



Hops cost of production



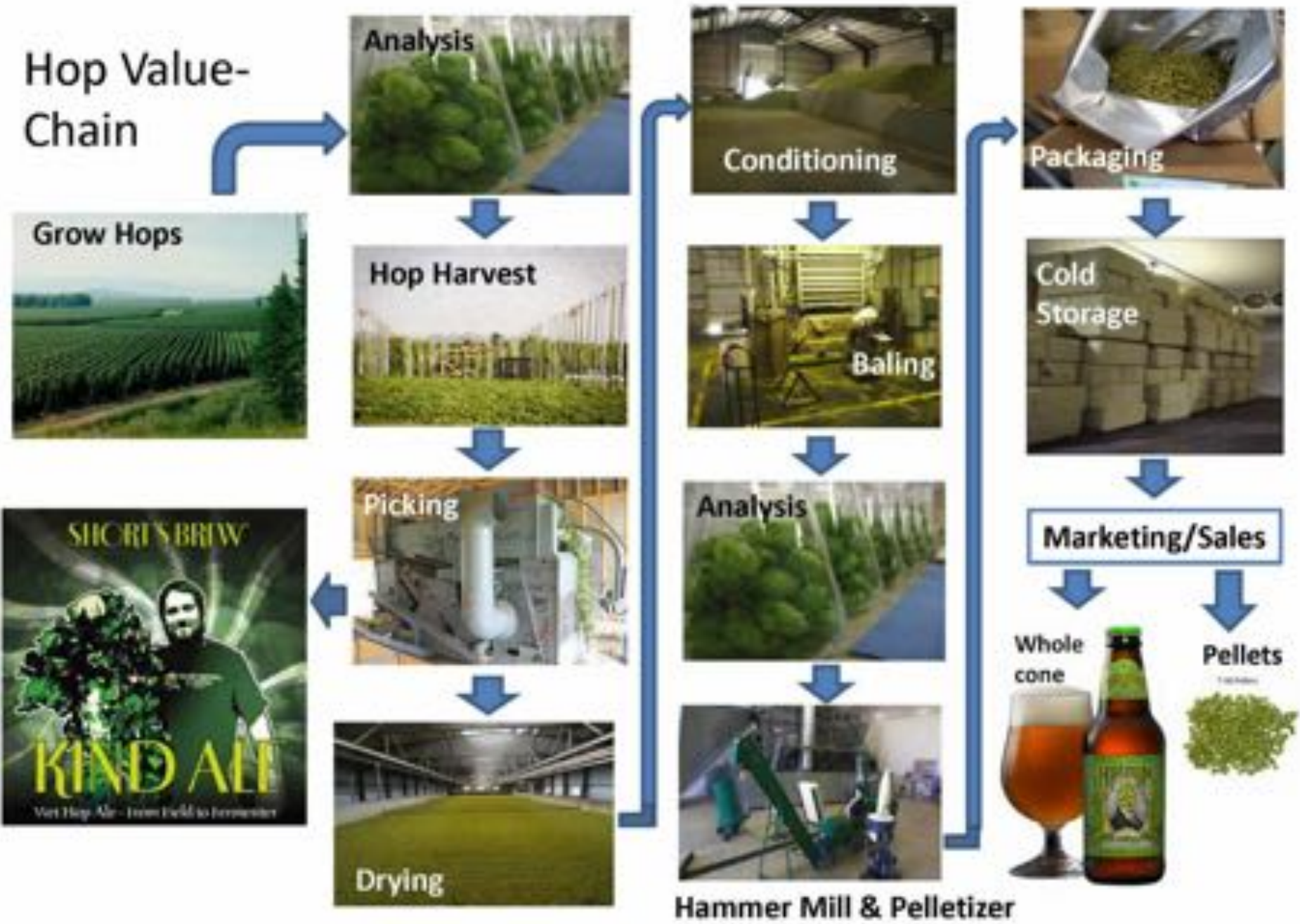
Great Lakes Hop & Barley Conference
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Hop Value-Chain



Considerations

- Scale
- Efficiencies
 - Can you do it all?
 - grow->sales?
 - Should you do it all?



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HOP FINDER

Newly updated versions released November 2016! The following Hop Enterprise Budgets have been developed by Michigan State University and the University of Vermont!

NEWS & MEDIA

[5 Acre Hop Enterprise Budget](#)[10 Acre Hop Enterprise Budget](#)[20 Acre Hop Enterprise Budget](#)

GROWER TOOLS

RESEARCH &
TECHNICAL

The "2015 Estimated Cost of Establishing and Producing Hops in the Pacific Northwest" published by Washington State University, is available below. This version is marked "draft", however, it is the final version.

INFO HUB

[2015 Hop Enterprise Budget](#)[2015 PNW Hop Production Cost Study Workbook](#)

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2016 Enterprise Budget for Small-Scale Hop Producers (5 acres)

Author: J Robert Harris, Michigan State University Extension, John Fox, University of Illinois, Dan Wilson, Oregon State

Instructions

- This spreadsheet is designed to help prospective hop producers estimate costs and returns for producing hops under two different scenarios.
Model 1: Producer grows hops only (pays for custom harvest, drying, baling, processing, marketing and sales).
Model 2: Producer grows, harvests, dries, and bales hops for custom processing, marketing and sales.
- The information in this publication serves as a general guide for a medium and well managed hop farm as of 2016. To avoid unwarranted conclusions for any particular operation, closely examine the assumptions used. If they are not appropriate for your situation, adjust the costs and/or returns as appropriate.
Example 1: App. C Equipment includes the price of a tractor (\$20,000, cell D6). If a tractor is not required, clear the cell and the baseline will adjust.
Example 2: If a hop producer receives more than \$100/lb for hops, she/he can modify the \$/lb (Row 3 for Model 1 & 2).

Assumptions**Model 1: Cash Flow-Growing Only**

Figures represent estimated costs and returns for a 5-acre hopyard where a producer grows hops only (Cash Flow-growing only tab).
Producer pays for custom harvest, drying, baling, and cold storage (\$1,000/lb).
Custom harvest and processor are located at the same location.

Model 2: Cash Flow-Grow + Harvest + Dry + Bale

Figures represent estimated costs and returns for a 5-acre hopyard where a producer grows, harvests, dries, and bales (Cash Flow-grow+harvest+dry+bale tab).

Model 1 & Model 2

Capital Purchases and Labor are paid for through a 4.2% interest loan amortized over 3 years (See Appendix O).
Capital Purchases, Labor, Annual Input, Loan Payments, & Farm Overhead amounts will vary by farm and should be adjusted accordingly.
Transportation costs will vary.
Producer pays for custom processing and packaging (\$1,500/lb).
Producer pays 10% of purchase price for marketing and sales.
Yield (Baled-dried hops (10% moisture), lb: 1-1,000; 2-1,100; 3-1,000; 4-1,400; 5-1,800. Yield will vary by variety and farm).
1 acre of hops = 100 hop plants (in row spacing = 3.3 ft. Between row spacing = 14 ft.).
5 acres of hops will require more than 2 acres of land to usually allow 1 ft. acre of land to produce 1 acre of hops.
Infrastructure (gates, ditches, etc.) and associated costs will vary and depend upon hopyard dimensions.
Price of dried, pelleted, and packaged hops = \$/lb from a broker. Actual \$/lb will likely vary.
Equipment purchase will vary by farm, but if a producer already owns a tractor and sprayer they can eliminate cells D4 and D5 in App. C Equipment.
Build out Labor (Appendix B) is hired out to a company @ \$20/hour/person.

Instructions and assumptions

Cash Flow-growing only

Cash Flow-grow+harvest+dry+bale

App. A -Old Out Infrastructure

App. B -Buildout Labor

App. C-Equipment

App. D-

5 ACRE HOP YARD (GROW ONLY)

Authors: J Robert Simon, Michigan State University Extension; Julian Post, University of Vermont

This document is intended to serve as a tool for producers interested in growing hops. Figures below are estimates based on survey data from small-scale growers in multiple states. Your figures will likely vary; you should add figures that accurately represent your operation. While this document has been vetted by several experts within the hop industry, you may need to add additional rows to account for unintended omissions.

Item	Year 1 (2016)	Year 2 (2017)	Year 3 (2018)	Year 4 (2019)	Year 5 (2020)	Years 1-5
Income						
Dried Hop Pellets (lbs./acre)		1300	1500	1600	1800	
price	\$	\$	\$	\$	\$	
\$/lb.	10	10	10	10	10	
GROSS INCOME	\$ -	\$ 55,000	\$ 75,000	\$ 80,000	\$ 90,000	\$ 300,000
Expenses						
Capital Purchase/Labor						
Irrigated Infrastructure (Appendix A)	\$ 65,100					
Buildout Labor (Appendix B)	\$ 24,800					
Equipment (Appendix C)	\$ 46,000					
Sub-Total Capital Purchase & Labor (accounted for in loan- roll B41)	\$ 136,100	\$ -	\$ -	\$ -	\$ -	\$ 136,100
Annual Expenses-Field						
Twine (2000 pre-cut 22' strings/bale-\$400. -50.17/string)		\$ 1,632	\$ 1,632	\$ 1,632	\$ 1,632	
Labor Stringing - (11.5 worker hrs/ac x \$30/hr) \$340/ac		\$ 1,700	\$ 1,700	\$ 1,700	\$ 1,700	\$160/acre
Labor- Training (\$150/acre) *variety dependent		\$ 750	\$ 750	\$ 750	\$ 750	
Fertilizer & leaf feed (N,P,K,S,Zn,B, etc.) yr 1=\$400/ac, yr 2=\$650/ac	\$ 1,000	\$ 3,250	\$ 3,250	\$ 3,250	\$ 3,250	
Chemicals (all pesticides) yr 1= \$500/ac, yr 2=\$750/ac	\$ 1,000	\$ 1,750	\$ 1,750	\$ 1,750	\$ 1,750	
Labor- Spraying (\$30/hr x .3 hrs/ac). Yr 1=12, yr 2=20 sprays	\$ 360	\$ 900	\$ 900	\$ 900	\$ 900	
Labor- Field Harvest (\$300/ac)		\$ 4,500	\$ 4,500	\$ 4,500	\$ 4,500	
Drinking (\$120/ac)	\$ 1,200	\$ 1,200	\$ 1,200	\$ 1,200	\$ 1,200	
Tractor Fuel & Oil (gasoline, diesel, propane, etc.) \$150/ac	\$ 750	\$ 750	\$ 750	\$ 750	\$ 750	
Parts/Repairs (equipment, irrigation, etc.) Yr 1=\$200/ac, yr 2=\$400/ac	\$ 1,000	\$ 2,000	\$ 2,000	\$ 2,000	\$ 2,000	
Sub-Total Annual Expenses- Field	\$ 6,670	\$ 26,812	\$ 26,812	\$ 26,812	\$ 26,812	\$ 86,718
Annual Expenses-Harvest & Post Harvest						

Parts/Repairs (equipment, irrigation, etc.) Yr 1-\$200/ac, yr 2-\$400/ac	\$ 1,000	\$ 2,000	\$ 2,000	\$ 2,000	\$ 2,000	\$ 2,000	
Sub-Total Annual Expenses- Field	\$ 8,878	\$ 28,002	\$ 28,002	\$ 28,002	\$ 28,002	\$ 28,002	\$ 88,128
Annual Expenses-Harvest & Post Harvest							
Transport to custom harvest & processing facility (variable)		\$ 2,000	\$ 2,000	\$ 2,071	\$ 2,000	\$ 2,000	\$ 9,121
Harvest/Drying/Baling \$3/lb		\$ 14,500	\$ 22,500	\$ 24,000	\$ 24,000	\$ 27,000	\$80,000
Processing \$1.50/lb		\$ 8,250	\$ 11,250	\$ 12,000	\$ 12,000	\$ 13,500	\$45,000
High Quality Analysis \$125/sample		\$ 1,250	\$ 1,250	\$ 1,250	\$ 1,250	\$ 1,250	\$ 5,000
Marketing & Sales (10% of purchase price)		\$ 1,500	\$ 7,500	\$ 8,000	\$ 8,000	\$ 9,000	\$30,000
Sub-Total Annual Expenses -Harvest & Post Harvest	\$ -	\$ 33,500	\$ 44,750	\$ 47,321	\$ 53,250	\$ 62,750	\$ 179,121
Annual Expenses- Loan (annual payment)							
Loan Detail (Appendix D)	\$ 31,938	\$ 31,938	\$ 31,938	\$ 31,938	\$ 31,938	\$ 31,938	\$ 191,628
Sub-Total Annual Expenses- Loan	\$ 31,938	\$ 31,938	\$ 31,938	\$ 31,938	\$ 31,938	\$ 31,938	\$ 191,628
TOTAL DIRECT COSTS							
Direct \$/acre (not including loan)	\$ 1,614	\$ 18,702	\$ 22,492	\$ 23,327	\$ 24,652	\$ 24,652	\$ 83,489
Annual Expenses - Farm Overhead							
Farm Supervisory Cost (\$20/yr)	\$ 4,000.00	\$ 4,000.00	\$ 4,000.00	\$ 4,000.00	\$ 4,000.00	\$ 4,000.00	
Utilities	\$ 400	\$ 400	\$ 400	\$ 400	\$ 400	\$ 400	
Land lease rate \$200/ac	\$ 1,000	\$ 1,000	\$ 1,000	\$ 1,000	\$ 1,000	\$ 1,000	
Property Taxes	\$ 1,400	\$ 1,400	\$ 1,400	\$ 1,400	\$ 1,400	\$ 1,400	
Insurance (Appendix E)	\$ 80	\$ 83	\$ 70	\$ 70	\$ 80	\$ 80	\$ 2,850
Unanticipated Expenses (Appendix F)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
TOTAL FARM OVERHEAD	\$ 6,880	\$ 7,743	\$ 7,800	\$ 7,870	\$ 8,640	\$ 8,640	\$ 42,850
TOTAL EXPENSES	\$ 50,858	\$ 93,195	\$ 104,625	\$ 107,545	\$ 113,260	\$ 113,260	\$ 469,483
Income-Expenses							
NET INCOME	\$ (50,858)	\$ (38,195)	\$ (29,625)	\$ (27,545)	\$ (23,260)	\$ (23,260)	\$ (169,483)

80	Property Taxes	\$ 1,400	\$ 1,400	\$ 1,400	\$ 1,400	\$ 1,400	
81	Insurance (Appendix E)	\$ 50	\$ 545	\$ 725	\$ 770	\$ 860	\$ 2,950
82	Unanticipated Expenses (Appendix F)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
83	TOTAL FARM OVERHEAD	\$ 14,850	\$ 1,745	\$ 1,925	\$ 1,970	\$ 2,040	\$ 42,883
84							
85	TOTAL EXPENSES	\$ 50,858	\$ 93,195	\$ 104,625	\$ 107,545	\$ 113,260	\$ 469,483
86							
87	Income-Expenses						
88							
89	NET INCOME	\$ (50,858)	\$ (38,195)	\$ (29,625)	\$ (27,545)	\$ (23,260)	\$ (169,483)
90							

91	NET INCOME/ ACRE under different B-1a and B-1b scenarios (per B)						
92			Price/¢				
93	Yield (Bt/acre)	\$4.00	\$6.00	\$10.00	\$12.00	\$14.00	
94	800	\$ (17,852)	\$ (16,252)	\$ (14,652)	\$ (13,052)	\$ (11,452)	
95	1000	\$ (16,852)	\$ (14,652)	\$ (12,652)	\$ (10,652)	\$ (8,652)	
96	1200	\$ (15,852)	\$ (13,652)	\$ (11,652)	\$ (9,652)	\$ (7,652)	
97	1400	\$ (14,852)	\$ (12,652)	\$ (9,652)	\$ (7,652)	\$ (5,652)	
98	1600	\$ (13,852)	\$ (9,652)	\$ (6,652)	\$ (4,652)	\$ (2,652)	
99	1800	\$ (11,852)	\$ (6,252)	\$ (3,652)	\$ (1,652)	\$ 2,348	
100	2000	\$ (9,852)	\$ (3,652)	\$ (652)	\$ 1,348	\$ 1,348	
101	2200	\$ (7,852)	\$ (652)	\$ (652)	\$ 1,348	\$ 2,348	

5 ACRE HOP YARD (GROW, HARVEST, DRY, BALE, STORE)

Authors: J. Robert Smith, Manager (State University Extension); John Post, University of Vermont; Alexander Adams, Vermont Hop Farm.

