

Economics of Cherry Production: Exploring Harvest Costs Versus Crop Damage Sensitivity in Washington Grown Sweet Cherries

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Washington Tree Fruit Association
Annual Meeting

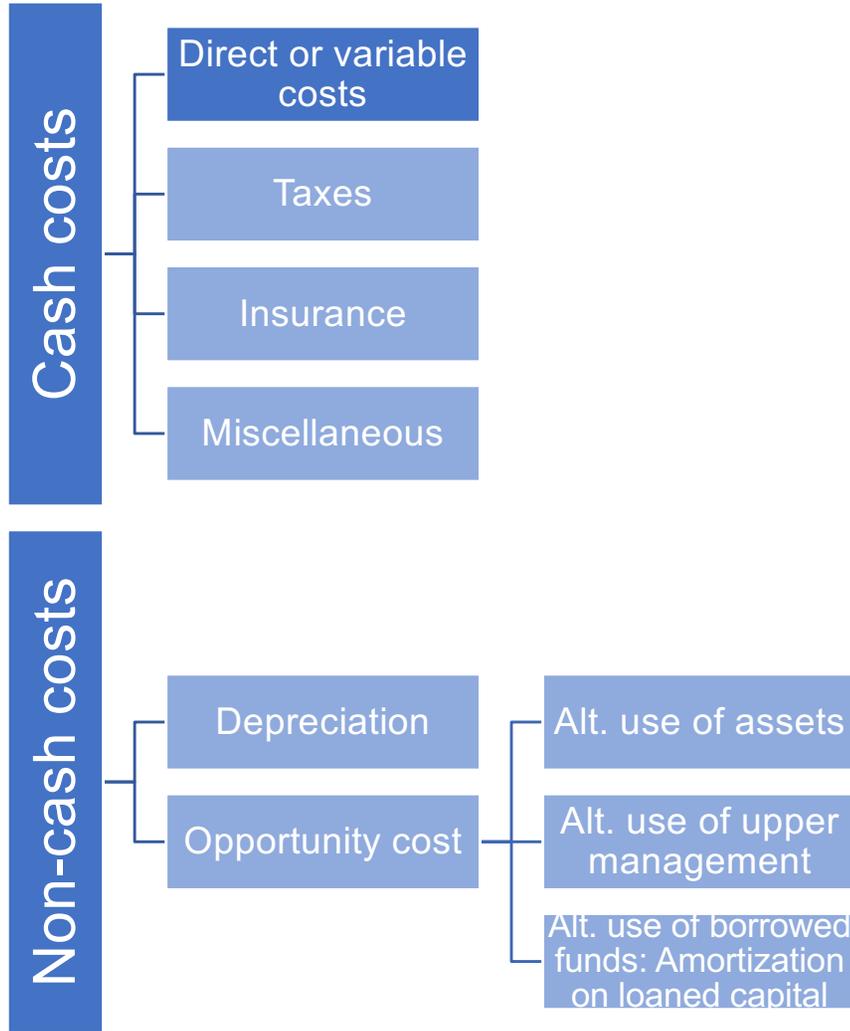
December 10, 2024



Source of photo: Capital Press (March 26, 2024).



Production costs



Production costs

- Profits are not always > 0
 - Yield and price variability
- Short-term economic situation
 - Variable costs and cash costs
- Long-term economic situation
 - Cash and non-cash costs



Source: WSFC – Northwest Cherries





WSU Sweet Cherry Enterprise Budgets

- 2009
- 2015
- 2021
- Update 2022- 4 varieties:
 - Chelan
 - Skeena
 - Coral Champagne
 - Sweetheart

2021–2022 COST ESTIMATES OF ESTABLISHING, PRODUCING, AND PACKING CHELAN SWEET CHERRIES IN WASHINGTON STATE



Preface

The results presented in this WSU publication serve as a general guide for evaluating the feasibility of producing Chelan sweet cherries in Washington State in 2021–2022. This publication is not intended to be a definitive guide to production practices, but it is intended to be helpful in estimating the physical and financial requirements of comparable plantings. Specific budget assumptions were adopted for this study, but these assumptions may not represent the conditions in all production and marketing situations since production costs and returns vary across orchard operations, depending on the following factors:

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

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

Chelan Sweet Cherry Production in Washington State

Washington State is the number one producer of sweet cherries in the United States. In 2009, the gross value of sweet cherries

was about \$394 million, ranking it eighth in terms of overall value of agricultural commodities produced in the state (WSDA 2021).

The top three sweet cherry varieties in Washington State, in terms of bearing acreage, are Bing, Sweetheart, and Chelan. The bearing acreage of Chelan is about 90% of the state total for sweet cherries in 2017, as compared to the shares of Bing and Sweetheart at 53% and 11%, respectively. The bearing acres of Chelan sweet cherries were 4,193 acres in 2017, distributed among four production regions: 36.4% in the Yakima Valley, 6.1% in Wenatchee, 23% in the Columbia Basin, and 30.5% in other areas (USDA NASS 2017). The first on board (FOB) price of Chelan in 2021 was \$2.71/lb. Between 2007 and 2021, the minimum and maximum prices of Sweetheart were \$2.27/lb and \$2.80/lb, respectively. The five-year average FOB price was \$2.62/lb, which is 3% lower than in 2021 (WSTFA 2021).

Study Objectives

The primary use of this report is in identifying inputs, costs, and yields considered typical of well-managed Chelan sweet cherry orchards.

This publication is designed to enable growers to estimate (1) the costs of equipment, materials, supplies, and labor required to establish and produce a Chelan sweet cherry orchard, including packing costs, and (2) the ranges of price and yield at which Chelan sweet cherry production would be a profitable enterprise.

Information Sources

The data used in this study were collected from information shared by a group of experienced Chelan cherry growers in 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 owner-operators anticipate would occur over an orchard's life, if no unforeseen failures occur. Given that many factors affect





How to find WSU Sweet Cherry Enterprise Budgets



wsu crop enterprise budget



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School of Economic Sciences | Washington State University
<https://ses.wsu.edu> > enterprise_budgets



Crop Enterprise Budgets | School of Economic Sciences

WSU enterprise budgets include different profitability forecasts to different output prices and yields. WSU enterprise budgets also include break-even analyses ...



WSU CAHNRS
140+ views · 7 months ago



WSU Specialty Crop Enterprise Budget - Instructional Video



Chapters 0:00 - What is a **crop enterprise budget**? 1:14 - Components of production costs 1:50 - Development of a **crop enterprise budget** 2:45 ...

http://www.ses.wsu.edu/enterprise_budgets

[School of Economic Sciences](#) / Crop Enterprise Budgets

Crop Enterprise Budgets

Agricultural operations are currently facing challenges due to the rising costs of inputs and stagnant output prices. To secure farm profitability, it is crucial to carefully assess expenses and revenues. Washington State University offers resources, such as tailored enterprise budgets, to guide producers in making informed decisions.

How to use enterprise budgets?

Enterprise budgets help farm management decisions. For example, projecting higher chemical costs prompts cost reduction exploration. Similarly, identifying high equipment depreciation may lead to selling underutilized machinery. Enterprise budgets

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Structure of enterprise budgets

Enterprise budgets present returns and costs. Total or gross returns, which are price times yield, are usually presented first. In WSU **tree fruit crop budgets**, we include the prices negotiated by the packinghouse on behalf of the grower. In other words, these are not the prices received by the growers, it is the price received by the packinghouse. We include the

WSU Crop Enterprise Budgets Instructional Video



Washington Enterprise Budgets for Crop Commodities

Search: cherries



Search:

Commodity	Title	Author	Date	Link
Alfalfa	2012 Irrigated Alfalfa Hay Budget Under Center Pivot in the Columbia Basin (FS133E)	Norberg, Neibergs	2014	pdf excel
Alfalfa	Organic Alfalfa Management Guide (Feb 2009) (EB2039E)	Fuerst, Koenig, Kugler, Painter, Stannard, Goldberger	2009	pdf
Alfalfa	Spreadsheet for Dryland Organic Alfalfa Production	Painter	2009	pdf excel
Alfalfa	2009 Costs of Producing Alfalfa Hay Under Center Pivot Irrigation in the Columbia Basin of Washington State April 2009 (EM007)	Hinman, Kugler, Painter, Petersen	2009	pdf excel
Alfalfa	Cost Calculator for Irrigated Organic Alfalfa Production	Painter	2009	pdf excel
Alfalfa	2006 Cost of Producing Alfalfa Seed in the Columbia Basin of Washington State (EB2013E)	Hinman, Kugler	2006	pdf excel
Alfalfa	2002 Cost of Producing Alfalfa Hay Under Center-Pivot Irrigation in the Columbia Basin of Washington State (EB1942E)	Hinman, Kugler, Woodward	2002	pdf
Alfalfa	1996 Alfalfa Seed Enterprise Budget, Walla Walla County, Washington (EB127E)	Gary, Willett	1996	pdf

