crop yields are 10% lower than the base, the investment cost will be recovered at 7.24 years. If crop yields are 10% higher than the base, the payback period is 5.88 years (Figure 2).

Figure 1. Payback period² given different price levels.

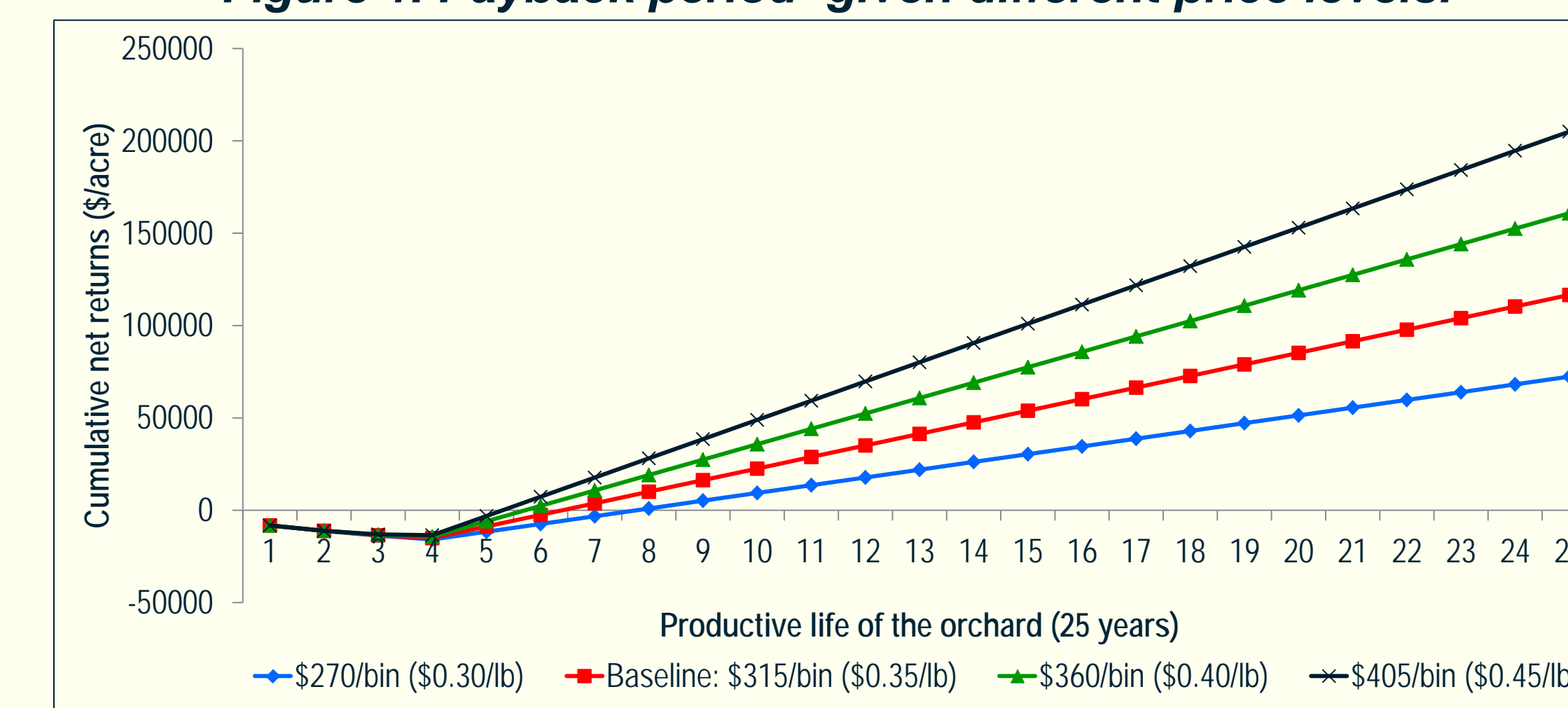
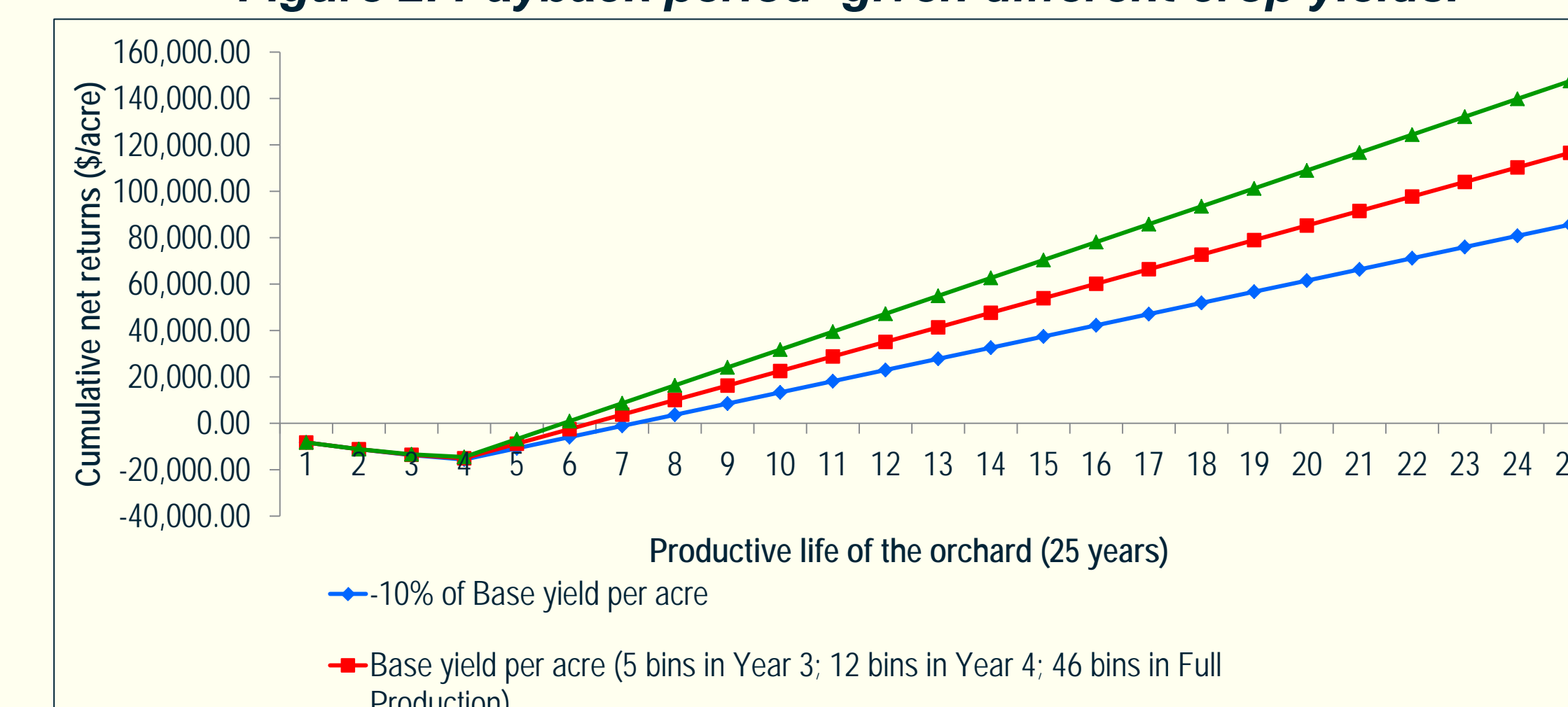