This document is intended to serve as a tool for producers interested in growing hops. Figures below are estimates based on survey data from small-scale growers in multiple states. Your figures will likely vary; you should add figures that accurately represent your operation. While this document has been vetted by several experts within the hop industry, you may need to add additional rows to account for unintended commissions.

Item	Year 1 (2014)	Year 2 (2017)	Year 3 (2018)	Year 4 (2019)	Year 5 (2020)	Years 1-5
Income						
Dried Hop Pellets (lbs./acre)	0	1100	1500	1600	1800	
acres	5	5	5	5	5	
\$/lb.	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	
GROSS INCOME	\$ -	\$ 55,000	\$ 75,000	\$ 80,000	\$ 90,000	\$ 300,000
Expenses						
Capital Purchase & Labor						
Hopped Infrastructure (Appendix A)	\$ 85,140					
Buildout Labor (Appendix B)	\$ 24,880					
Equipment (Appendix C)	\$ 97,000					
Sub-Total Capital Purchase & Labor (accounted for in loan- call B45)	\$ 187,020	\$ -	\$ -	\$ -	\$ -	\$ 187,020
Annual Expenses- Field						
Twine (2400 pre-cut 22' strings/bale=\$400, ~\$0.17/string)		\$ 1,632	\$ 1,632	\$ 1,632	\$ 1,632	
Labor-Stringing ~(11.5 worker hrs/ac x \$30/hr)		\$ 1,700	\$ 1,700	\$ 1,700	\$ 1,700	-\$140/acre
Labor- Training (\$150/acre) *variety dependent		\$ 750	\$ 750	\$ 750	\$ 750	
Fertilizer & leaf feed (N,P,K,S,2n,B, etc.) yr 1=\$400/ac, yr 2+=\$450/ac	\$ 2,000	\$ 2,250	\$ 2,250	\$ 2,250	\$ 2,250	
Chemicals (all pesticides) yr 1= \$500/ac, yr 2+=\$750/ac	\$ 2,500	\$ 2,750	\$ 2,750	\$ 2,750	\$ 2,750	
Labor- Spraying (\$30/hr x 3 hrs/acre) Yr 1=12, yr 2+=20 sprays	\$ 540	\$ 900	\$ 900	\$ 900	\$ 900	
Labor- Field Harvest (\$800/ac)		\$ 4,000	\$ 4,000	\$ 4,000	\$ 4,000	
Dixing (\$128/ac)	\$ 1,280	\$ 1,280	\$ 1,280	\$ 1,280	\$ 1,280	
Tractor Fuel & Oil (gasoline, diesel, propane, etc.) (\$150/ac)	\$ 750	\$ 750	\$ 750	\$ 750	\$ 750	
Parts/Repairs (equipment, irrigation, etc.) Yr 1=\$200/ac, yr 2=\$400/ac	\$ 1,000	\$ 2,000	\$ 2,000	\$ 2,000	\$ 2,000	
Sub-Total Annual Expenses- Field	\$ 8,670	\$ 20,012	\$ 20,012	\$ 20,012	\$ 20,012	\$ 88,110

Pulling Machine Operation Labor (\$12/hr x 7 people=84\$/hr; 1400 hours/acre x 2 strings/acre=1120 hours; 1120 hours/acre @120\$/hour=134,400)	\$	1,940	\$	1,940	\$	1,940	\$	1,940			
Pulling machine electricity	\$	-	\$	-	\$	-	\$	-	PTC-eligible		
Gas Fuel (diesel/acre) - \$200/200gal	\$	1,000	\$	1,125	\$	1,200	\$	1,250			
Gas Labor (\$ 12 hr/acre; \$12/hr)	\$	480	\$	480	\$	440	\$	500			
Salting Labor (\$12/hr; 3- 1000lb. bags/acre)	\$	300	\$	300	\$	300	\$	300			
Transport labor to custom pellet facility (variable based on mileage, fuel, truck capacity)	\$	1,500	\$	1,600	\$	1,600	\$	1,600	4,000		
Custom Processing (pelletizer, package) \$1.50/lb	\$	9,210	\$	11,250	\$	12,000	\$	12,000	40,000		
High Quality Analysis \$125/sample	\$	1,250	\$	1,250	\$	1,250	\$	1,250	5,000		
Marketing & Sales (10% of purchase price)	\$	5,000	\$	7,500	\$	8,000	\$	9,000	30,000		
Sub Total Annual Expenses: Harvest & Post Harvest	\$	-	\$	21,440	\$	21,540	\$	26,870	\$	21,730	109,500
Loan Detail (Appendix D)	\$	43,913	\$	43,913	\$	43,913	\$	43,913	\$	43,913	219,560
Sub Total Annual Expenses Loan	\$	43,913	\$	43,913	\$	43,913	\$	43,913	\$	43,913	219,560
TOTAL DIRECT COSTS	\$	21,903	\$	65,349	\$	91,290	\$	91,783	\$	91,640	411,270
Direct \$/acre (not including loan)	\$	-	\$	4,329	\$	5,471	\$	5,774	\$	6,244	21,903
Farm Supervisory Cost (\$20/hr)	\$	8,000.00	\$	4,000.00	\$	4,000.00	\$	4,000.00	\$	4,000.00	
Utilities	\$	400	\$	400	\$	400	\$	400	\$	400	
Land lease rate \$200/acre	\$	1,000	\$	1,000	\$	1,000	\$	1,000	\$	1,000	
Property Taxes	\$	1,400	\$	1,400	\$	1,400	\$	1,400	\$	1,400	
Insurance (Appendix E)	\$	50	\$	50	\$	70	\$	70	\$	80	3,150
Unanticipated Expenses (Appendix F)	\$	-	\$	-	\$	-	\$	-	\$	-	
TOTAL FARM OVERHEAD	\$	10,850	\$	7,740	\$	7,820	\$	7,870	\$	8,040	42,550
TOTAL EXPENSES	\$	62,833	\$	91,310	\$	99,210	\$	100,765	\$	103,705	459,820
Income-Expenses											
NET INCOME	\$	(62,833)	\$	(38,310)	\$	(24,215)	\$	(20,765)	\$	(13,705)	(159,820)

NET INCOME/ ACR under different \$/hr and \$/lb scenarios (year 0)

Yield (lbs./acre)		Price/lb								
		\$9.00	\$8.00	\$10.00	\$12.00	\$14.00				
800	\$	(75,741)	\$	(14,587)	\$	(12,747)	\$	(11,147)	\$	(5,347)
1000	\$	(14,741)	\$	(12,740)	\$	(10,740)	\$	(8,740)	\$	(6,740)
1200	\$	(12,541)	\$	(11,541)	\$	(9,541)	\$	(7,541)	\$	(5,541)
1400	\$	(10,341)	\$	(9,341)	\$	(7,341)	\$	(5,341)	\$	(3,341)
1600	\$	(8,141)	\$	(7,141)	\$	(5,141)	\$	(3,141)	\$	1,000
1800	\$	(5,940)	\$	(4,940)	\$	(2,940)	\$	800	\$	4,000
2000	\$	(3,740)	\$	(2,740)	\$	(740)	\$	2,200	\$	5,200
2200	\$	(1,540)	\$	(1,440)	\$	1,200	\$	3,600	\$	16,000

Estimated establishment cost/acre (Infrastructure + Labor; not including well or excavation)

\$ 18,005

Picking Machine Operation Labor (\$12/hr x 4 people=\$48/hr; 960 bins/acre x 2 strings/bin=1920 bins; 1920 bins/acre @120 bins/hr =16 hrs)	\$	1,940	\$	1,940	\$	1,940	\$	1,940		
Picking machine electricity	\$	-	\$	-	\$	-	\$	-	PTO driver	
Over Fuel (overfuel) - \$200-250/acre	\$	1,000	\$	1,125	\$	1,200	\$	1,250		
Over Labor (\$ 12 hrs/acre, \$12/hr)	\$	480	\$	480	\$	440	\$	720		
Baling Labor (\$12/hr, 3- 1000s bales/hr)	\$	320	\$	300	\$	320	\$	360		
Transport bales to custom pellet facility (variable based on mileage, fuel, truck capacity)	\$	1,700	\$	1,500	\$	1,600	\$	1,800	\$ 6,000	
Custom Processing (pelletize, package) \$1.50/bu	\$	8,250	\$	11,250	\$	12,000	\$	13,500	\$ 45,000	
High Quality Analysis \$125/sample	\$	1,250	\$	1,250	\$	1,250	\$	1,250	\$ 5,000	
Marketing & Sales (10% of purchase price)	\$	5,000	\$	7,500	\$	8,000	\$	8,000	\$ 30,000	
Sub-Total Annual Expenses- Harvest & Post Harvest	\$	-	\$	21,440	\$	27,345	\$	28,870	\$	109,595

Appendix A - Hop Yard Infrastructure (5 acres)

Item	# Units	Cost/unit	Total Cost	Description
Trellis				
Poles	240	\$45.00	\$10,800.00	Red Pine 2"
Anchor Poles	120	\$45.00	\$5,400.00	Yellow Pine 4x6"
Weight for poles	5	\$800.00	\$4,000.00	
5/16" Cable rolls	5	\$1,200.00	\$6,000.00	NYT Submersed
1/4" Cable rolls	5	\$350.00	\$1,750.00	NYT Submersed
5/16" Clips	1,800	\$0.25	\$450.00	Metalsafe
1/4" Clips	400	\$0.25	\$100.00	Metalsafe
Fence Staples 1 3/4"	5	\$20.00	\$100.00	
Fence Staples 2"	4	\$100.00	\$400.00	
2" Spikes	4	\$50.00	\$200.00	
Anchor Bolts	194	\$11.00	\$2,134.00	x 6"
Concrete	10	\$100.00	\$1,000.00	
	SUBTOTAL		\$34,974.00	
Irrigation				
Drip Line	12	\$100.00	\$1,200.00	New PC31833-24
Manual Irrigation Valve - Brass	4	\$50.00	\$200.00	
Check Valve - Brass	4	\$25.00	\$100.00	
PVC Submain	40	\$14.75	\$590.00	Schedule 40 2" x 20'
Filter	1	\$241.00	\$241.00	New 30 2" Dia Filter IT-4815042-24-16
Air Test	1	\$18.00	\$18.00	New AMV 8881-2
Man. Fittings	4	\$200.00	\$800.00	PVC
Tube OR Adapter	80	\$0.70	\$56.00	New AP 14716
Connectors	80	\$0.68	\$54.40	New CAP 16
Figure 8 End Clamp	80	\$0.18	\$14.40	New F-216
Main line	1	\$2000.00	\$2000.00	
Well digging	1	variable		
Sales Tax		4%	\$495.57	
	SUBTOTAL		\$7,871.77	
Equipment Rental				
Ditch Witch & Drilling	1	\$1400.00	\$1400.00	
Trencher	2	\$1000.00	\$2000.00	
GPS Unit	1	\$400.00	\$400.00	1 year rental, RTK base kit
Submersed Subal w/ pump	1	\$2000/roll	\$2000.00	drilling post/anchor for 40ft
Excavating	1	variable		
	SUBTOTAL		\$4,700.00	
Plants				
	4000	\$1.25	\$5,000.00	
	SUBTOTAL		\$5,000.00	
GRAND TOTAL 5 acres			\$65,146	
1 acre			\$13,029	

Appendix B. Build-Out Labor (5 Acres)

Item	# Persons	Hours/Person	# of Hours	Cost / Hour*	Total Cost
Unloading Deliveries	1	8	8	\$20.00	\$160.00
Discing	1	4	4	\$20.00	\$80.00
Marking	4	16	64	\$20.00	\$1280.00
Drilling	2	40	80	\$20.00	\$1600.00
Pole Layout	2	8	16	\$20.00	\$320.00
Raising Poles	2	16	32	\$20.00	\$640.00
Tamping Poles	4	24	96	\$20.00	\$1920.00
Drilling Anchors	2	24	48	\$20.00	\$960.00
Pitching/Locking in anchors	4	32	128	\$20.00	\$2560.00
Concrete	4	8	32	\$20.00	\$640.00
Layout Cable	2	20	40	\$20.00	\$800.00
Stretching Cable	6	50	300	\$20.00	\$6000.00
Planting	7	24	168	\$20.00	\$3360.00
Irrigation	4	32	128	\$20.00	\$2560.00
Fumigation (\$400/ac)					\$2000.00
*contracted out					
TOTAL LABOR					\$24880

