Achieving Sustainability in Montana Vineyards and Orchards

What role do wine and cider have in supporting a vibrant farm economy?

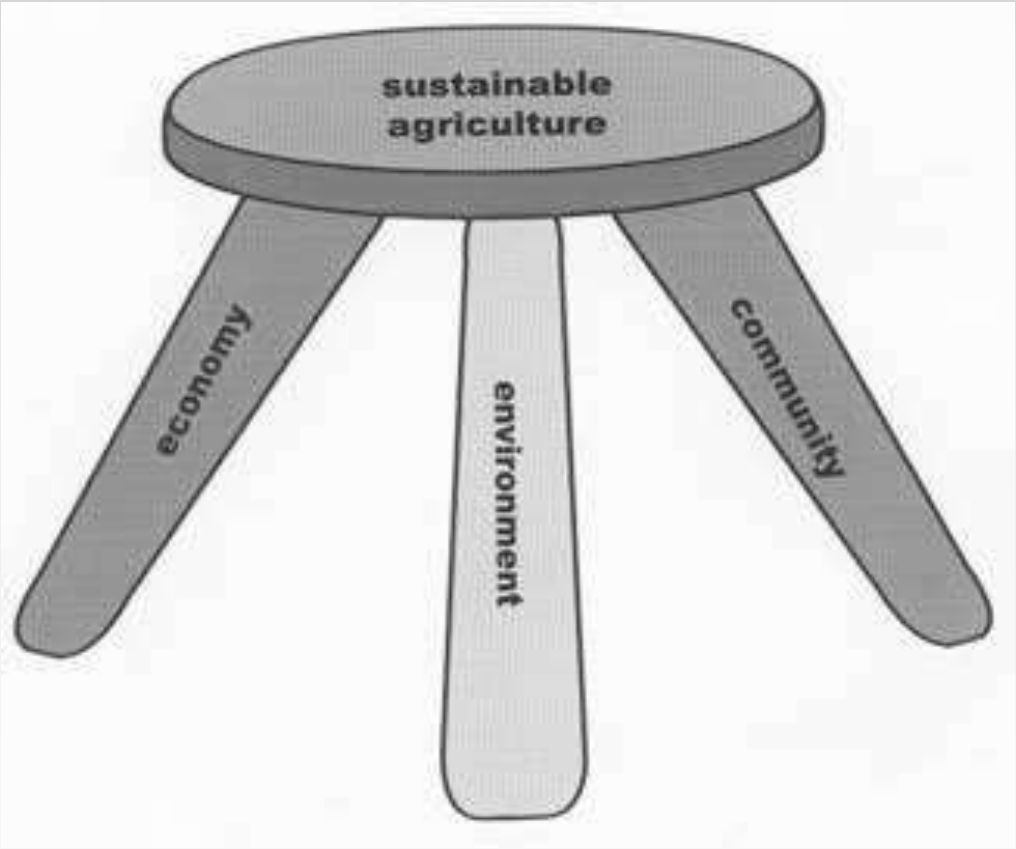
DR. TERENCE BRADSHAW
UNIVERSITY OF VERMONT

MONTANA GRAPE AND WINE ASSOCIATION
5TH ANNUAL MEETING
HELENA. MT MARCH 22, 2019

What is Sustainability?

UVM's definition derives from the U.N. Brundtland Commission in 1987, which stated:

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."



https://www.cias.wisc.edu/curriculum-new/module-i-section-a/

Environment

Environmental Impacts of Orchards & Vineyards

http://agresearch.montana.edu/warc/guides/Orchard_Design.html

https://www.hcn.org/issues/42.21/farmings-toxic-legacy

Count yourselves lucky?