Figure 2. Payback period² given different crop yields.



²The calculation of payback period only accounts for net cash flows (i.e., excludes depreciation costs that are non-cash expenses and opportunity costs such as interest cost and management cost).

Key Results

Based on the underlying assumptions about production practices, crop yield, price received and total production costs:

- Cider apple production in western Washington is economically profitable.
- At the base price of \$315/bin (\$0.35/lb), the producer will recover the cash costs of cider apple orchard investment after 6 years.
- The return must be \$281/bin (about \$0.31/lb) in order to offset the estimated total production cost for a full producing cider apple orchard. Total cost includes cash expenses, depreciation costs and opportunity costs. Opportunity costs are defined as the revenue foregone by not investing in the next best alternative such as investing money in the stock market, paying off an outstanding loan, or using the producer's skills and time in another endeavor.

Limitations of the Study

- The study's data and profitability analysis were based on consolidated information provided by cider apple growers in western Washington who participated in the study. Production costs and returns by individual growers may differ, thus the results cannot be generalized to represent the entire population of growers.
- The price of cider apples used in the study is an approximation of what cider makers in western Washington pay or are willing to pay for cider apple varieties. Currently, there are no published statistics or reports on the prices, production and utilization of cider apples in Washington. Further research work is warranted to examine the supply of and demand for cider apples in the state.

Additional Information

- This study is funded by a WSU CSANR BIOAg Grant and published as WSU Extension Publication FS141E (2014).
- Related studies, funded by the WSDA Specialty Crop Block Grant, focusing on cider apple production in eastern Washington and on the costs of mechanical harvest are ongoing.
- WSU Mount Vernon NWREC has one of the most active cider research and education programs in the country. The program leader is Dr. Carol A. Miles. More information about cider research at WSU and the U.S. can be found in the following website:

<http://extension.wsu.edu/maritimefruit/pages/cider.aspx#research>.