Commodity	Title	Author	Date	Link
Cherries	2021-2022 Cost Estimates of Establishing, Producing, and Packing Chelan Sweet Cherries in Washington State (TB84E)	Gallardo and Galinato	2022	pdf 2021 excel 2022 excel
Cherries	2021-2022 Cost Estimates of Establishing, Producing, and Packing Skeena Sweet Cherries in Washington State (TB85E)	Gallardo and Galinato	2022	pdf 2021 excel 2022 excel
Cherries	2021-2022 Cost Estimates of Establishing, Producing, and Packing Coral Champagne Sweet Cherries in Washington State (TB82E)	Gallardo and Galinato	2022	pdf 2021 excel 2022 excel
Cherries	2021-2022 Cost Estimates of Establishing, Producing, and Packing Sweetheart Sweet Cherries in Washington State (TB83E)	Gallardo and Galinato	2022	pdf 2021 excel 2022 excel
Cherries	2015 Cost Estimates of Establishing, Producing, and Packing Sweetheart Sweet Cherries in Washington State (TB34)	Galinato, Gallardo	2016	pdf excel
Cherries	2015 Cost Estimates of Establishing, Producing, and Packing Bing Sweet Cherries in Washington (TB22)	Galinato and Gallardo	2016	pdf excel
Cherries	2009 Cost Estimates of Establishing and Producing Sweet Cherries in Washington (FS022E)	Galinato, Gallardo, Taylor	2010	pdf excel

WSU enterprise budgets – PDF & Excel



Preface

The results presented in this publication serve as a general guide for evaluating the feasibility of producing Sweetheart sweet cherries in Washington State in 2021–2022. This publication is not intended to be a definitive guide to production practices, but it is intended to be helpful in estimating the physical and financial requirements of comparable plantings. Specific budget assumptions were adopted for this study, but these assumptions may not represent the conditions in all production and marketing situations since production costs and returns vary across orchard operations, depending on the following factors:

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

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

Sweetheart Sweet Cherry Production in Washington State

Washington State is the number one producer of sweet cherries in the United States. In 2019, the gross value of sweet cherries

was about \$394 million, ranking it eighth in terms of overall value of agricultural commodities produced in the state (WSDA 2021).

Sweetheart is second to Bing in terms of acreage. In 2017, Sweetheart's share in the total bearing acreage of sweet cherries in Washington State was 11%, while Bing's share was 53%. The bearing acres of Sweetheart were 4,462 acres in 2017, distributed between two major production regions: 40% in the Columbia Basin and 60% in the Wenatchee Valley (USDA NASS 2017). The free on board (FOB) price of Sweetheart in 2021 was \$1.96/lb. Between 2017 and 2021, the minimum and maximum prices of Sweetheart were \$1.49/lb and \$2.81/lb, respectively. The five-year average FOB price is \$2.03/lb, which is 2% higher than in 2021 (WSTVA 2021).

Study Objectives

The primary use of this report is in identifying inputs, costs, and yields considered typical of well-managed Sweetheart sweet cherry orchards.

This publication is designed to enable growers to estimate (1) the costs of equipment, materials, supplies, and labor required to establish and produce Sweetheart sweet cherries, including packing costs, and (2) the ranges of price and yield at which Sweetheart sweet cherry production would be a profitable enterprise.

Information Sources

The data used in this study were collected from information shared by a group of experienced Sweetheart cherry growers in Washington. Their production practices and input requirements from the baseline assumptions that were used to develop the enterprise budget. Additionally, the data represent what these owner-operators anticipate would occur over an orchard's life, if no unforeseen failures occur. Given that many factors affect production costs, packout, and returns, individual growers can

Table 2. Cost and Returns per Acre of Establishing, Producing and Packing Sweetheart Sweet Cherries on a 12-Acre Block

	Establishment Years					Full Production ^A
	Year 1	Year 2	Year 3	Year 4	Year 5	
Estimated Net Production, Fresh (lb/acre) ^B			1,600.00	8,000.00	14,400.00	19,200.00
FOB Price, Fresh (\$/lb) ^C			2.05	2.05	2.05	2.05
Estimated Net Production, Cull (lb/acre)			400.00	2,000.00	3,600.00	4,800.00
FOB Price, Cull (\$/lb)			0.04	0.04	0.04	0.04
Total Returns (\$/acre)			3,296.00	16,480.00	29,664.00	39,552.00

Variable Costs (\$/acre):

Establishment

Soil Preparation	2,439.52
Trees (including labor)	3,900.00

Orchard Activities

Pruning & Training ^D	108.80	456.96	609.28	783.36	1,218.56	870.40
Green Fruit Thinning ^D	0.00	0.00	0.00	0.00	435.20	435.20
Irrigation Labor ^E	115.05	161.07	161.07	207.09	207.09	207.09
Chemicals ^{E,F}	629.57	1,094.94	1,616.26	1,770.07	1,842.59	1,842.59
Monitoring & Testing ^G	66.00	66.00	206.00	206.00	206.00	228.00
Fertilizer ^{E,F}	84.89	170.00	254.89	284.26	284.26	284.26
Frost Protection (Labor) ^E			17.26	17.26	17.26	17.26
Beehives			114.00	114.00	114.00	114.00
General Farm Labor ^H	225.00	225.00	225.00	225.00	225.00	225.00
Irrigation Water & Electric Charge	275.00	275.00	275.00	275.00	275.00	275.00
Drying Cherries ^I			350.00	350.00	350.00	350.00

Harvest Activities^J

Picking Labor	500.00	2,500.00	4,500.00	6,000.00
Other Labor (checkers, tractor drivers)	100.00	500.00	900.00	1,200.00
Hauling	30.00	150.00	270.00	360.00

Warehouse Packing Charges^K

Maintenance and Repair	1,200.00	6,000.00	10,800.00	14,400.00
Maintenance & Repair	265.00	265.00	300.00	300.00
Fuel & Lube	240.00	270.00	280.00	320.00

Other Variable Costs

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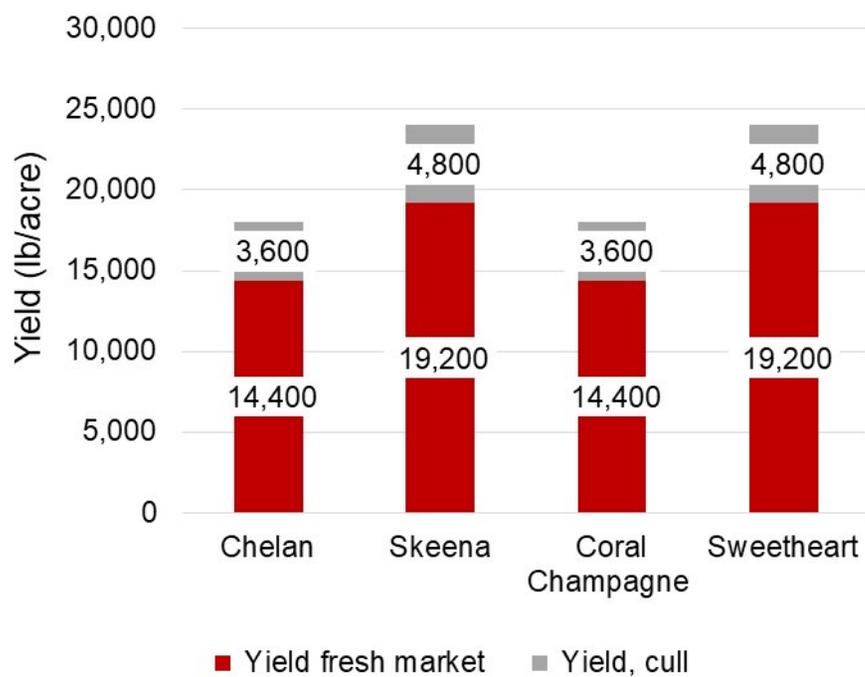


WSU budgets are based on assumptions and data collected from industry

	Chelan	Skeena	Coral Champagne	Sweetheart
Farm size (acre)	300	300	300	300
Productive block size (acre)	12	12	8	12
Gross yield full production (lb/acre)	18,000	24,000	18,000	24,000
Packout (%)	80	80	80	80
FOB price (\$/lb)	2.55	2.35	2.25	2.05
In-row spacing (feet)	6	6	6	10
Bet. row spacing (feet)	12	12	12	16
Root stock	G12	G12	G12	Mazzard
Life of planting (years)	25	25	25	25
Tree density (trees/acre)	605	605	605	272
Trellis system		Vertical trellis		No trellis
Block architecture		Central leader, three dimensional		