Essentials of Sustaining Agricultural Production
(McGuire, 2015)

1. Protect the soil

/cover-crops/page/2/

Essentials of Sustaining Agricultural Production

(McGuire, 2015)

1. Protect the soil
2. Maintain soil fertility

Macro Elements:	
Nitrogen	(N)
Phosphorous	(P)
Potassium	(K)
Magnesium	(Mg)
Calcium	(Ca)
Sulfur	(S)

Micro Elements:	
Manganese	(Mn)
Iron	(Fe)
Boron	(B)
Copper	(Cu)
Zinc	(Zn)
Molybdenum	(Mo)

http://bulletin.ipm.illinois.edu/?p=2645

http://blogs.uvm.edu/cvcrops/category/cover-crops/page/2/

Essentials of Sustaining Agricultural Production
(McGuire, 2015)

1. Protect the soil
2. Maintain soil fertility
3. Use water efficiently

http://glisa.umich.edu/media/files/page/reports/GLISA_ProjRep_Purdue.pdf

/cover-crops/page/27/

Essentials of Sustaining Agricultural Production

(McGuire, 2015)

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4. Protect the crop

http://blog.uvm.edu/cvc
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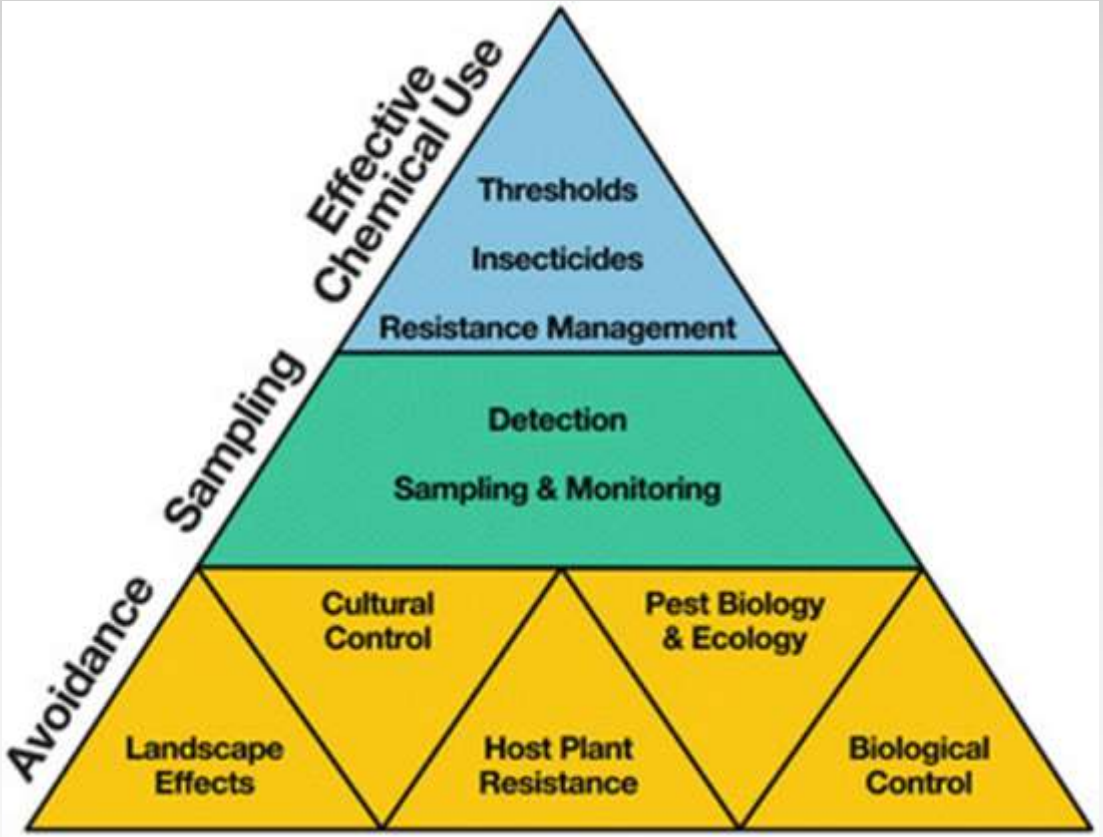


http://blog.uvm.edu/cvcrops/category/e[illegible]e/2/

(Naranjo 2011)

Economic

Farm business and the industries they support (and that support them) must be profitable

CITIZEN CIDER | OUR STORY | CIDERS | ORCHARDS | TASTING ROOM | CIDER LIFE | EVENTS | LOCATOR | SHOP | GET IN TOUCH

We use 100% locally sourced apples and cider for 100% of our products, 100% of the time. Meet the great local farmers who are growing the cider apples we use to make our cider; they're the best citizens we know.