1 acre

\$4976

Appendix C. Equipment Costs (5 acres)

Item	# of Units	Cost / Unit	Total Cost
Airblast Sprayer	1	\$10,000	\$10,000.00
Weed Sprayer	1	\$1,500	\$1,500.00
Tractor	1	\$30,000	\$30,000.00
Disc	1	\$1,000	\$1,000.00
Weed Badger	1	\$1,000	\$1,000.00
Mower	1	\$2,500	\$2,500.00
Walk in Cooler (11' x 17' x 8')	1	\$6,000	\$6,000.00
Harvester, Hopster5P (PTO-powered), ~120-140 bins/hr	1	25,000	\$25,000.00
Oast (??)	1	\$7,500	\$7,500.00
Baler (RB60)	1	\$6,500	\$6,500.00
Twining sled/scaffold \$4000- \$15,000	1	\$6,000.00	\$6,000.00
Total Equipment Cost			\$97,000.00

Appendix D. Loan Detail (5 Acres)**

Business loan payment (5 acre) GROW ONLY

Loan Amount	\$	136,025.97
Interest rate		6.5%
Life of loan (years)		5
Payments per year		12
Total number of payments		60
Payment per period (month)		\$2,661.50
Sum of payments per year		\$31,938.05
Sum of payments (total cost of loan)		\$159,690.26
Total interest paid		\$23,664.29

Business loan payment (5 acre) GROW HARVEST DRY BALE STORE

Loan Amount	\$	187,025.97
Interest rate		6.5%
Life of loan (years)		5
Payments per year		12
Total number of payments		60
Payment per period (month)		\$3,659.38
Sum of payments per year		\$43,912.53
Sum of payments (total cost of loan)		\$219,562.67
Total interest paid		\$32,536.70

Appendix E. Insurance Detail (1 Acre)

Coverage	Year 1	Year 2	Year 3	Year 4	Year 5	Total Estimated Cost (yrs 1-5)
yields (lb/acre dried hops) yr 1= 8, yr 2= (1100), yr 3= (1300), yr 4= (1400), yr 5 = (1500) @ \$15/lb.						
*Growing Hops (ex. Hail, wind, etc.; \$1/\$100)	\$ -	\$ 99	\$ 125	\$ 144	\$ 162	\$ 540
Trellis (\$1000 coverage per acre=\$10/acre)	\$ 10	\$ 10	\$ 10	\$ 10	\$ 10	\$ 50
Peak Season (Hops in process)						
Crop Storage						
Cargo/Transit (\$250,000 coverage)						
Disruption in Farm Operations						
TOTAL INSURANCE	\$ 10	\$ 109	\$ 145	\$ 154	\$ 172	\$ 590

*Yield loss is covered and based on historical yields. Coverage includes equipment, supplies, and labor to restring bines.

Insurance Fine Print 1. Jeff Barom, HUB Northwest LLC

Growing Crop - \$1 per \$100 of value. If we agree to an unscientific amount of \$1/lb. for uncured costs, then Cost / Acre = (gross expected income - \$1/lb.) / 100 / # acres. For year 3: 1800 lbs/acre * \$1/lb - \$1/lb) / 100 / 5 = \$162 per acre/yr annual cost.

Trellis - \$1,000 per acre = \$10 per acre.

Cargo/transit is a flat cost based on the maximum load value. Most growers are carrying around \$250,000 with an annual cost around \$2,200. The challenge with trying to come up with a per acre cost for this coverage is a 100 acre grower will have the same exposure on a 40' flatbed as a 2,000 acre grower so there is an economy of scale for larger growers for this particular coverage.

Peak season coverage - This question was is worth but this coverage is based on the maximum value of hops in process in your picking structure, not also water for your most valuable variety? - Once again a grower with 100 acres of hops is going to have the same peak season exposure as a grower with 2,000 acres.

Disruption of farming operations (DOFO) - 30%. Assuming \$18,000/acre

Insurance Fine Print 2. Jeff Widdows, Payne West

Growing Crop - Hops - \$1.00 rate per \$100 of value contracted/grown and insured. You must insure 100% of all tined fields and yield that you intend to harvest. PNW perils include wind, hail, rain, collapse, lightning, fire, etc. Coverage in other regions may vary based on weather patterns. Coverage includes loss to yield as well as extra expense to harvest due to a covered event.

Trellis Coverage - \$1.00 per \$100 of trellised value. Growers will set a value to insure per acre (usually around \$7500) and must insure 100% of all trellised/tined fields. This pays for the reconstruction or repair of a damaged field, above a given deductible. There are very few growers that purchase this

Hops in Process - \$1.57 per \$100 of value for the 45-60 days of harvest. Covers hops from the picker to the bale, and in the bale while awaiting delivery if

Crop Storage - \$.36/\$100 of stored goods. This rate will vary widely depending on the storage facility and conditions and length of storage. For our clients that have an extended storage period or sell the product directly, we place a separate stock throughput policy which picks up this exposure and is less expensive.

Transit - \$.80/\$100 of limit used per truck/vehicle. This too will vary depending on the limit purchased. Some growers don't even buy it as the brokers pick up at Disruption in Farming Operations (DOFO) - \$.25 per \$100 of value. This number is generally calculated off of the full value of the projected year's harvested crop

Appendix F. Unanticipated Expenses

Item	Year 1			Year 2			Year 3			Year 4			Year 5		
	# of Units	Cost / Unit	Total Cost	# of Units	Cost / Unit	Total Cost	# of Units	Cost / Unit	Total Cost	# of Units	Cost / Unit	Total Cost	# of Units	Cost / Unit	Total Cost
			\$0.00			\$0.00			\$0.00			\$0.00			\$0.00
			\$0.00			\$0.00			\$0.00			\$0.00			\$0.00
			\$0.00			\$0.00			\$0.00			\$0.00			\$0.00
			\$0.00			\$0.00			\$0.00			\$0.00			\$0.00
			\$0.00			\$0.00			\$0.00			\$0.00			\$0.00
			\$0.00			\$0.00			\$0.00			\$0.00			\$0.00
			\$0.00			\$0.00			\$0.00			\$0.00			\$0.00
			\$0.00			\$0.00			\$0.00			\$0.00			\$0.00
			\$0.00			\$0.00			\$0.00			\$0.00			\$0.00
			\$0.00			\$0.00			\$0.00			\$0.00			\$0.00
			\$0.00			\$0.00			\$0.00			\$0.00			\$0.00
			\$0.00			\$0.00			\$0.00			\$0.00			\$0.00
Total			\$0.00			\$0.00			\$0.00			\$0.00			\$0.00

Expenses

- Hopyard Infrastructure
- Build-out Labor
- Equipment
- Annual Expenses
 - Field
 - Harvest & Post Harvest
 - Loan
 - Farm Overhead

Expenses

- **Hopyard Infrastructure**

- 14 x 3.5 spacing
- 1778 strings/acre
- 889 hills
- 55 poles

- **Build-out Labor**

- Equipment
- Annual Expenses
 - Field
 - Harvest & Post Harvest
 - Loan
 - Farm Overhead



















A close-up photograph of Chuck Norris with a beard and mustache, wearing a blue sleeveless shirt. The background is a blurred window with yellow light. The text is overlaid in white with a black outline.

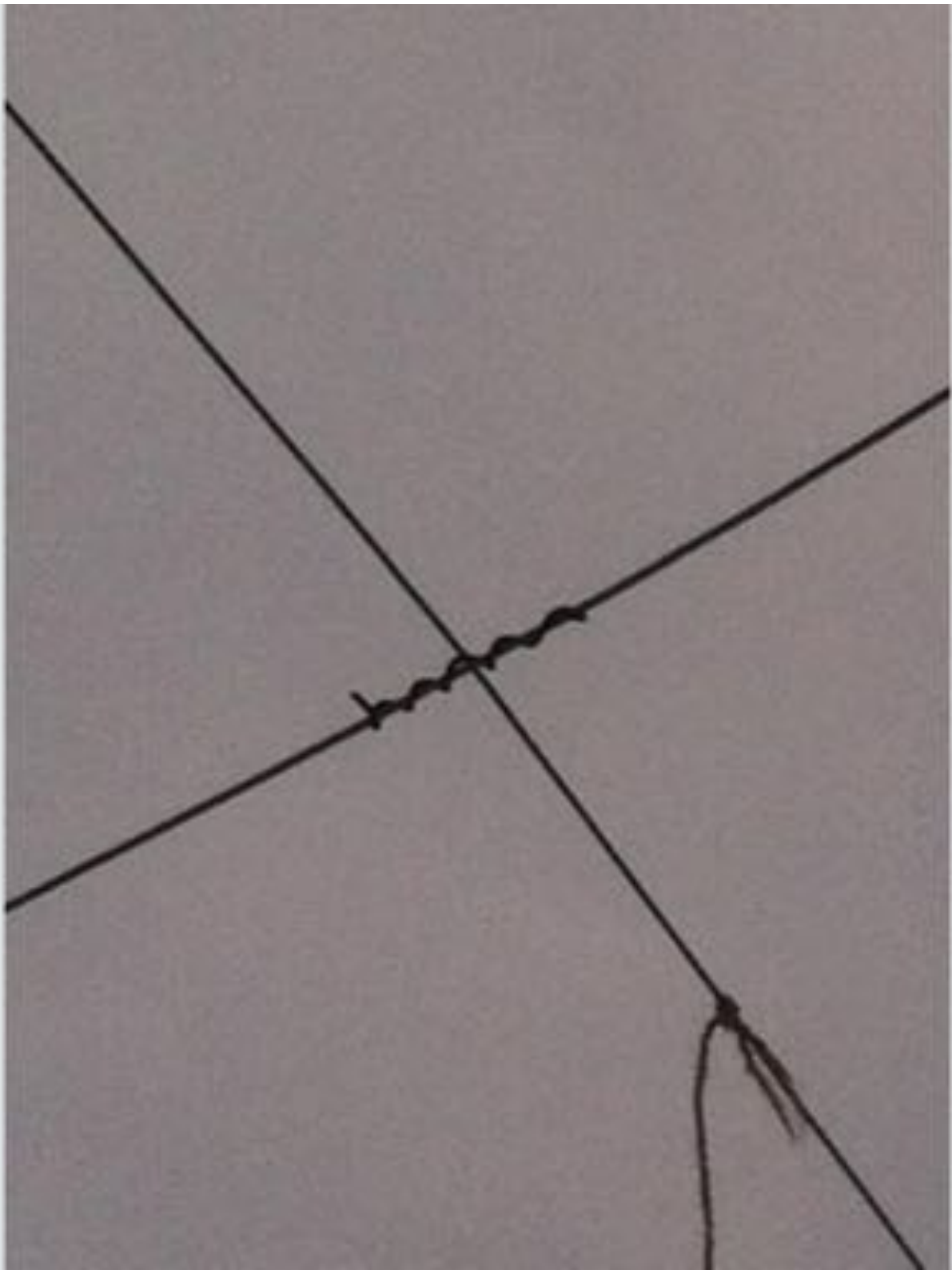
**CHUCK NORRIS ONCE
KICKED A HORSE IN THE JAW..**

**.. NOW WE HAVE
GIRAFFES.**













Irrigation

- 75-80% of total annual hop water use occurs after mid-June
- Greatest daily amounts late July-early August
- Majority of roots are in top 4'
- Hops usually extract 50-60% from top 2', but can extract water from 8' or below
- Overall use around 30 inches/year, depends on season
- \$-right size your well, different zones for different cultivars

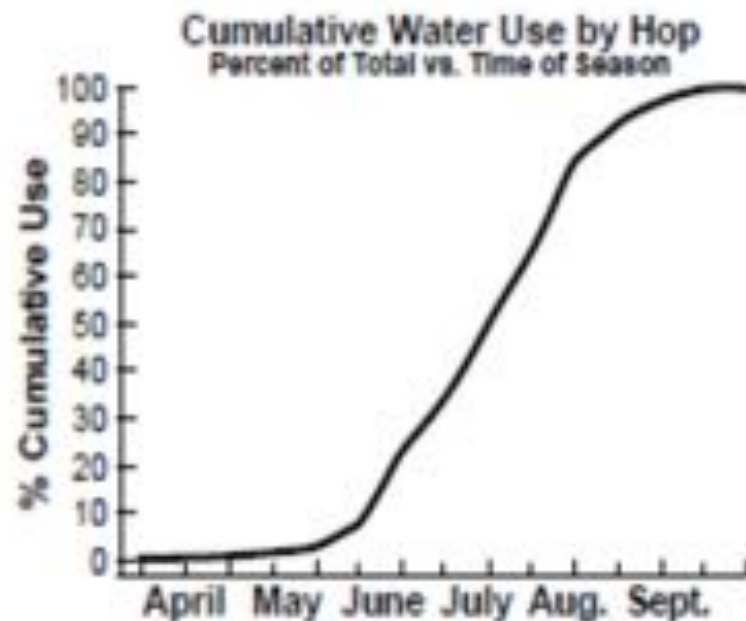


Fig. 1. Cumulative water use of hop during the growing season.