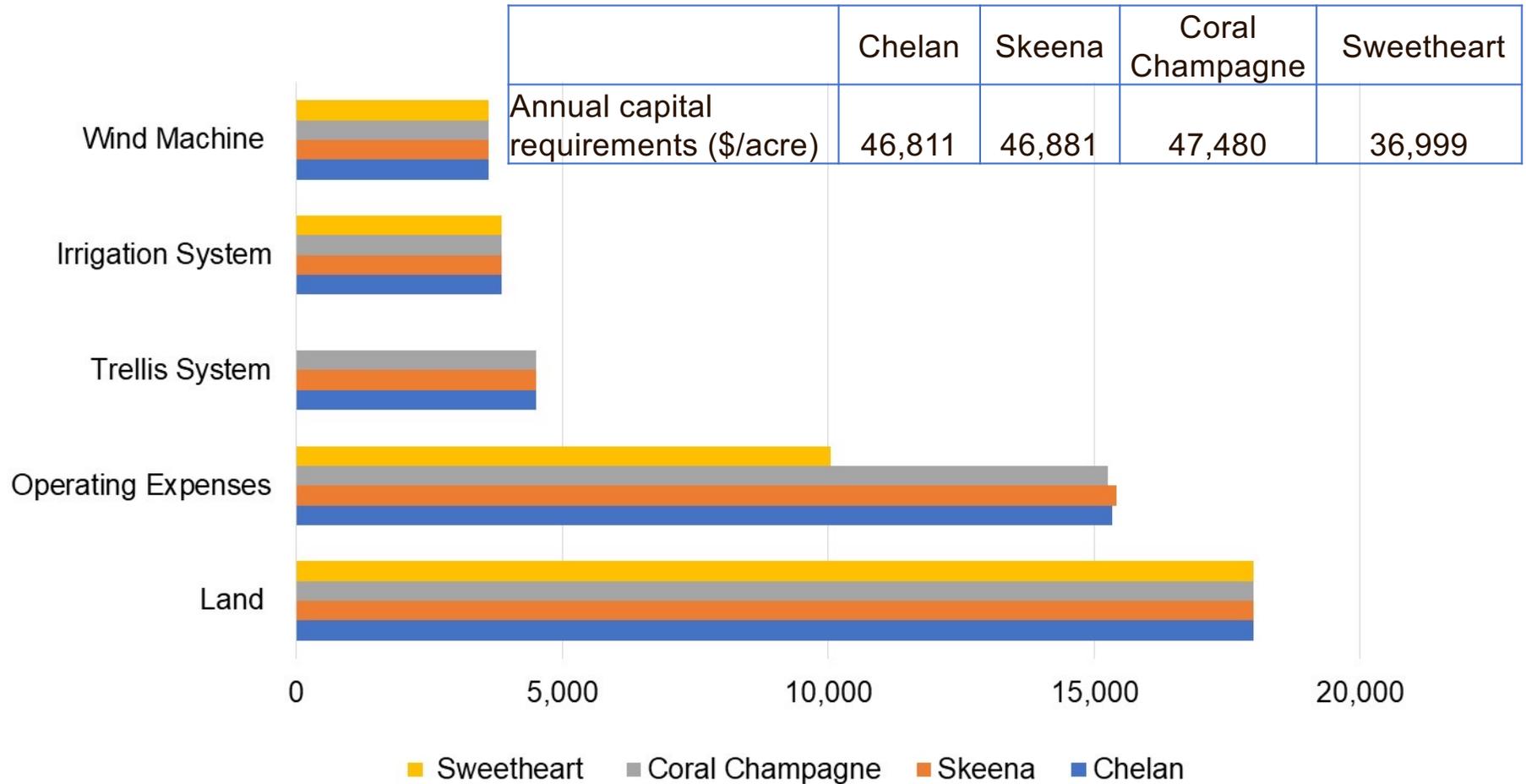


2022 sweet cherry yield and FOB prices during full production



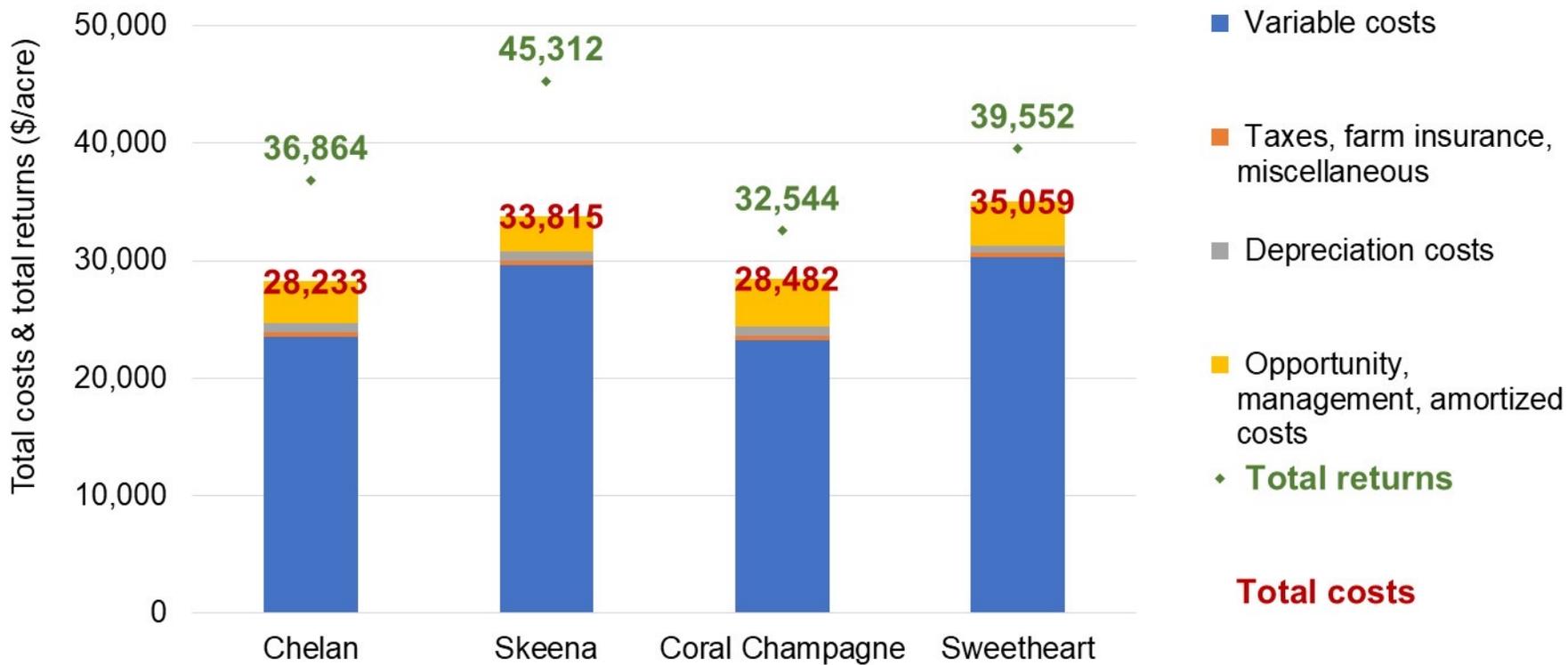


Capital requirements, 2022





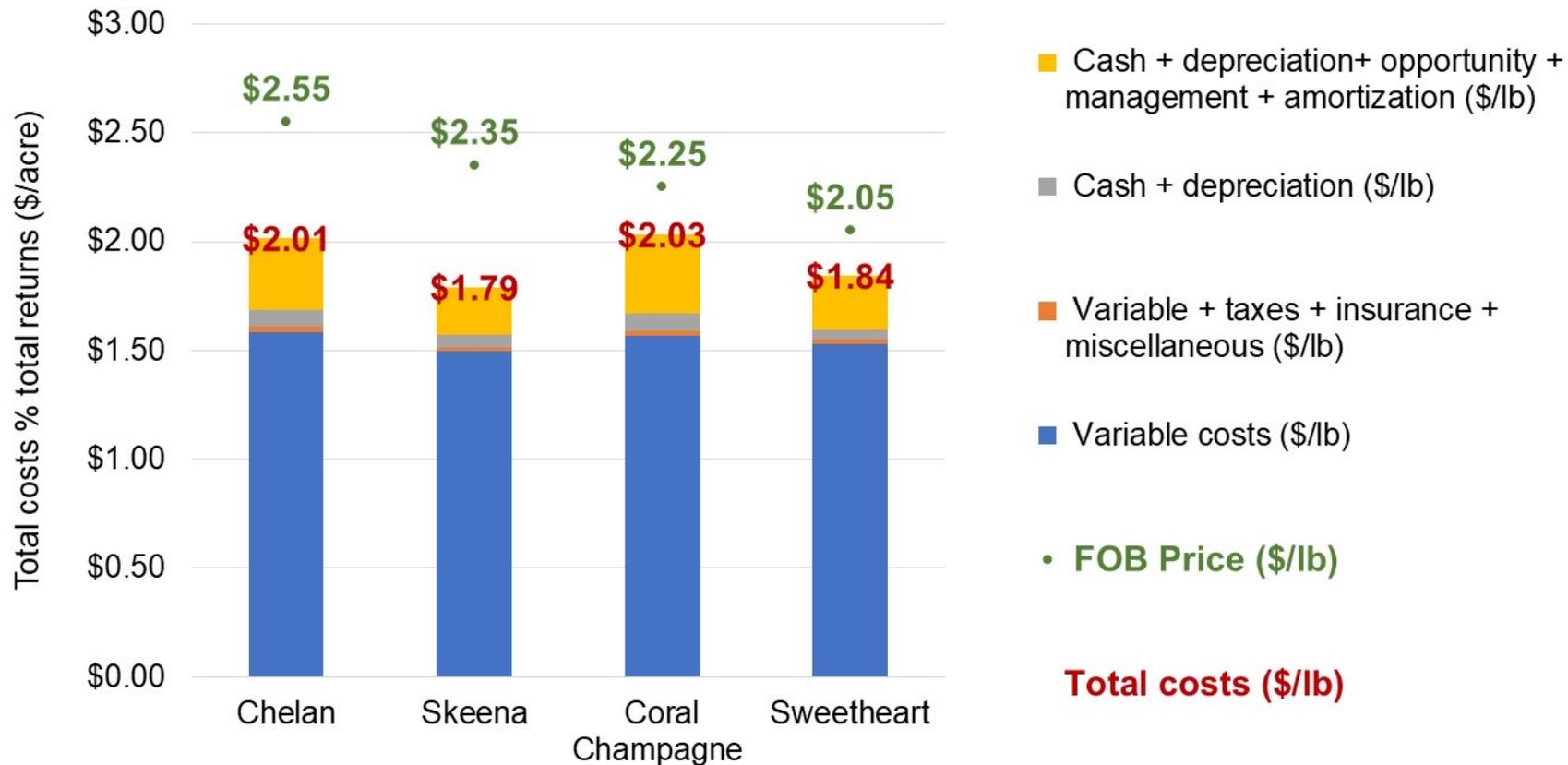
Total returns versus total costs (\$/acre)



Note: Production costs on a full production year.



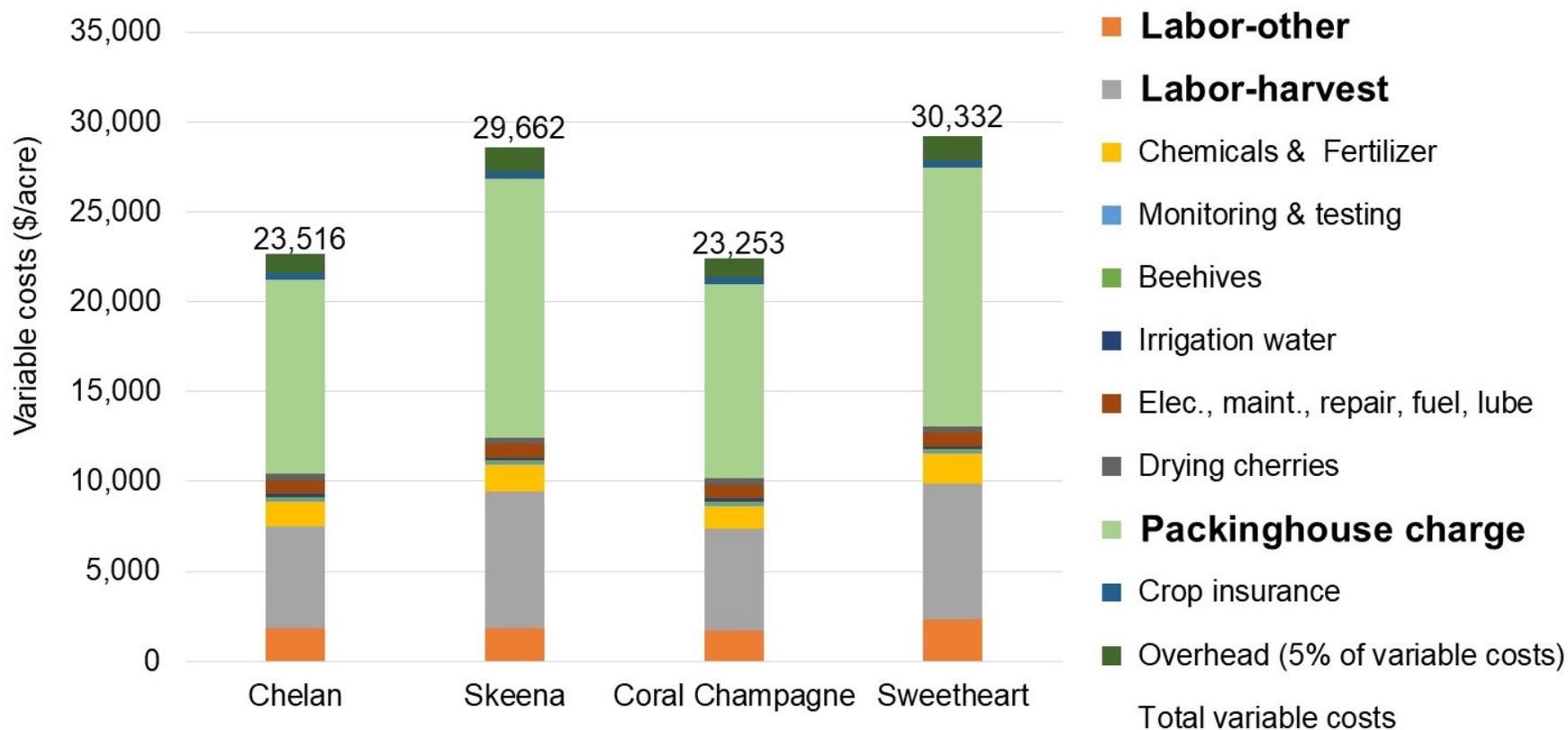
Total returns versus total costs (\$/lb)