Cider Makers Survey: Prices paid per bushel

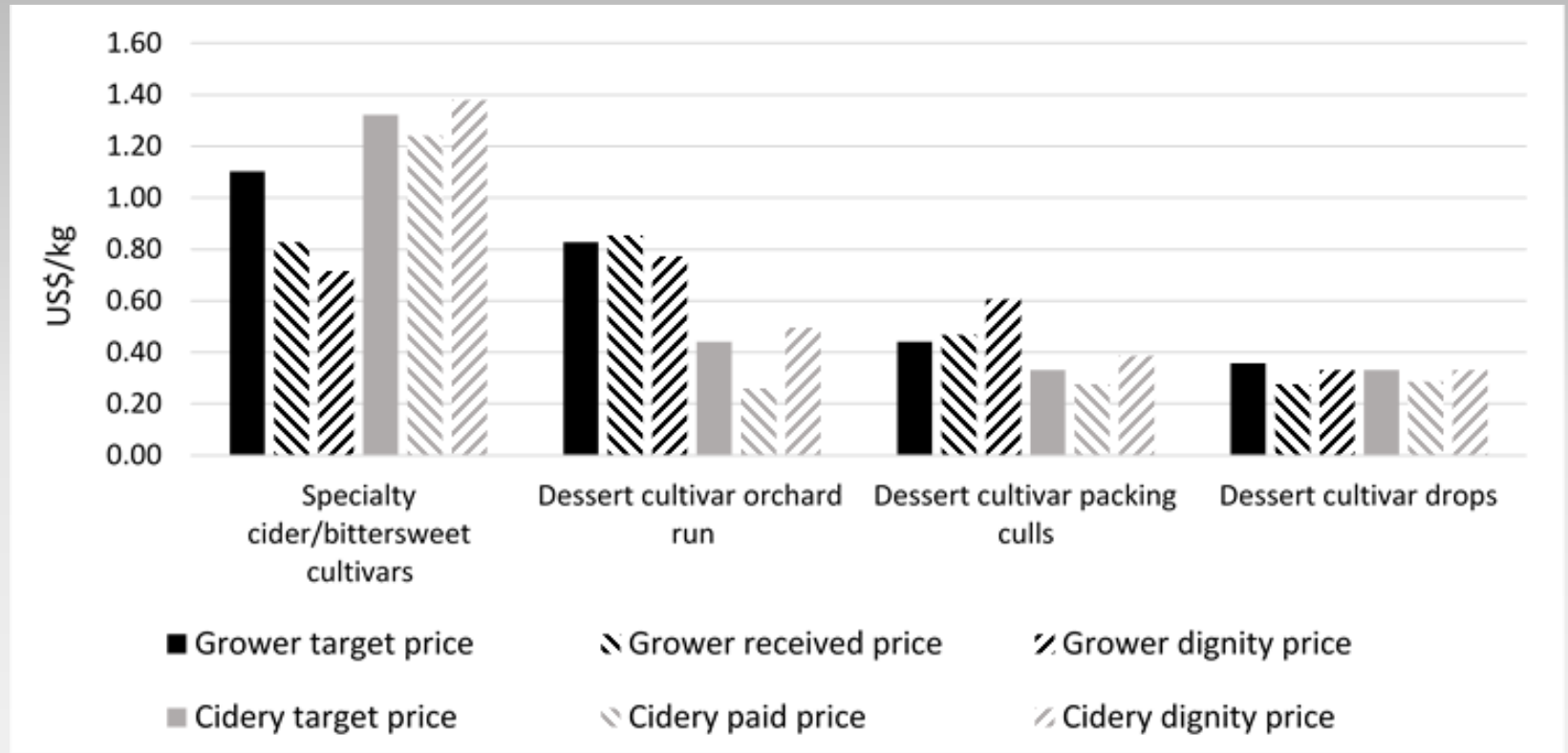


Figure 1. Median prices received and paid for apples to be used in cider production (growers: n = 9 and cideries: n = 5)

Becot, F. A., T. L. Bradshaw and D. S. Conner (2016). "Apple Market Optimization and Expansion through Value-Added Hard Cider Production " HortTechnology **26**(2): 220-229.