Expenses

- Hopyard Infrastructure
- Build-out Labor
- **Equipment**
 - Grow only?
 - Grow, harvest, dry, bale, store?
 - Scale?
- Annual Expenses
 - Field
 - Harvest & Post Harvest
 - Loan
 - Farm Overhead

Appendix C. Equipment Costs (5 acres)

Item	# of Units	Cost / Unit	Total Cost
Airblast Sprayer	1	\$10,000	\$10,000.00
Weed Sprayer	1	\$1,500	\$1,500.00
Tractor	1	\$30,000	\$30,000.00
Disc	1	\$1,000	\$1,000.00
Weed Badger	1	\$1,000	\$1,000.00
Mower	1	\$2,500	\$2,500.00
Walk in Cooler (11' x 17' x 8')	1	\$6,000	\$6,000.00
Harvester, Hopster5P (PTO-powered), ~120-140 bins/hr	1	25,000	\$25,000.00
Oast (??)	1	\$7,500	\$7,500.00
Baler (RB60)	1	\$6,500	\$6,500.00
Twining sled/scaffold \$4000- \$15,000	1	\$6,000.00	\$6,000.00
Total Equipment Cost			\$97,000.00

Expenses

- Hopyard Infrastructure
- Build-out Labor
- Equipment
- **Annual Expenses**
 - **Field**
 - Harvest & Post Harvest
 - Loan
 - Farm Overhead







- 1778 strings/acre (2 per plant)



<http://roguefarmsblog.wordpress.com/category/crops/hops-crops/>









Training labor date affects yields

- 3-4 bines
- Clockwise only
- Timing-Cultivar and weather dependent
- Will likely have to re-train





Lessons Learned: Training Date

1970-1973 Studied the effect of the date of training

a. Yield

b. Length of cones

c. Number of shoots

d. Density of setting (# cones per 10cm of shoot)

e. Mean length of shoots

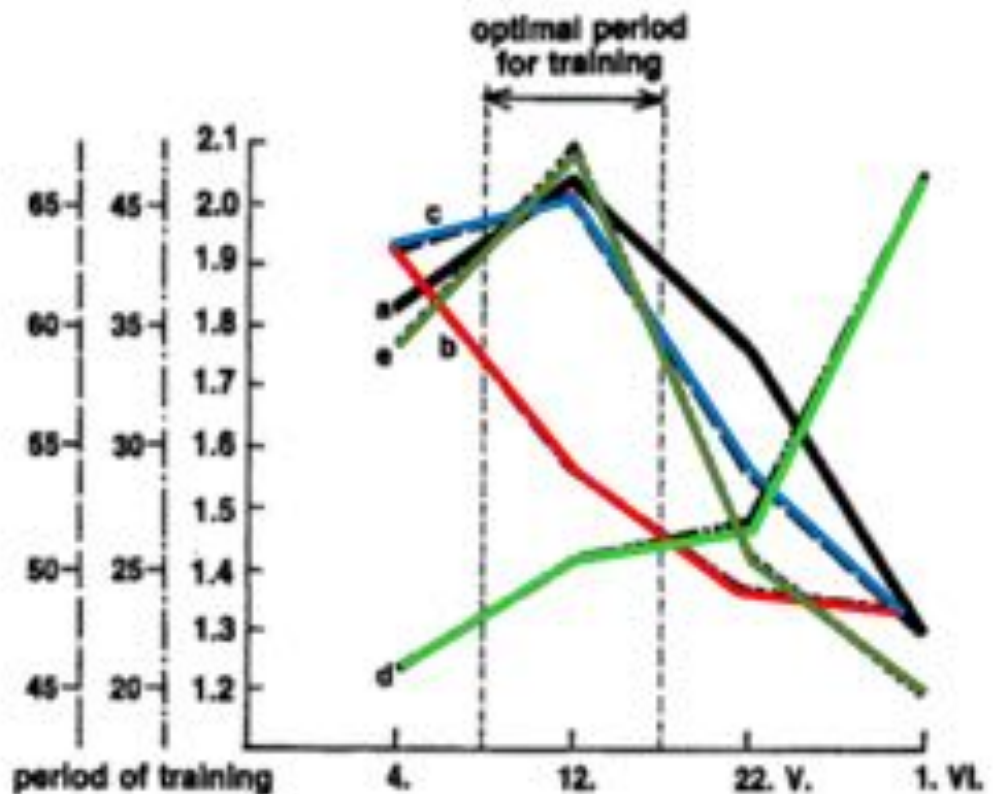
Yield Reductions

Late training (June 1) = 38.5 %

Early training (May 4) = 10.3%

TAKE HOME: the date of training principally affects the yield of cones and their quality

RybaCek, V. 1991. Hop Production. Developments in Crop Science 16. Pg. 205



Insect, weeds, disease control





Lesson: Weed control-especially w/ babies hops









Tissues tests and Soil tests

Recommended fertilization rates:

Nitrogen (N) = 150-200 lbs/acre total

April-May with urea (40-0-0) every week (100 lbs: 25 lbs each week)

Mid-May: Triple 16

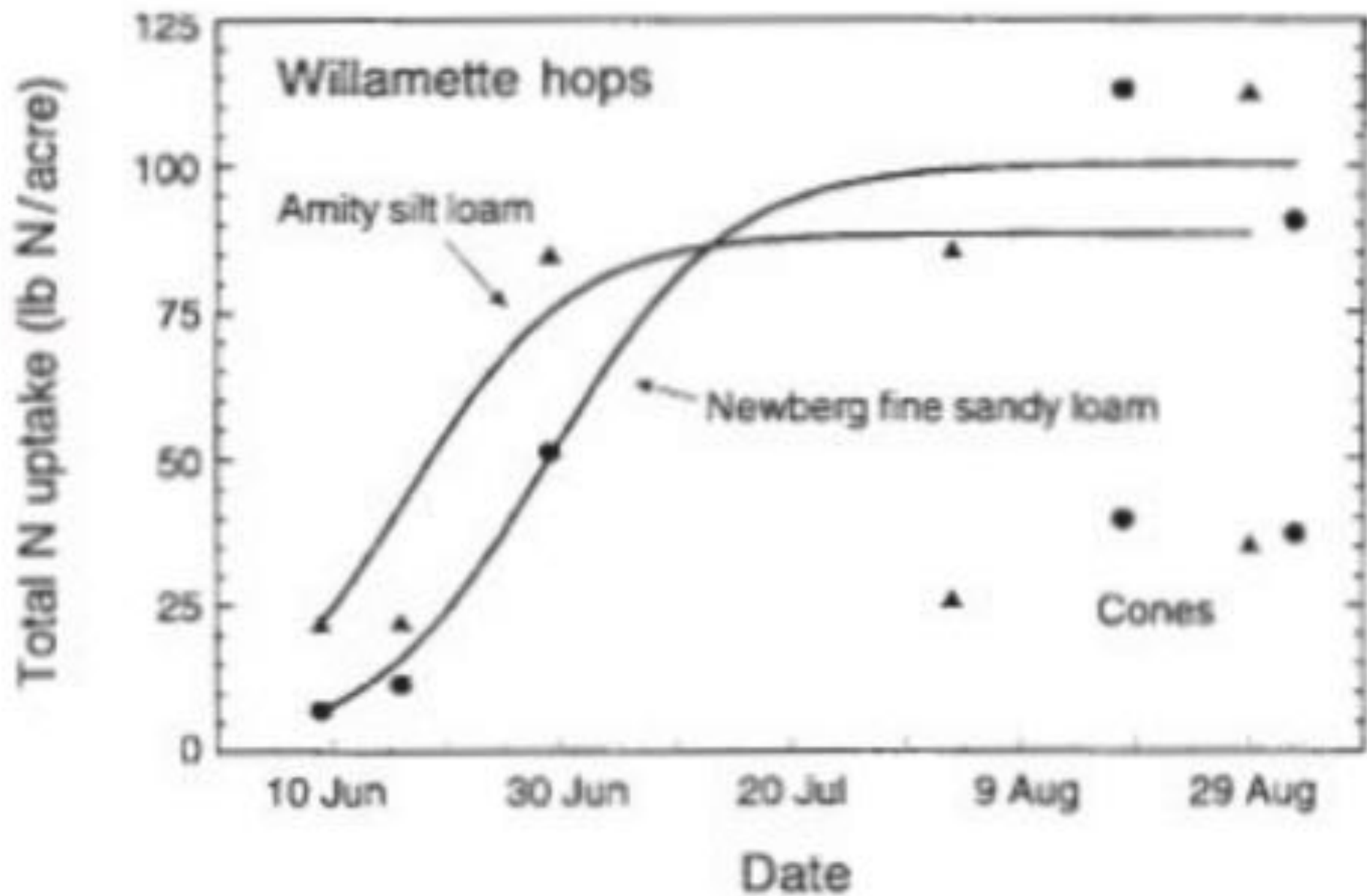
End-May-burn/prune back flag shoots

June-75-100 lbs liquid N (28N solution)

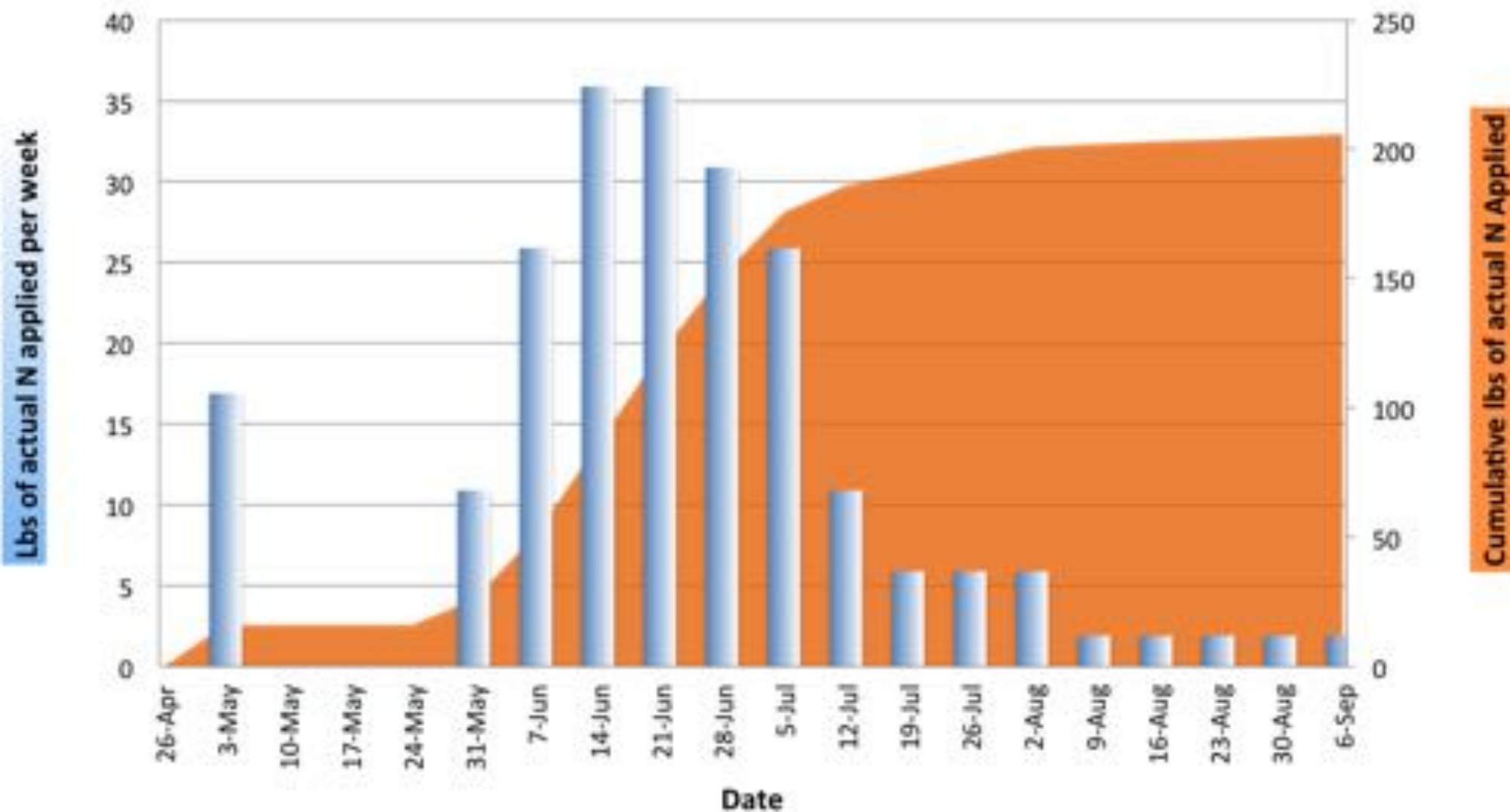
Boron, Iron, Manganese, Zinc, Copper

Phosphorous (P) = 60-100 lbs/acre

Potassium (K) = 100 lbs/acre (potash)



Weekly & Cumulative Nitrogen Application for Hops in Michigan



Optimum Nutrient Ranges

NUTRIENTS	JOHN I HAAS	Plant Analysis Handbook III		Western Labs 5.5 ft above ground
		Vegetative Stage- Pre-Bloom	Reproductive stage & Full Bloom	
Nitrogen (%)		3.2 - 5.6	2.13 - 3.93	4.0
Potassium (%)	1.49 - 2.5	1.6 - 3.4	0.97 - 2.55	3.0
Phosphorous (%)	0.29 - 0.6	0.27 - 0.54	0.18 - 0.43	0.4
Calcium (%)	0.79 - 1.2	1.03 - 2.57	3.09 - 6.05	2.5
Magnesium (%)	0.24 - 0.8	0.29 - 0.67	0.55 - 1.71	0.4
Manganese (ppm)	25 - 150	45 - 125	50 - 150	85
Iron (ppm)	30 - 60	44.3 - 97.9	35.4 - 151	
Copper (ppm)	10 - 25	8 - 29	5.7 - 16.6	10
Boron (ppm)	24 - 75	17.6 - 63.2	48 - 150	55
Zinc (ppm)	24 - 50	23.2 - 108	19.4 - 57.1	60
% Sulfur Sampled Basis	0.16 - 0.32	0.2 - 0.34	0.18 - 0.30	0.25
% Sulfur Dry Matter Basis	0.16 - 0.32	0.2 - 0.34	0.18 - 0.30	
Mo		0.5 - 3	1 - 5	
Na	0 - 1400			
NO3 ppm	4000-12000			

Expenses

- Hopyard Infrastructure
- Build-out Labor
- Equipment
- **Annual Expenses**
 - Field
 - **Harvest & Post Harvest**
 - Loan
 - Farm Overhead







USA HOPS
HOP GROWERS OF AMERICA

Transport to the Picker

Degradation potential

- Distance?
- Humidity level?
- Time of harvest (early a.m. or noon)?
- Temperature at harvest?
- Cost

In terms of the drying process picked hop cones can be regarded as a living organism whose basic life processes, particularly respiration, are continuing. They first react to being removed from the plant by a higher intensity of respiration. Rybacek, 1991.



Picking

Considerations

- Acreage
- Speed (bines/hour)
- Drying capacity
- Pelletizing capacity
- Storage
- \$\$\$
- Varieties
- Scheduling!!