Note: Production costs on a full production year.



Variable costs: Labor costs vs. ALL variable costs (including packinghouse charges)



Note: Production costs on a full production year.



Farmers receive the residual price of the supply chain

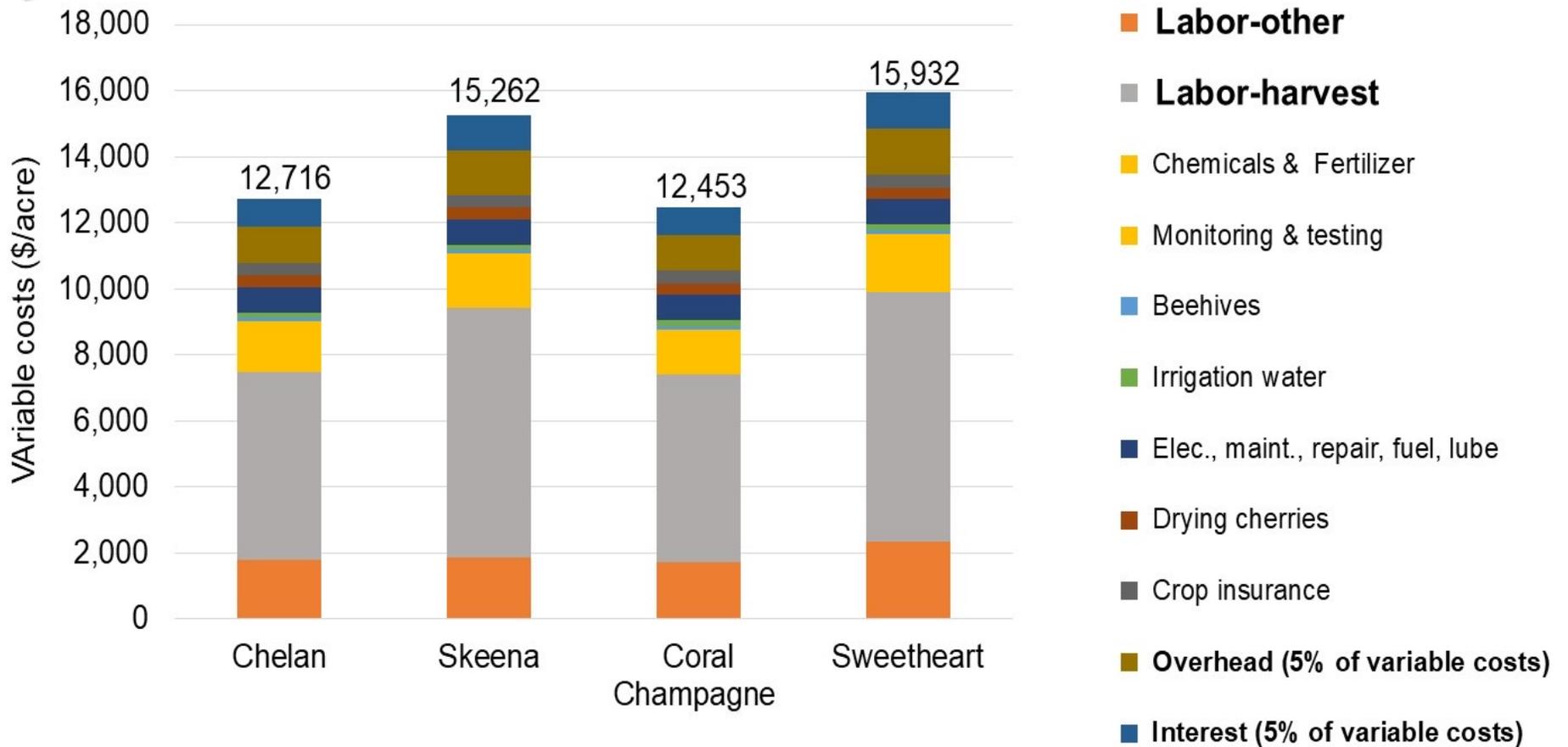
- For every dollar spent by consumers:
 - 15 cents go to the farmer
 - 85 cents go to the supply chain