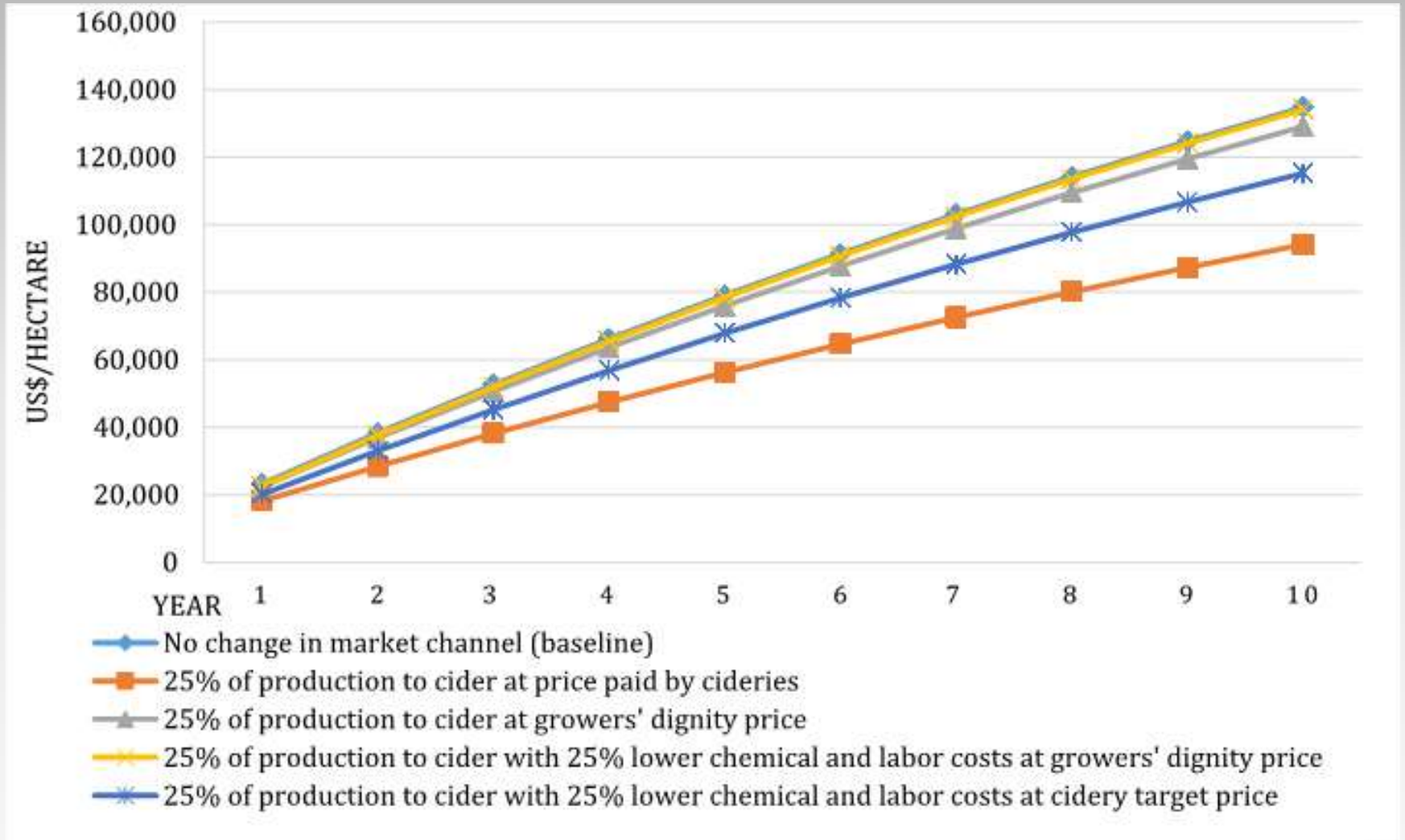