<http://brewpublic.com/brewpubs/in-hop-pursuit/>

Used Wolf 2014-2015 price list

Note: Does not include shipping, build-out, electrical panel


[513 video](#)

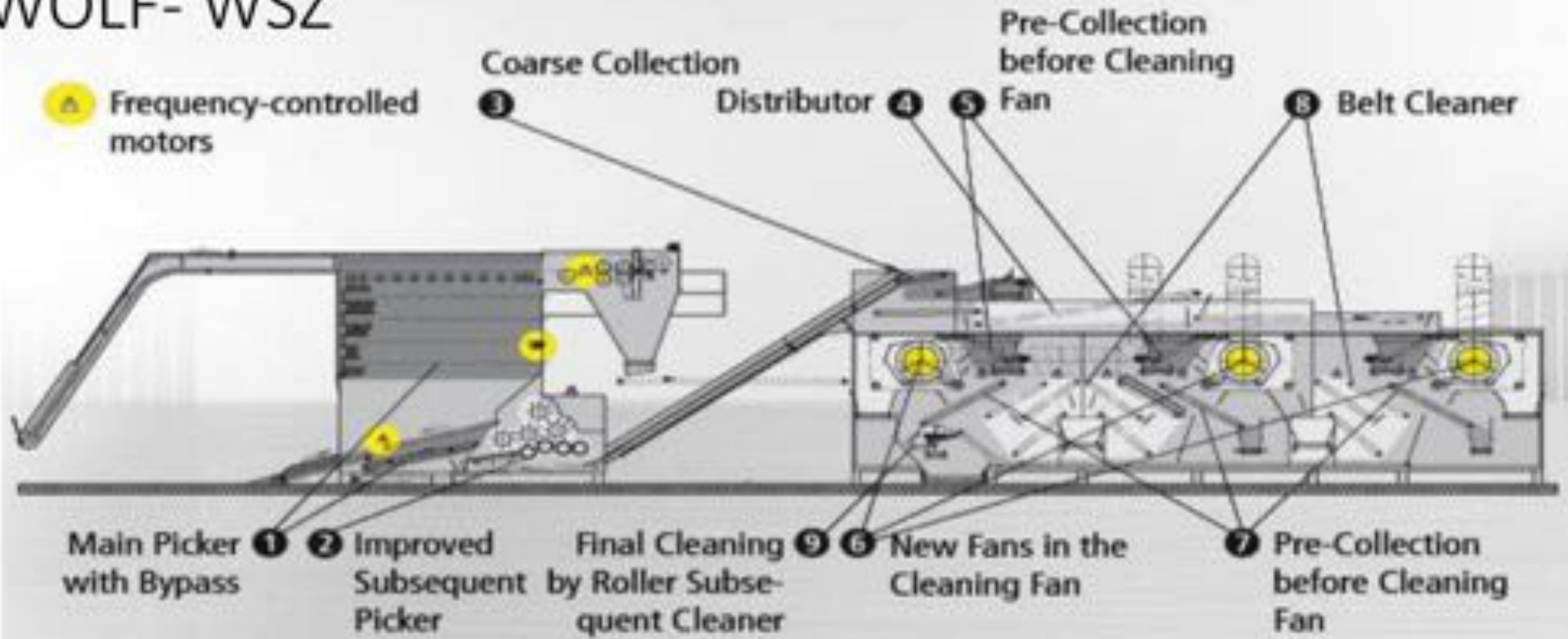
WOLF 170





WOLF- WSZ

 Frequency-controlled motors





<https://lagunitas.com/hop-harvest-2015>



#2 DRIBBLES & CONVEYOR	#3 DRIBBLES & CONVEYOR	#4 DRIBBLES & CONVEYOR	TROMMEL RETURN CONVEYORS	#1 FANS	#1 CLEANER	#2 FANS	#2 CLEANER	#3 FA
------------------------	------------------------	------------------------	--------------------------	---------	------------	---------	------------	-------

#4 CLEANER	#2 - #3 TROMMEL CROSS	#1 - #2 TROMMEL CROSS	#1 TROMMEL FEED CONVEYOR	#4 TROMMEL FEED CONVEYOR	ARM PICKER	RETARDER	GRIZZLY MESH CROSS CONVEYOR	PH HA ST
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- *The interdependence of picking and drying* is very difficult to accommodate, it requires a matched efficiency and similar operation rate of both parts.
- The efficiency of the whole centre depends on the drier, which influences the other components.

Rybacek, V. (ed). 1991. Developments in crop science 16: Hop Production. Elsevier. Amsterdam.



- Matched to the WHE-513, 30-40 Ha
- 180-360kg/per drawer
- Each drying cycle about 4 hours
- Two yr, 2 phased project ~\$3 million dollars

Lessons Learned: Drying

Drying is regarded as the most important operation in the harvesting process.

- The basic process around which the hop harvest should be organized
- Therefore, the preceding operations, both in time and volume, should be matched to the speed of the drier.

we cannot dry without heat

Factors that influence drying

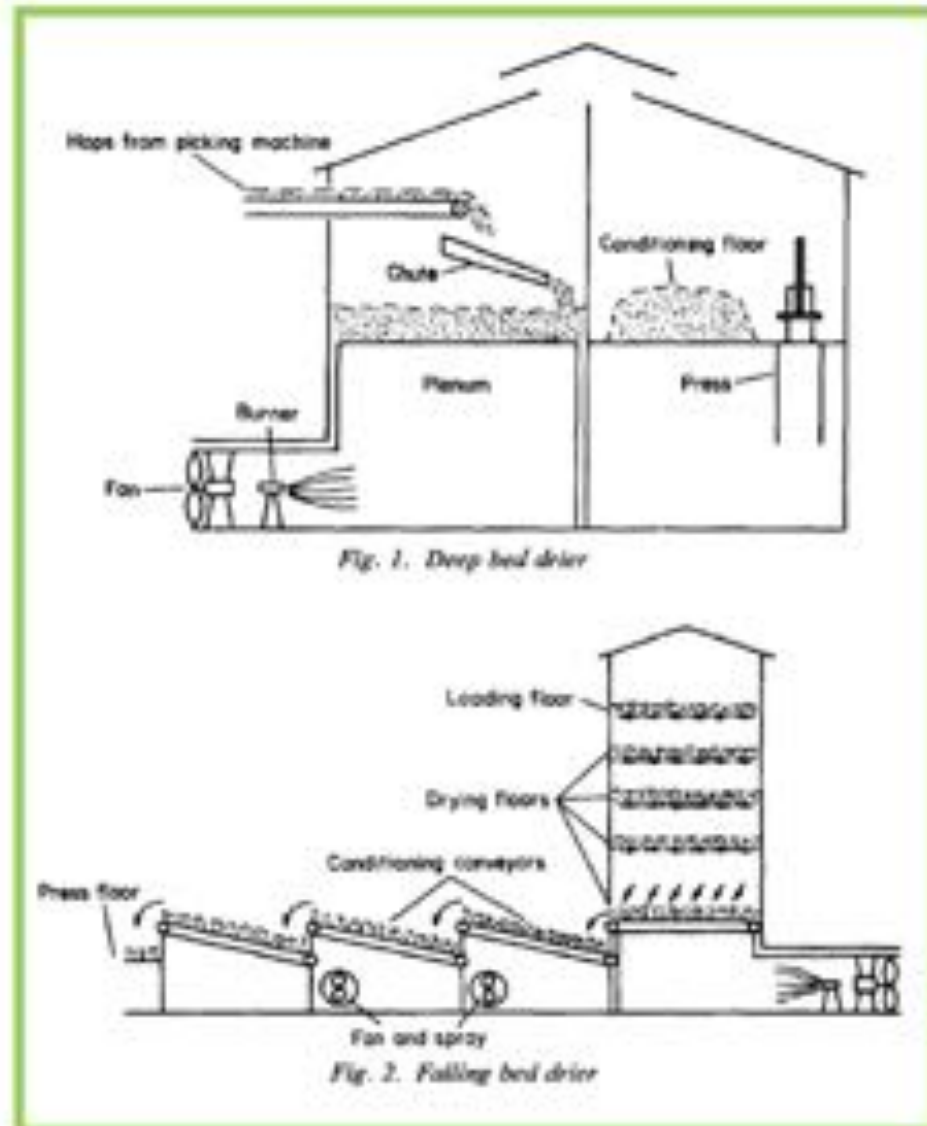
1. air velocity
2. air moisture content
3. bed depth
4. air temperature



Contribute to the effectiveness of drying and the resulting aromatic, physical, and storing properties of dried hops.

Dryer Types

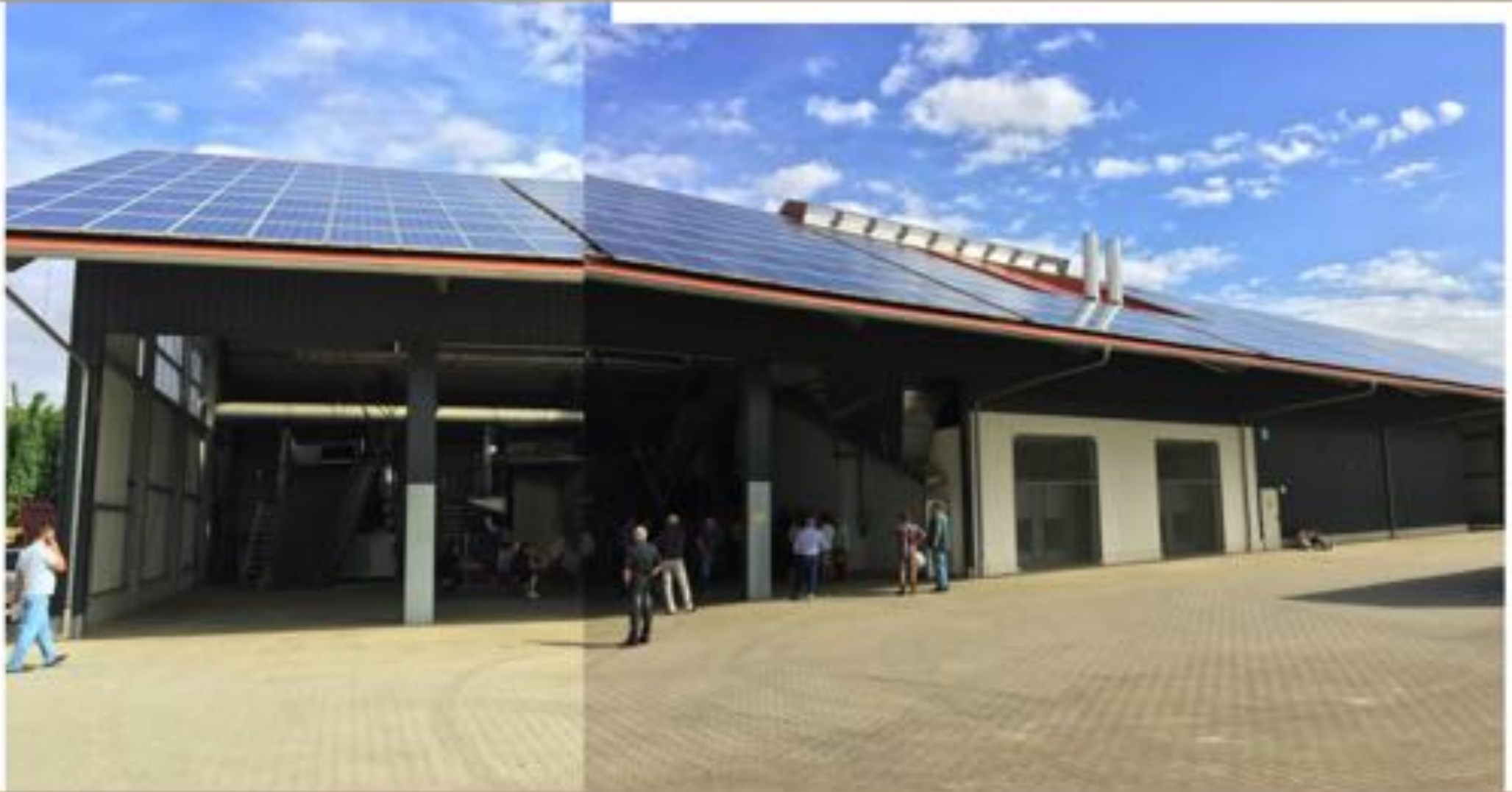
- Bed



- Louvered













Conditioning



Considerations

- Humidity- (In 2 hours you could go from 9% to 13% moisture)
- Throughput and timing
- Space requirements
- Food safety?

- The hops are left in these heaps for 12 hours in a staged process known as “conditioning”.
- The heaps are re-piled for a further 12 hours across the floor in which time the moisture level continues to equilibrate to ensure consistency prior to baling.
- Target moisture level for our hops is around 9.5 % (+/- 1 %) which requires a high level of patience and skill to achieve.







<https://lagunitas.com/hop-harvest-2015>

Baling

Considerations

- Timing
- Quantity of hops
- Size
- \$\$ baler
- Storage
- Transport

“Whole leaf hops are voluminous, but turning them into a bale makes them more compact and stackable, and overall easier to store. It also cuts down on oxidation, which affects brewing quality.”





Global Cold Chain Alliance

- Optimum storage temp. is 24 to 28°F (-4.44 to -2.22°C) at a relative humidity of 70 to 85% relative humidity, with little air movement to prevent excessive drying.
- Sufficient space should be allowed around the bales for ventilation, so that any heat generated in the bale may be dissipated.
- This is particularly important immediately after baling."

<http://www.gcca.org/wp-content/uploads/2012/09/Hops.pdf>

Hop Analysis Services



Harvest Package \$50

- Combining Brewing Values and Dry Matter analysis

Hop Profile Package \$130

- Combining Brewing Values, Oil Content and Volatile Oil Profile analyses, this package is designed to help customers determine the alpha acids, beta acids, hop storage index and oil content of their hops.