Source: USDA ERS. 2022.





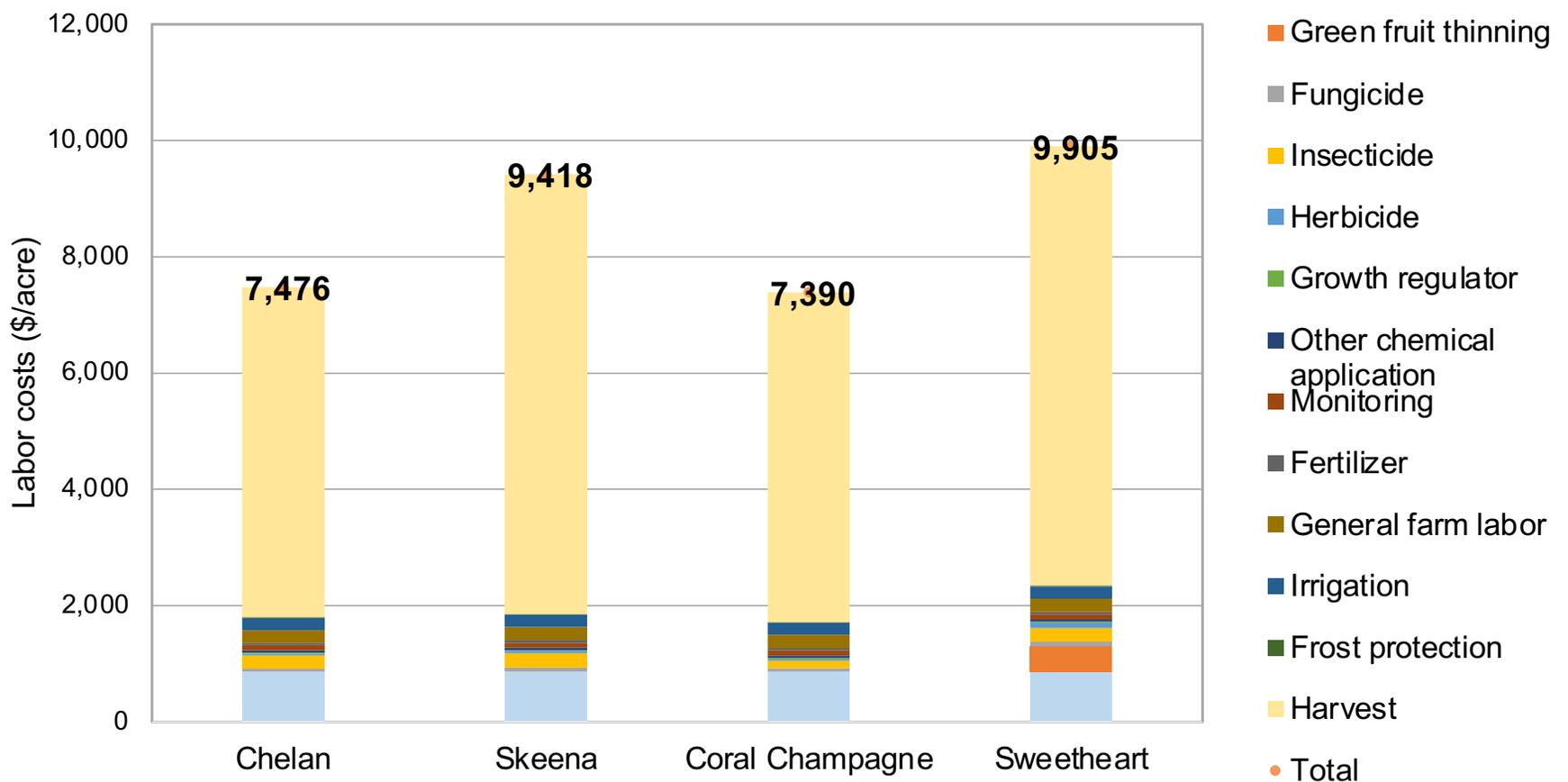
Variable costs: Labor costs vs. ALL variable costs (not including packinghouse charges)





Labor costs in the field only

How are labor costs distributed across different field activities?

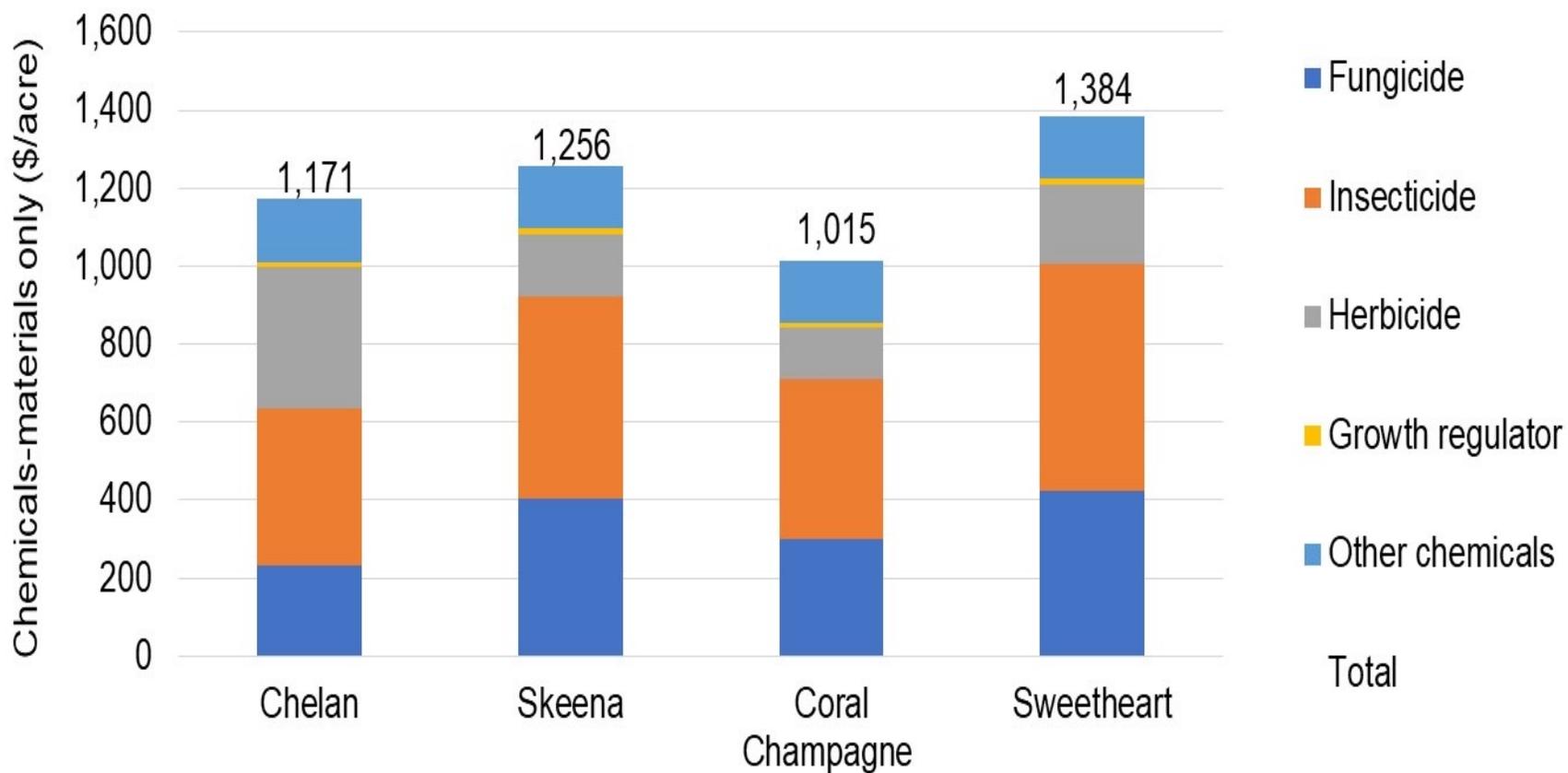


- Pruning and training
- Green fruit thinning
- Fungicide
- Insecticide
- Herbicide
- Growth regulator
- Other chemical application
- Monitoring
- Fertilizer
- General farm labor
- Irrigation
- Frost protection
- Harvest
- Total



Chemical costs

How are chemical costs distributed across different categories?