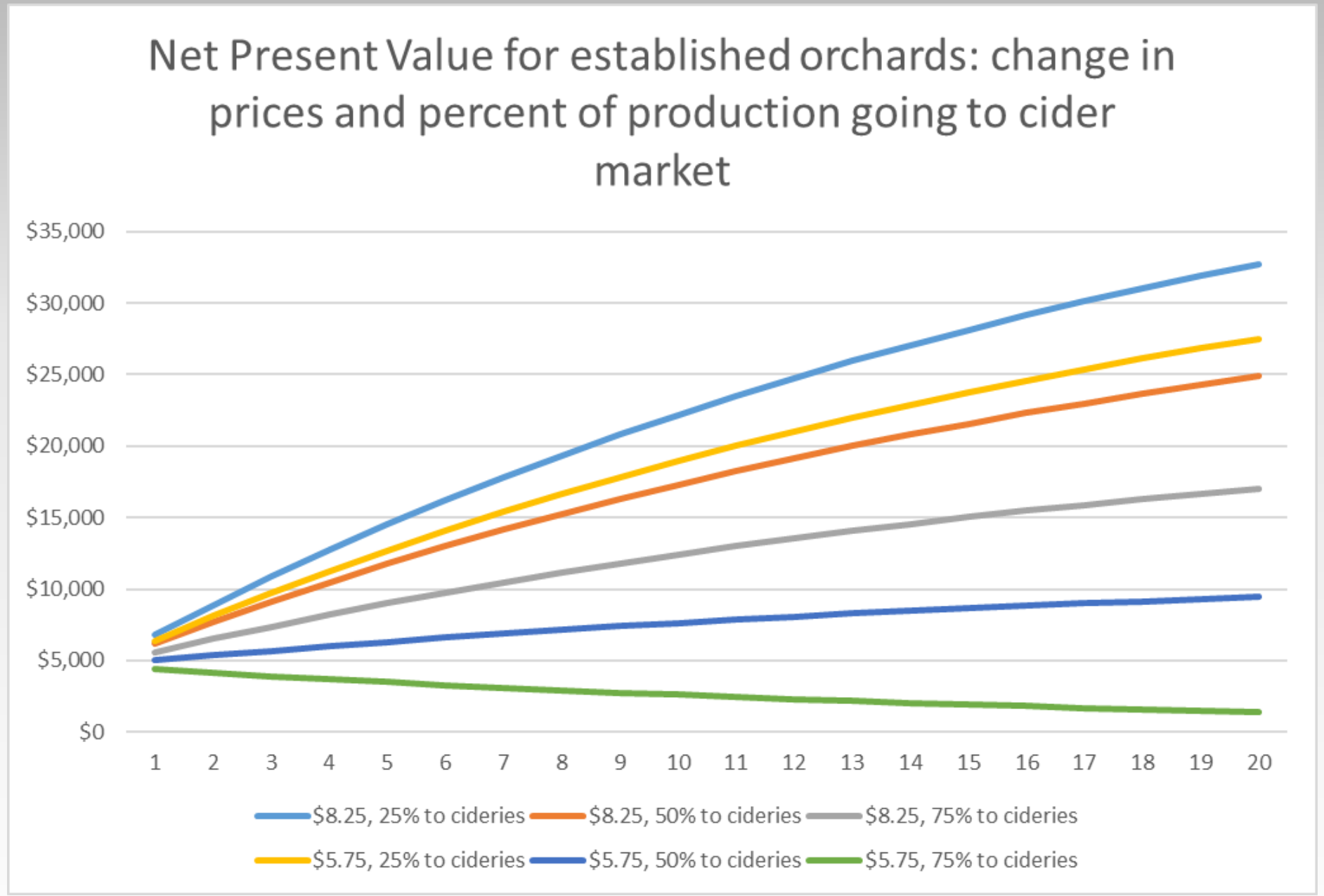