Brewing Values \$35

- Alpha acids, beta acids, and hop storage index (H.S.I.) values

Dry Matters \$20

- Dry matter analysis provides growers with the necessary information to forecast peak harvest windows based on hop cone maturity

Oil Content \$20

- Provides a value for the volume of oil in a hop sample

Volatile Oil Profile \$100

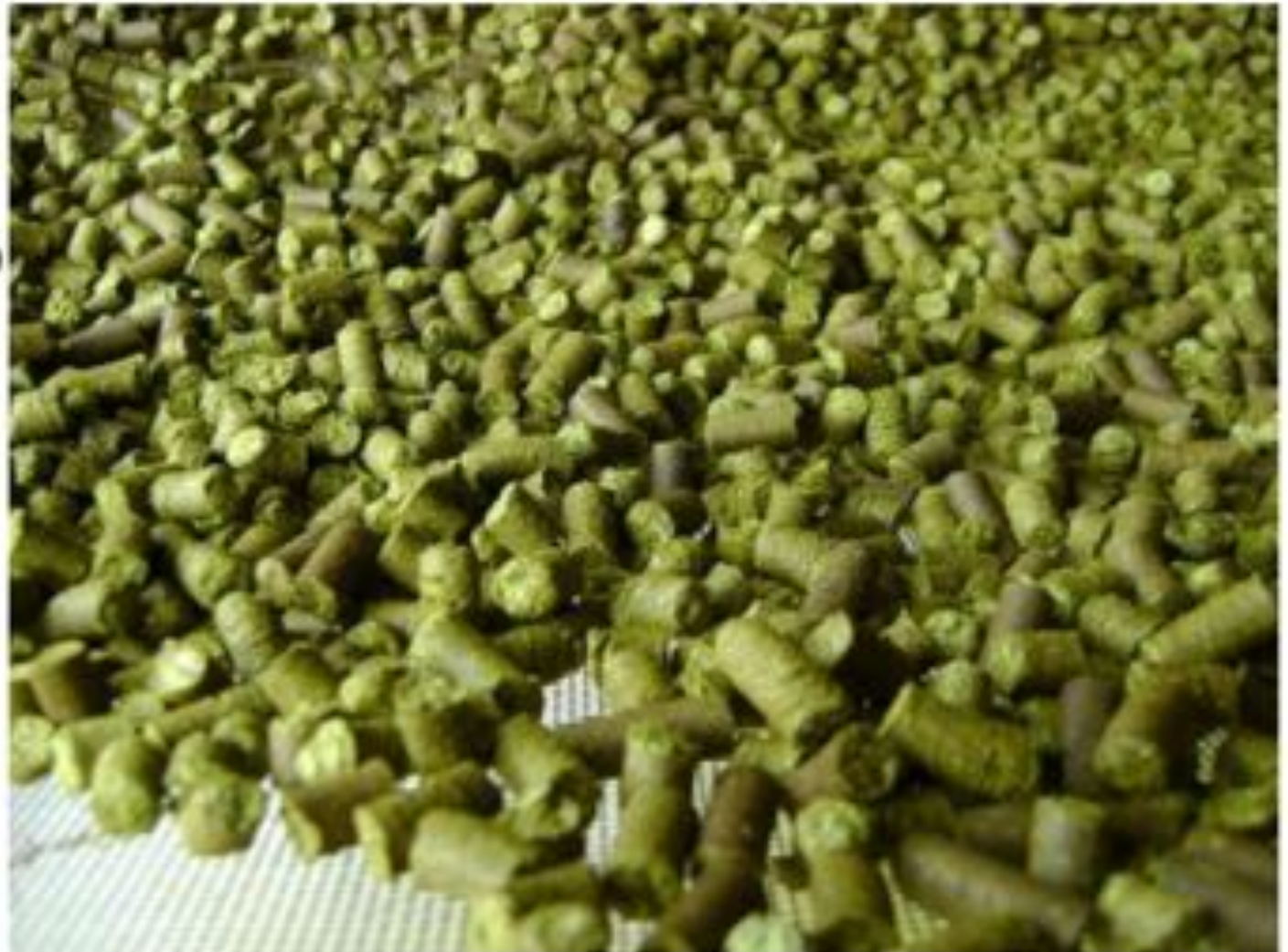
- Volatile Oil Profile provides a specific value for the most important oil compounds

Pelletizing

Considerations

- Temperature
- Time
- Final product (eg. t-90 or t-45)
- Machine type
- Machine \$\$
- Facility

- pellets- preferred storage method
- increased density- less surface area exposed to oxygen



- [Pelletizing](#)

<http://www.youtube.com/watch?v=hn3nc1UBiNY>



LM \$36,000

350-1000 lbs/hour

Max- 50 C around 120 F

<http://www.makepellets.ca/Hophead%202-1.jpg>

Packaging and Storage



Considerations

- Oxygen and Photosensitivity
 - Hops are photosensitive and, therefore, long exposure to light changes their biochemical structure as is shown by a typical red-brown colour, which is commercially undesirable.
- Package size and quality
 - 3-ply Al-foilium bags under inert N₂ atmosphere-vacuum sealed
- Cold storage-YES

BARTH-HAAS GROUP

FOOD GRADE PRODUCTS

Packaging:

- Pellets are packed in laminated foils with an aluminium layer as a barrier against diffusion of oxygen
- Sealed under inert gas and/or vacuum packed
- Foil material used meets all food industry packaging regulations.
- Residual oxygen content in the foil packs is < 2% by volume
- Pack sizes are available from 1 kg to 500 kg

CRYSTAL

T-90 HOP PELLET 44LBS. NET WT.

LOT# GI-CRI4213

ALPHA: 8.8%

BETA: 9.2%

H.S.I: 0.227



EMPIRE
HOPS FARM

WWW.EMPIREHOPSEARM.COM

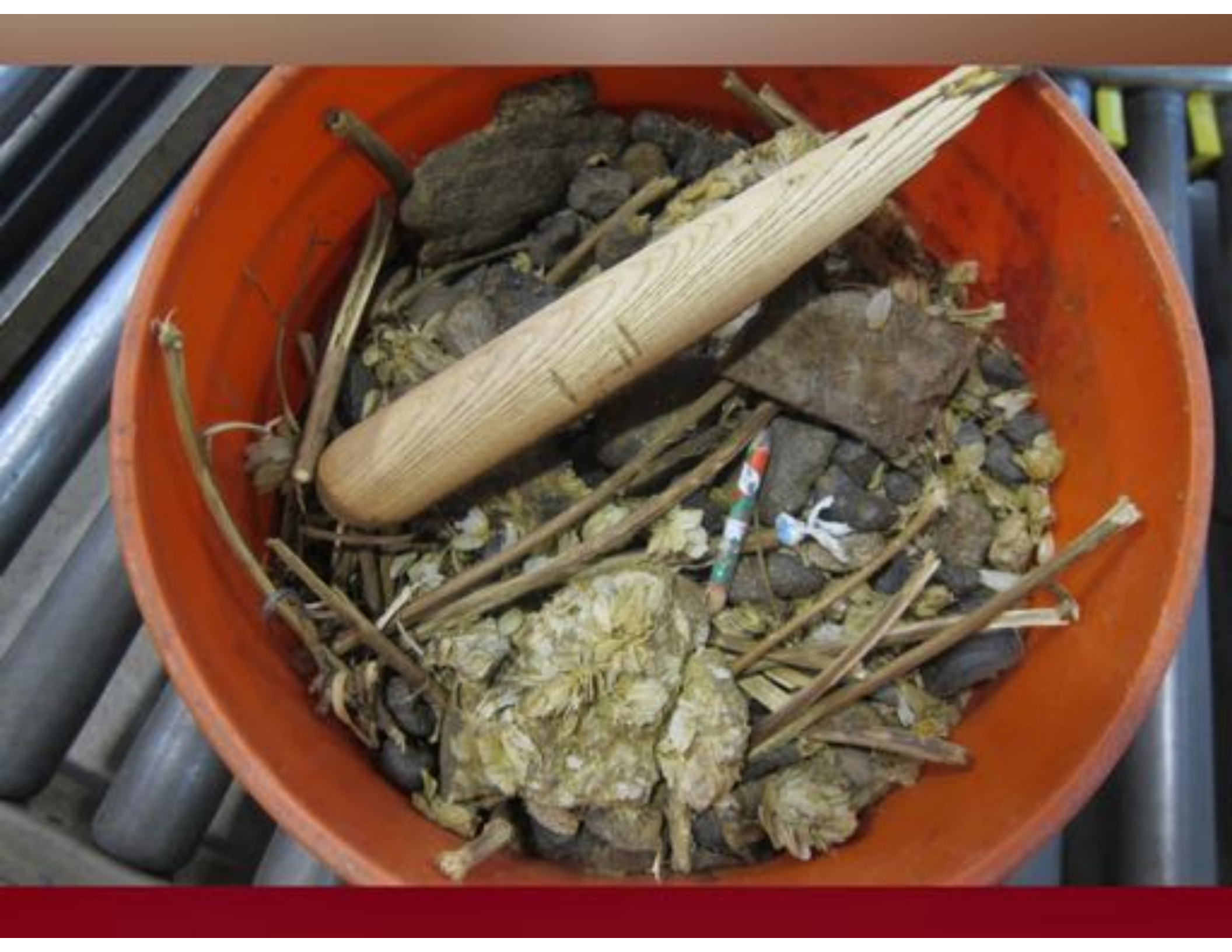
-MADE IN MICHIGAN-



- Hops are a food product
 - Authorized personnel only
 - Protective clothing must be worn if in contact with hops
-
- El lúpulo es un producto alimenticio
 - Solo personal autorizado
 - Ropa de protección deben ser usados en caso de contacto con lúpulo

Perrault Farms, Inc.









ROY FARMS, INC

MOXEE WA USA



Are Roy Farms hops traceable back to field origin and chemical treatment?

Absolutely!

Back about 10 years ago it became apparent that brewers wanted to know more about food safety issues related to their hops—what chemicals had been applied, how close to harvest they had been applied and more.

Traceability and food safety concerns (and data gathering) do not end at harvest, our attention to data gathering and reporting are core elements of assigning harvested crop to inventory and logistical planning for sales.

GLOBALG.A.P.





HOP ENTHUSIAST

HOP FINDER

NEWS & MEDIA

GROWER TOOLS

RESEARCH & TECHNICAL

INFO HUB



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Best Practices

Farm operations vary based on their equipment and other resources. However unique, all hop growers should commit to continuous improvement of farming and harvesting practices and crop quality. Some growers subscribe to third-party audited quality control programs such as GLOBALG.A.P. and USDA GAP. Some customers (hop merchant companies and brewers) provide specific guidance to their growers for food safety and quality control practices.

Over the next few years Hop Growers of America will develop several "Best Practices" modules that will allow growers to self-certify the care and attention they invest in their crop, insuring customers receive hops that are safe and consistently high in quality.

While future modules will only be available in the Member Area of this website, we feel Food Safety practices during hop harvest are critically important for all growers, regardless of membership in HGA. This self-certification Food Safety/Harvest Practices program that is consistent with third-party certified programs has been developed, and includes templates for many of the documents you will need to document your practices.

FOOD SAFETY MODULE 1 - HARVEST PRACTICES

MODULE 1 ATTACHMENTS

Marketing and Sales

- What brewers are looking for
 - Quality *Craft* product
 - Consistent supply
 - Sustainable pricing for them
 - Local relationships with hop farms



RAW MATERIALS ISSUE

THE NEW BREWER[®]