STUDY on CHERRIES

Why Coordinate Actions among Growers?

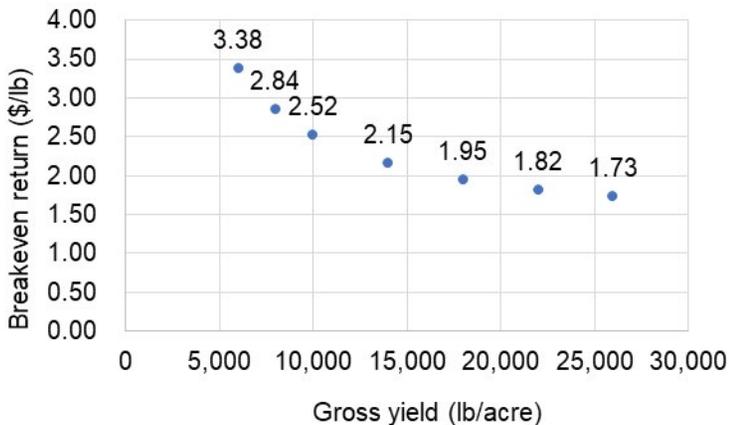
- Given mobility of pests, they are “common property” to neighboring growers
- Coordinating actions can help better manage pest populations across large regions, reducing their numbers and minimizing damage
- Different possible coordinated actions. But for the purpose of this exercise:
 - Involves coordinating pesticide applications (timing and mode of action) among neighboring growers
- This study aims to understand growers' preferences and willingness to cooperate in addressing pest problems



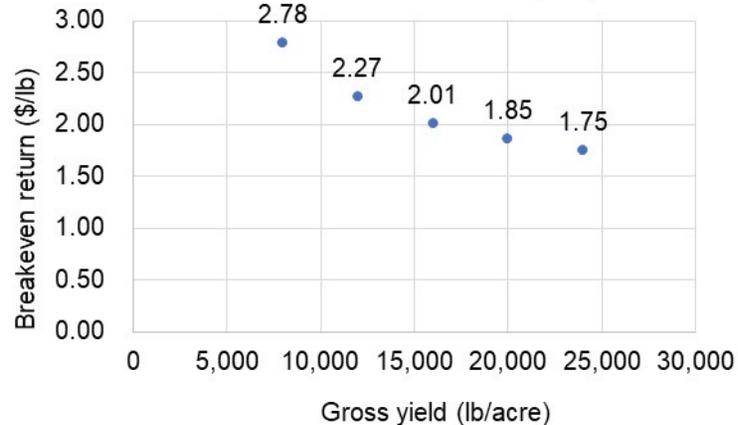


Breakeven prices at different yields

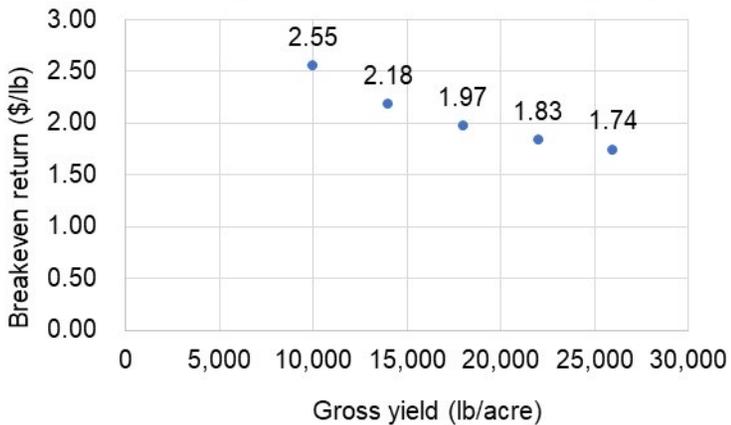
Chelan- Breakeven Return (\$/lb)



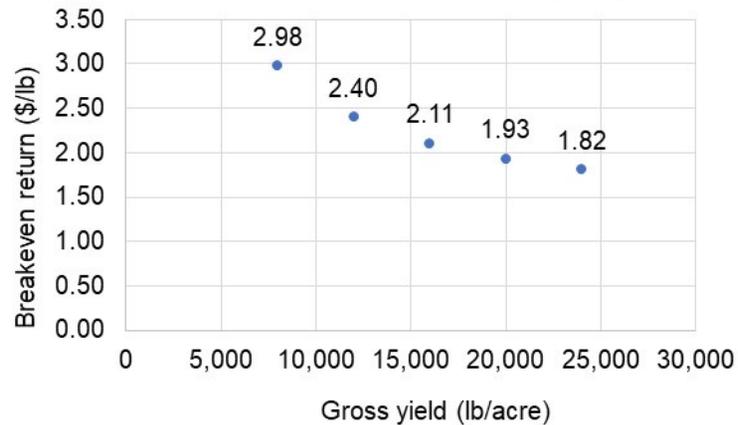
Skeena- Breakeven Return (\$/lb)



Coral Champagne- Breakeven Return (\$/lb)



Sweetheart- Breakeven Return (\$/lb)





Key Take-aways

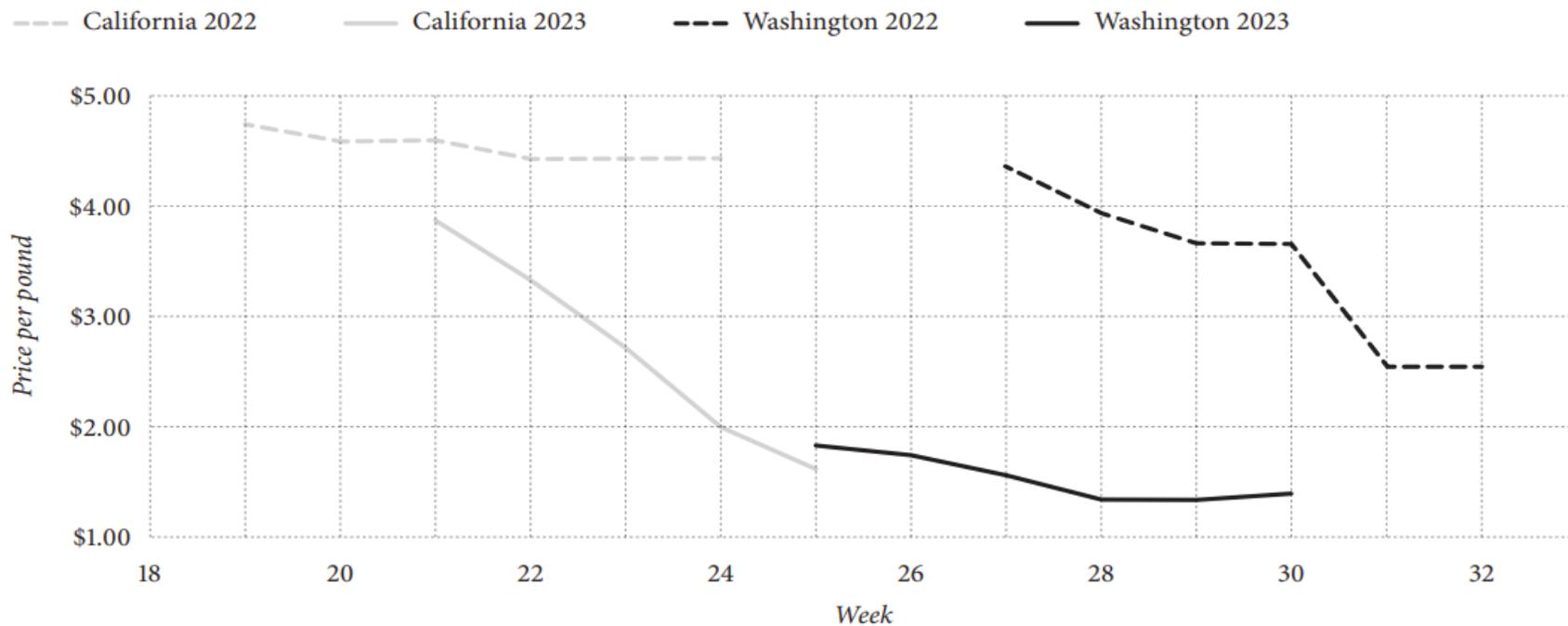
- Based on study assumptions in 2022:
 - Four sweet cherry cultivars are economically profitable.
 - Labor represents 59%-62% of all variable costs (excluding packinghouse charges).
 - Harvest represents 76%-80% of labor costs in the field.