THE JOURNAL OF THE BREWERS ASSOCIATION

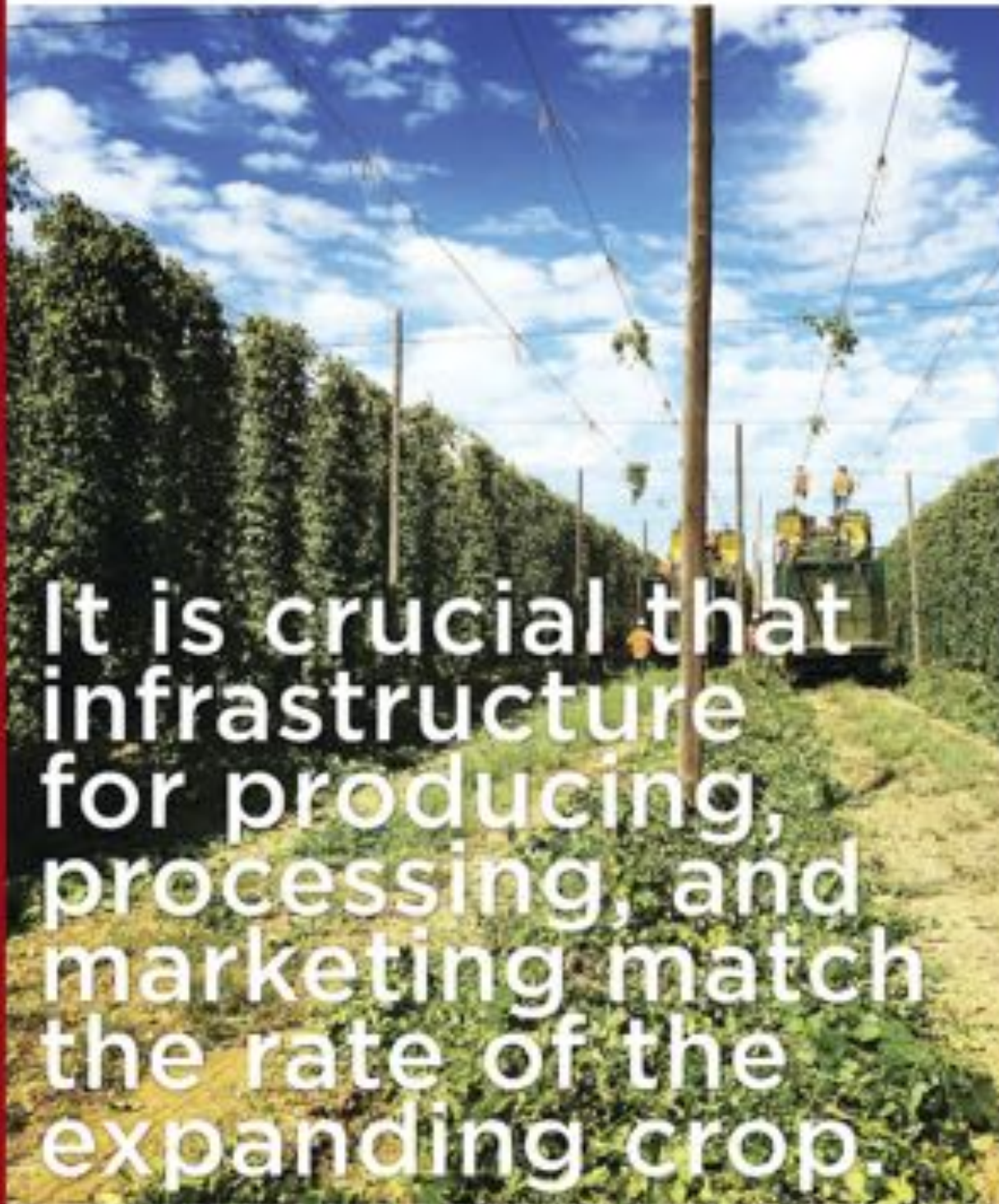
2016 WORLD HARVEST REPORTS

U.S. BARLEY

SMALL CROP, GOOD QUALITY

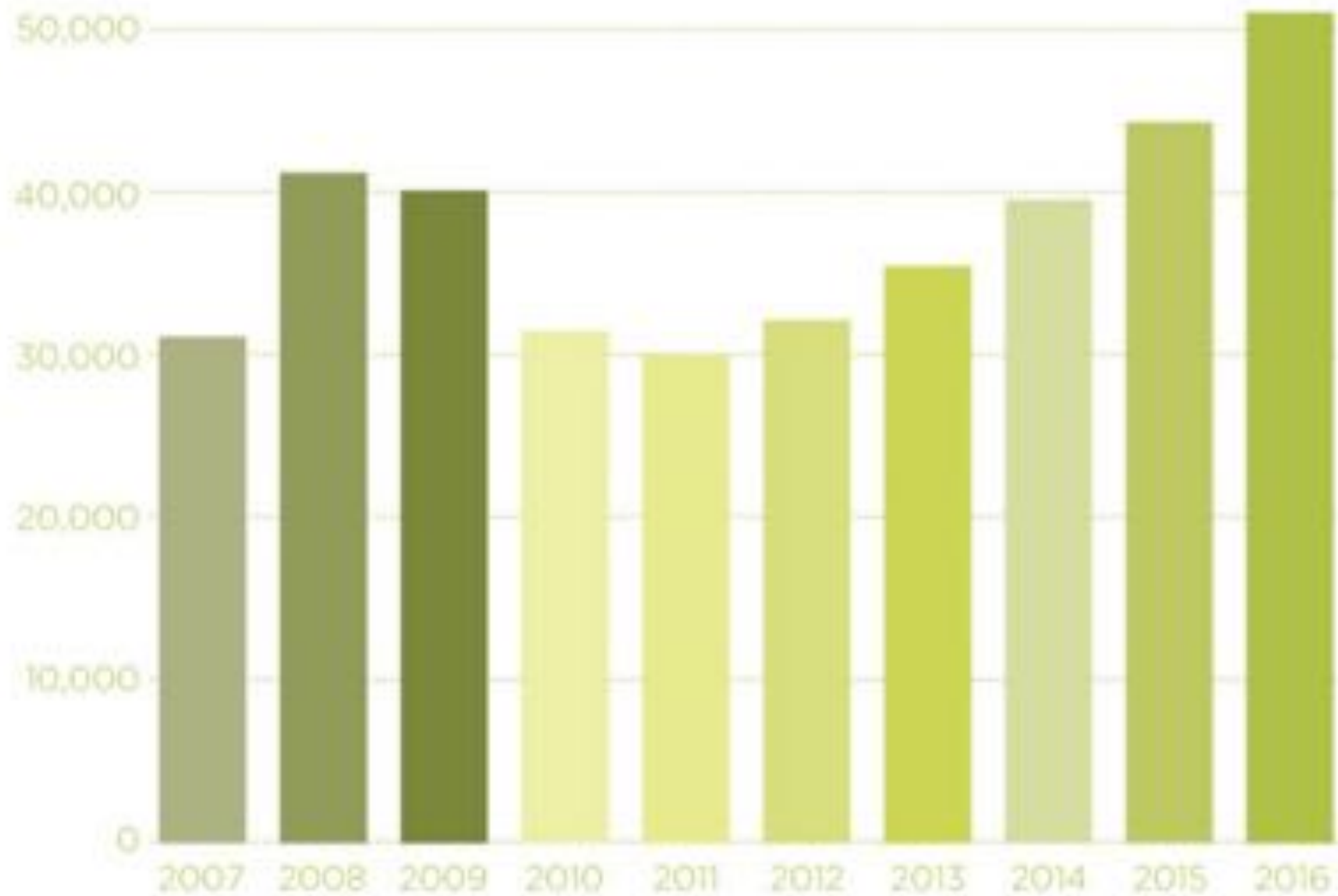
+ U.S. NOW WORLD'S
TOP HOP PRODUCER





It is crucial that infrastructure for producing, processing, and marketing match the rate of the expanding crop.

Figure 2: Pacific Northwest Acreage



Source: USDA/National Agricultural Statistics Service

TOP 10 EXPANDED POUNDAGE

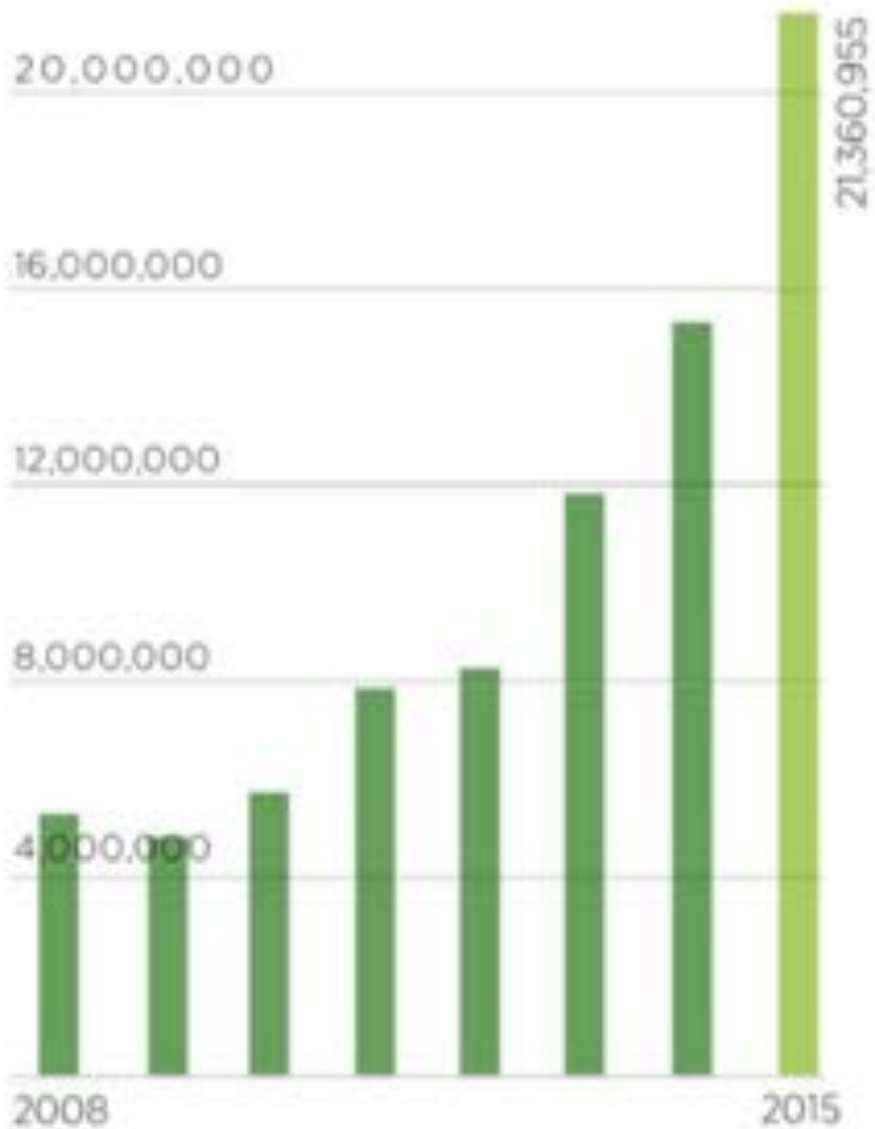
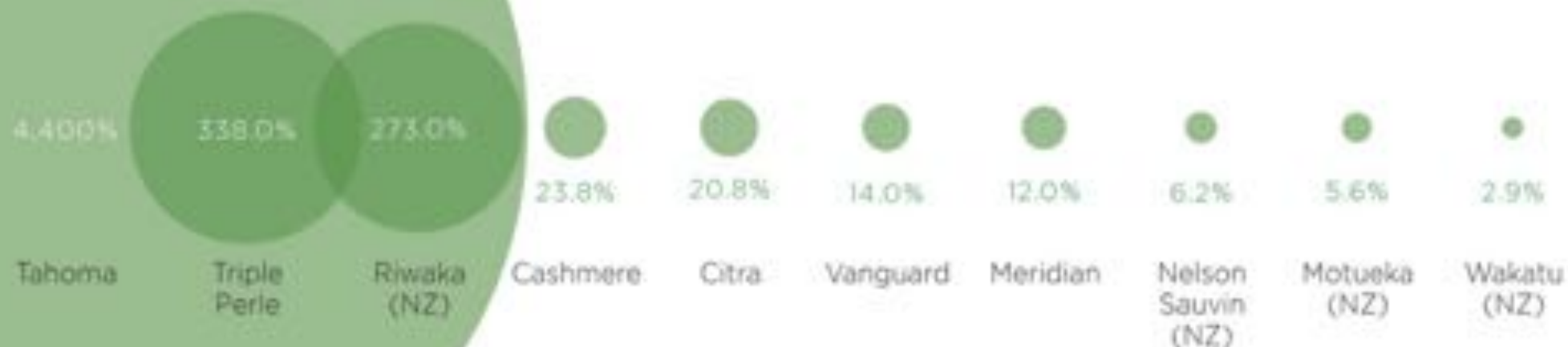


Illustration © Eric Chow, iart.com; photos courtesy of YCH Hops;
Chart by Brian Devine

VARIETY SHORTFALL AS % OF TOTAL POUNDS OF VARIETY USED

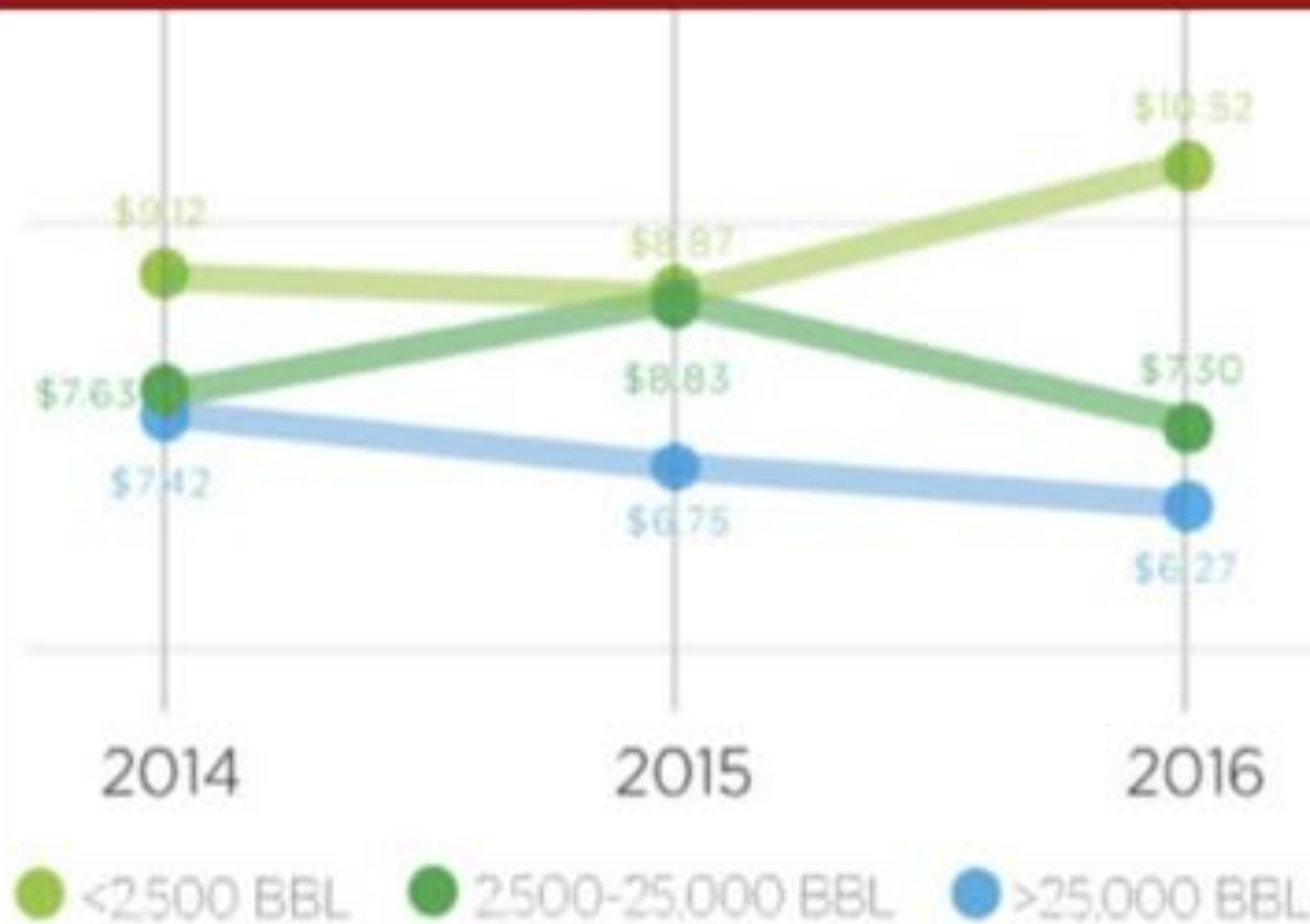


% OF BREWERIES REPORTING A SHORTFALL IN VARIETY



COST OF HOPS

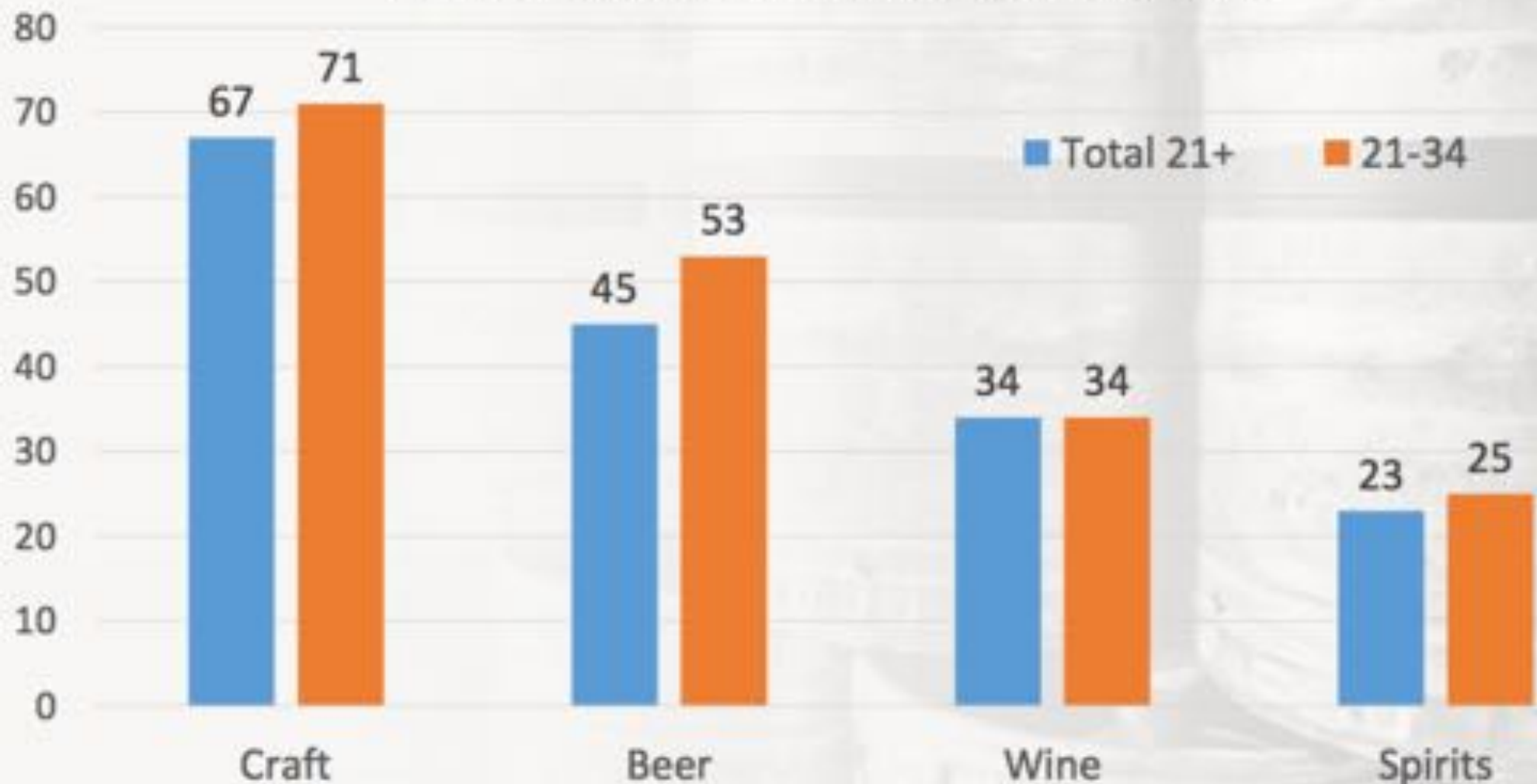
AVG COST \$/POUND



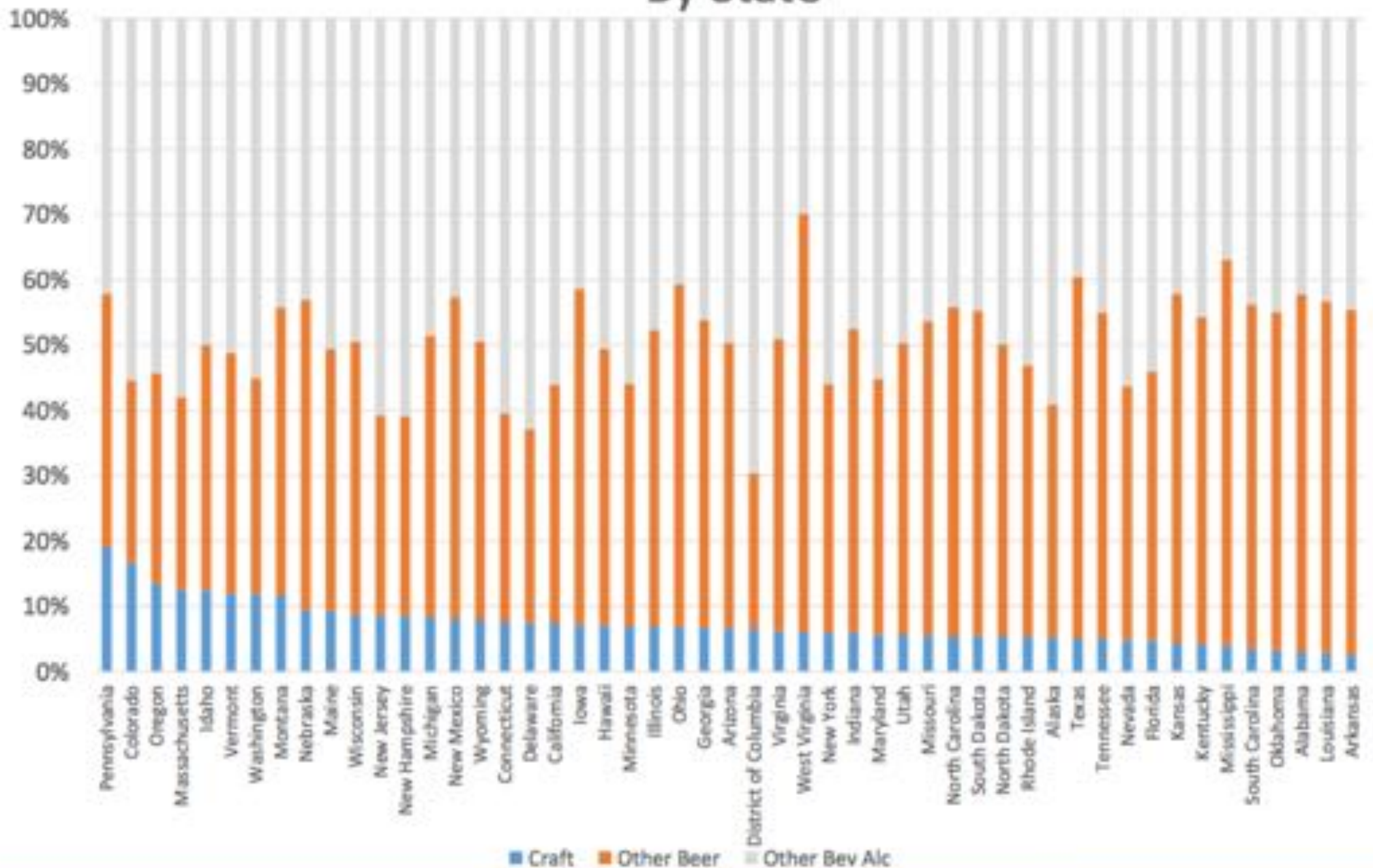


How important is “local” in purchase decisions?

Nielsen Surveys: Sum of very/somewhat important



Craft Brewer/Beer Share of Beverage Alcohol By State



TTB Permitted Brewery Count

7,180 as of 12/31/2016

State	Count	State	Count	State	Count
Alabama	37	Kentucky	60	North Dakota	15
Alaska	36	Louisiana	34	Ohio	236
Arizona	110	Maine	102	Oklahoma	26
Arkansas	34	Maryland	88	Oregon	304
California	927	Massachusetts	146	Pennsylvania	333
Colorado	386	Michigan	379	Rhode Island	17
Connecticut	76	Minnesota	165	South Carolina	59
Delaware	25	Mississippi	14	South Dakota	21
DC	13	Missouri	116	Tennessee	101
Florida	264	Montana	79	Texas	266
Georgia	69	Nebraska	47	Utah	34
Hawaii	23	Nevada	44	Vermont	73
Idaho	67	New Hampshire	73	Virginia	209
Illinois	244	New Jersey	96	Washington	424
Indiana	163	New Mexico	86	West Virginia	24
Iowa	94	New York	394	Wisconsin	217
Kansas	47	North Carolina	260	Wyoming	33

Source: NBWA and TTB, 2017.

Green
Blackberry
Prickly
Passion fruit
Citrus

Cascade




Cascade / USA
 Cascade / Australia
 Cascade / Germany / Switzerland
 Cascade / Germany / Switzerland
 Cascade / NZ
 Cascade / New Zealand



New Zealand

The Cascade variety was developed from the crossing of several high yielding, late ripening, large fruited, orange to red fruited varieties with high soluble solids and high acid content. It is a very productive, early ripening variety and is the most widely planted variety in New Zealand.


Cascade
Germany / Switzerland

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Cascade



Cascade
Germany / Switzerland

The Cascade variety was developed from the crossing of several high yielding, late ripening, large fruited, orange to red fruited varieties with high soluble solids and high acid content. It is a very productive, early ripening variety and is the most widely planted variety in New Zealand.

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DRINK MICHIGAN BEER

MIBEER.COM





small-scale 1/2-5 ac.











Small-scale MI processors



small-scale 1/2-5 ac.



15 acres + harvests and bales for others



WOLF 280, + automation panel \$75k+

Louvered dryer- used \$20K

Baler - used \$15K

Buskirk pelletizer \$80K

Pole barn \$80K+

MICHIGAN HOP ALLIANCE



An aerial photograph of a hop farm in Michigan. The image shows neat rows of hop plants in a field, with a dirt road curving through them. In the background, there is a dense forest and a large body of water under a clear sky. The text is overlaid on the image.

MICHIGAN GROWN, MICHIGAN PROUD
#MICHIGANHOPS

1 0 7 5 1











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[ABOUT](#) [TEAM](#) [BOP VARIETIES](#) [CONTACT](#)





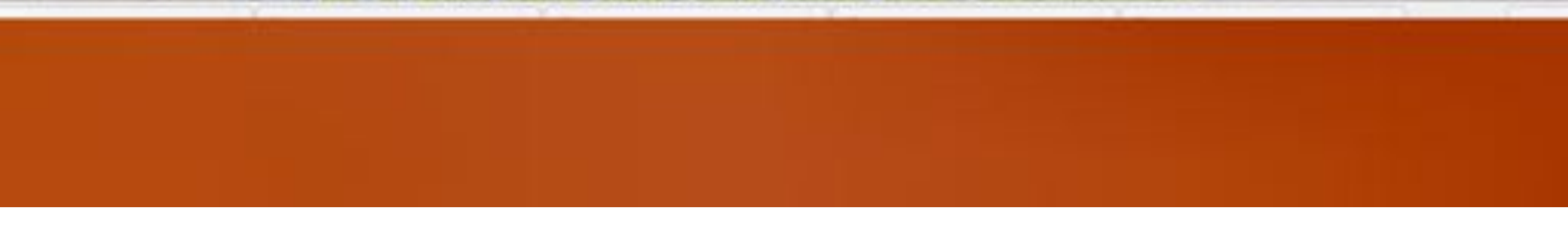






MI LOCAL HOPS

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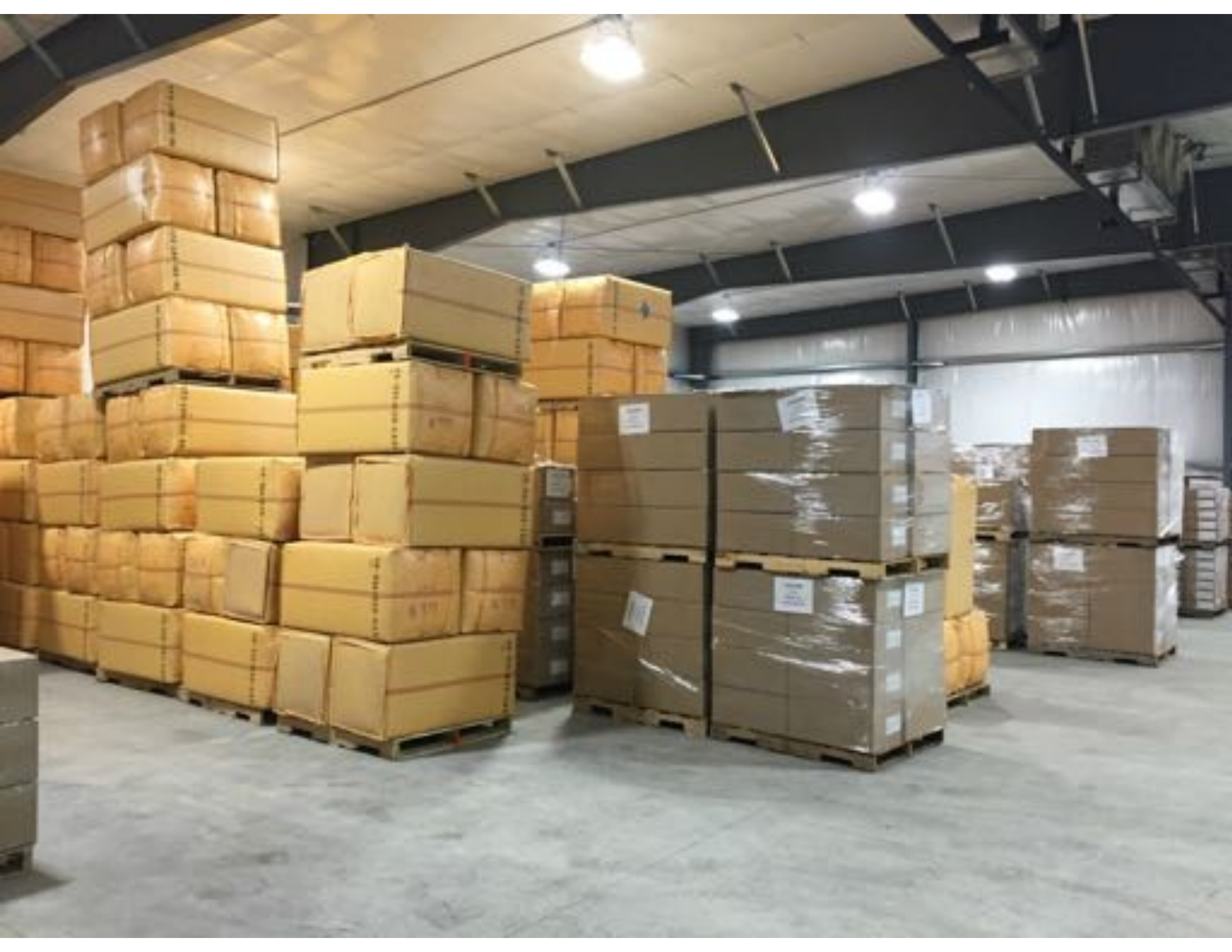














200 ac + other growers

30,000 sq ft. harvest facility (WOLF 1000)

15,000 sq ft. processing center and cold storage

A tall, clear glass filled with a golden-brown beer, topped with a thick, white head of foam. The glass is set against a plain, light-colored background. The beer has a slightly hazy appearance, and the foam is very dense and creamy. The glass is positioned in the center of the frame, with a soft shadow cast to its right.

J Robert Serrine
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