2023 Sweet Cherry Prices and Harvest Decision

Sweet cherry prices during 2023 marketing season:

- ~50% more sweet cherry volume on the domestic market in late June and early July, forcing down producer prices



Source: USDA – AMS Shipping Point Report

Weekly shipping point prices for 10 1/2 row size cherries



Harvest Decision

Questions

1. Harvest?

Harvest costs

- Impacted by volume of production and fruit size.
- Costs = picking + support + hauling + *field sorting*.
 - Field sorting – optional; incurred when % of culls > 20% of total volume





Sweet Cherry Prices and Harvest Decision

Factors in harvest decision:

1. Market price
 - Harvest even when volume of production is low, *if and only if* market price is high enough to cover harvest costs and the packinghouse charges.
2. Expected pack-out percentage (↑ cull % = ↓ returns).
3. Size of the cherry



Photo credit:
TJ Mullinax,
Good Fruit Grower

Harvest Decision: Assumptions

Harvest and packing costs	Cost (\$/lb)
Harvest labor	
Picking	0.30
Other labor (checkers, tractor, drivers)	0.05
Hauling	0.015
Sorting in the field (only when the cull % exceeds 20%)	0.0225
Packinghouse charges	0.60

Sweet cherry variety	Gross yield (lb/acre) Yield before packout	FOB price (\$/lb) (as of 2022, before packing charges are subtracted)
Chelan	16,000	4.59
Bing	15,000	3.46
Sweetheart	24,000	2.61



Sensitivity Analyses – 4 variables

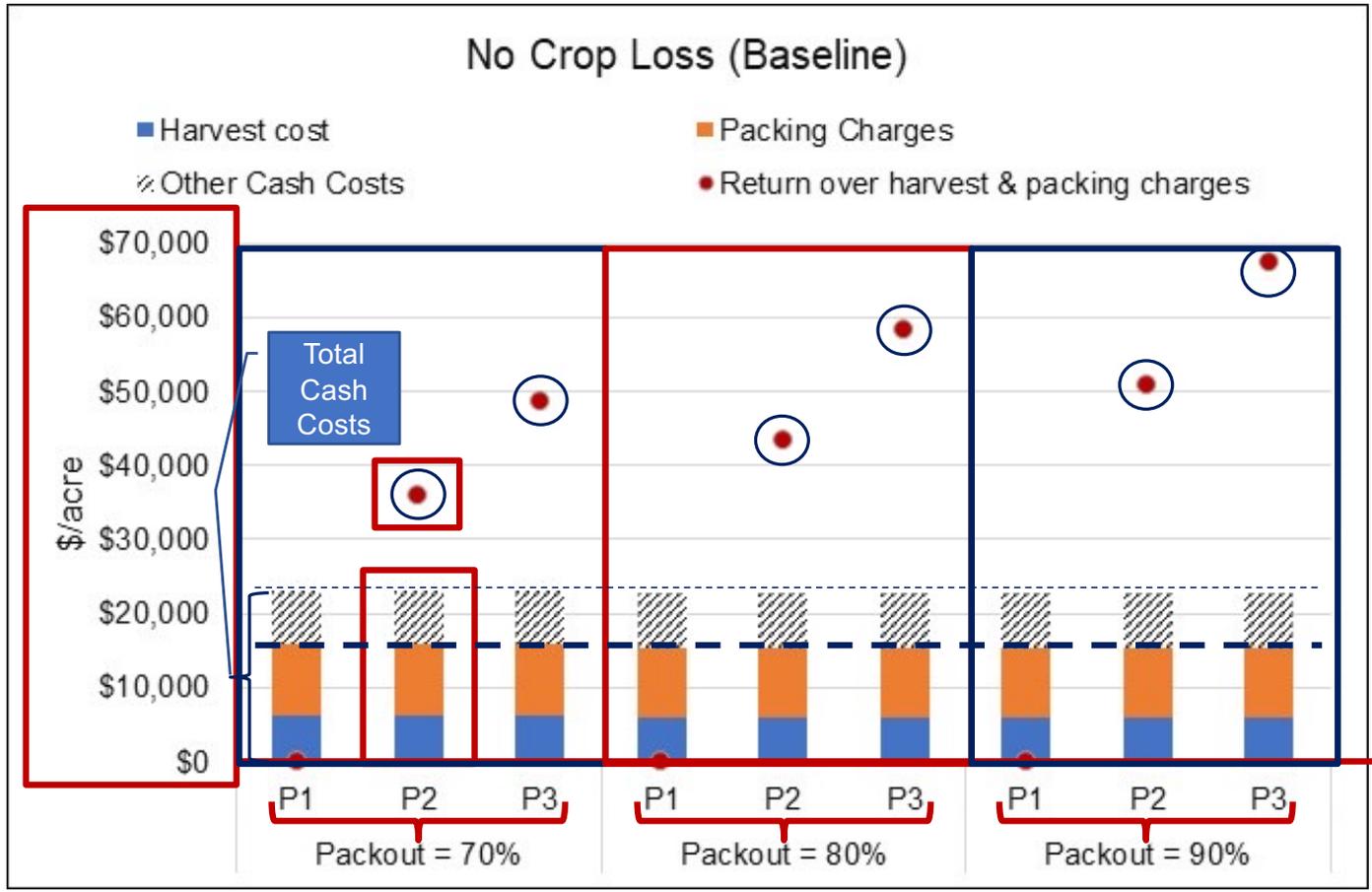
Variables	Baseline		Alternative scenarios	
			Low	High
FOB price	Chelan	\$4.59 /lb	80% lower than baseline	25% higher than baseline
	Bing	\$3.46 /lb		
	Sweetheart	\$2.61 /lb		
Crop loss in the field	No loss		60%	40%
Packout %	80%		70%	90%
Sorting cost	None		Sorting labor cost x gross yield	None





Chelan

Estimated harvest cost, packing charges and returns given crop loss %, packout % and FOB prices (P)



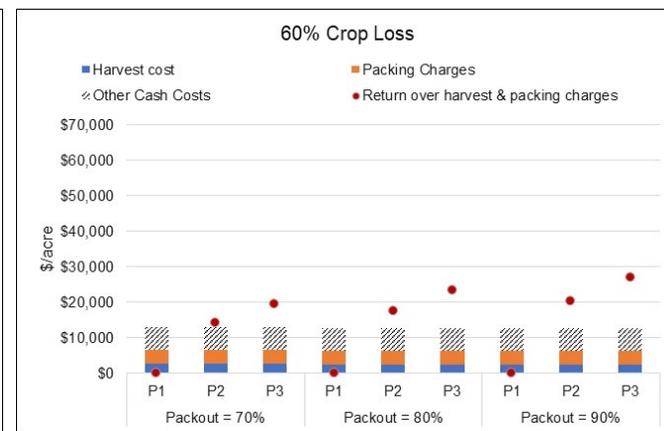
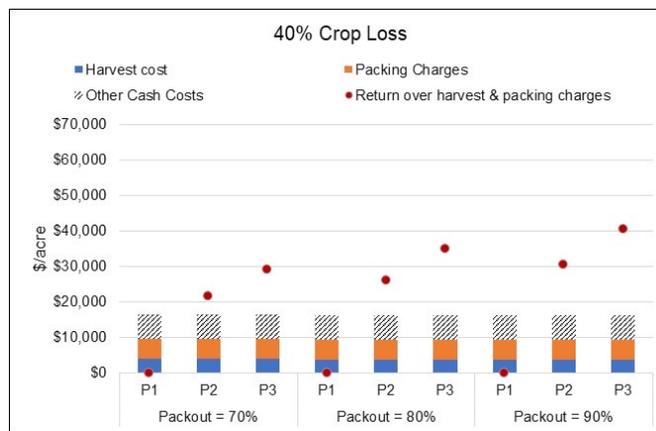
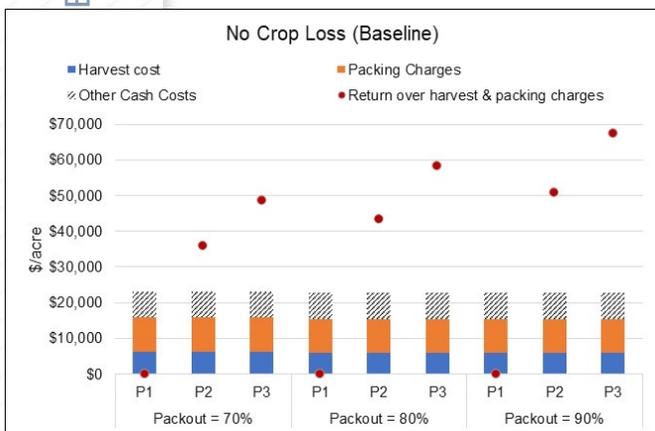
FOB price
 At P1 = Total returns **equal**
 (harvest + packing costs)
 P2 = Base
 P3 = High (Base + 20%)

FOB price (\$/lb)
 P1 = Breakeven
 • 70% packout = \$1.39
 • 80% and 90% = \$1.20
 P2 = \$4.59 (Base)
 P3 = \$5.74 (High)



Chelan

Estimated harvest cost, packing charges and returns given different in-field crop loss %, packout % and FOB prices (P)



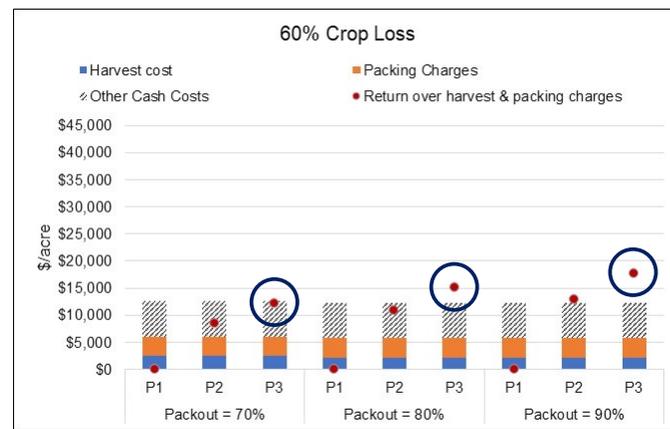
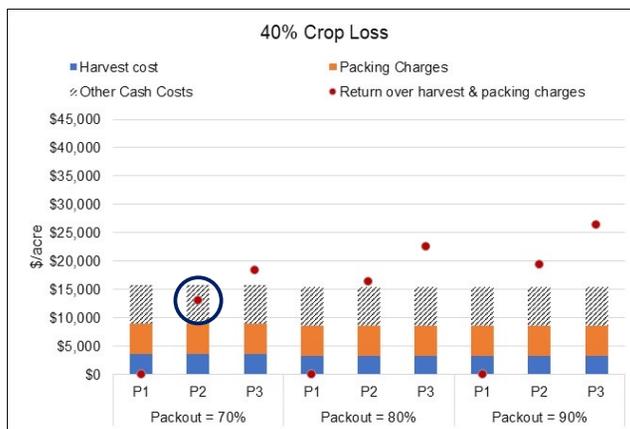
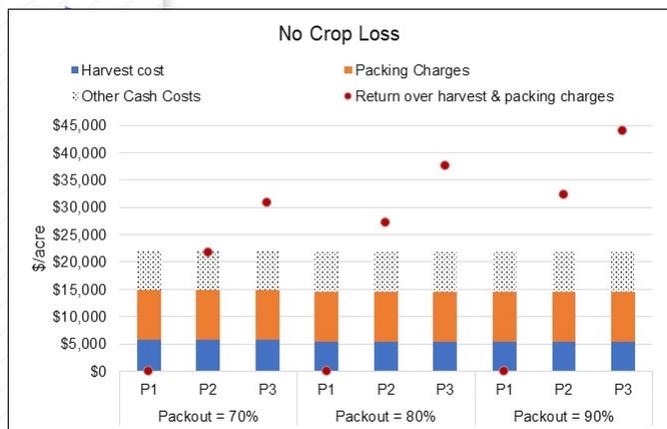
FOB price: $P1_{70\%} = \$1.39$ or $P1_{other} = \$1.20$ (BE), $P2 = \$4.59$ (Base), $P3 = \$5.74$ (High)

- Harvest and packing costs are directly related to gross yield: Gross yield ↓ ⇒ Costs ↓ and Returns ↓.
- Scenarios of 40% and 60% crop loss:
 - Harvest and packing costs, & Other cash costs < Baseline; Returns < Baseline.
 - All cash costs are covered when price = P2 and P3.
 - Negative returns when price < P1 ⇒ harvest is not viable (same as baseline).



Bing

Estimated harvest cost, packing charges and returns given different in-field crop loss %, packout % and FOB prices (P)



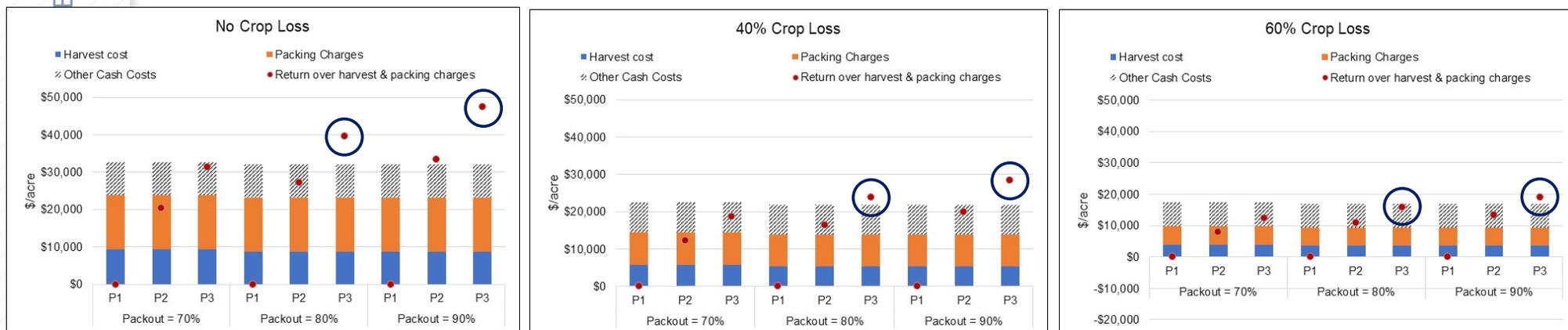
FOB price: : P1_{70%} = \$1.39 or P1_{other} = \$1.20 (BE), P2 = \$3.46 (Base), P3 = \$4.33 (High)

- Gross yield ↓ ⇒ Costs ↓ and Returns ↓.
- Both scenarios of 40% and 60% crop loss:
 - Harvest and packing costs, & Other cash costs < Baseline; Returns < Baseline.
 - Negative returns when price < P1 ⇒ harvest is not viable (same as baseline).
- At 40% crop loss: All cash costs covered at P2 and P3, except at 70% packout.
- At 60% crop loss: In all packout scenarios, all cash costs are covered only when price = P3.



Sweetheart

Estimated harvest cost, packing charges and returns given different in-field crop loss %, packout % and FOB prices (P)



FOB price: $P1_{70\%} = \$1.39$ or $P1_{other} = \$1.42$ (BE), $P2 = \$2.61$ (Base), $P3 = \$3.26$ (High)

- Gross yield $\downarrow \Rightarrow$ Costs \downarrow and Returns \downarrow .
- \uparrow Crop loss \Rightarrow Harvest and packing costs $<$ Baseline; Returns $<$ Baseline.
- All crop loss scenarios: All cash costs are covered at P3, except when packout is 70%.
- Negative returns when price $<$ P1. \Rightarrow *Harvest is not viable.*



Key Take-aways

- How do harvest costs change when production level changes?
 - Harvest costs = directly related to gross yield, so when gross yield decreases (i.e., crop loss), the costs decrease as well.
 - Harvest costs slightly higher when expected packout = 70% due to in-field sorting.
 - When crop loss increases = harvest and packing costs are lower than baseline (no crop loss); and the returns too!



Photo credit: Marieke Hemmes, Fresh Plaza (May 16, 2024)



Key Take-aways

- When is it economically feasible to harvest?
 - Combination of factors = market price, expected packout, and fruit size & crop yield.
 - **Market price = important.** → Harvest **only if** price is enough to cover harvest labor cost and packinghouse charges.
 - All scenarios, harvest is not viable when:
 - FOB price is below breakeven price.
 - Packout is 70%.
 - Returns enough to cover harvest and packinghouse charges are important **but** must also cover other cash costs to be economically viable in the short run.

Acknowledgments

- Anonymous sweet cherry growers and packinghouse owners-operators, pesticide consultants, and WSU Extension.
- *Funding:*
 - USDA-NIFA-SCRI: “Moving from crisis response to long-term integrated management of SWD: A keystone pest of fruit crops in the United States” (2020-51181-32140).
 - USDA Risk Management Agency project, “Crop Sensitivity Analyses”.



Photo credit: TJ Mullinax, Good Fruit Grower





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Webpage:

https://ses.wsu.edu/enterprise_budgets/



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