Figure 2. Net present value for small scale orchard selling 25% of the dessert cultivar orchard run production to cider under various price and management scenarios.

Becot, F.A., Bradshaw, T.L., and Conner, D.S., 2016. Growing apples for the cider industry in the U.S. Northern Climate of Vermont: Does the math add up? *Acta Hort*. In press.


Net Present Value for established orchards: change in prices and percent of production going to cider market
$35,000
$30,000
$25,000
$20,000
$15,000
$10,000
$5,000
$0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
$8.25, 25% to cideries
$8.25, 50% to cideries
$8.25, 75% to cideries
$5.75, 25% to cideries
$5.75, 50% to cideries
$5.75, 75% to cideries

2015 Vermont Vineyard Feasibility Study

Mark Cannella

Farm Business Specialist

Mark.Cannella@uvm.edu

802-223-2389

The Next 25 Years in Vermont

- Will we have grape sellers ?

Best Practices

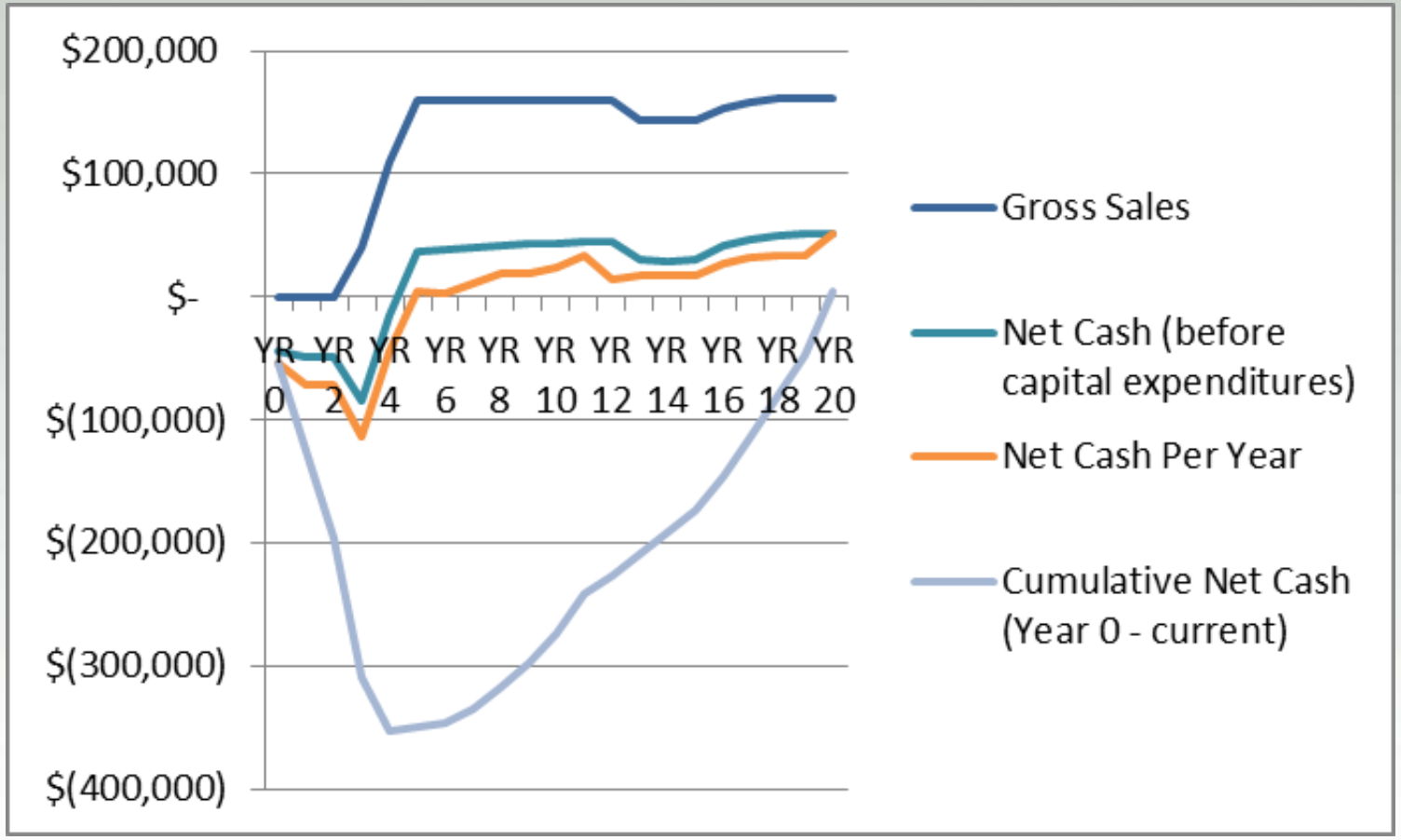
Right Sizing

Viability

UNIVERSITY OF VERMONT EXTENSION
CULTIVATING HEALTHY COMMUNITIES

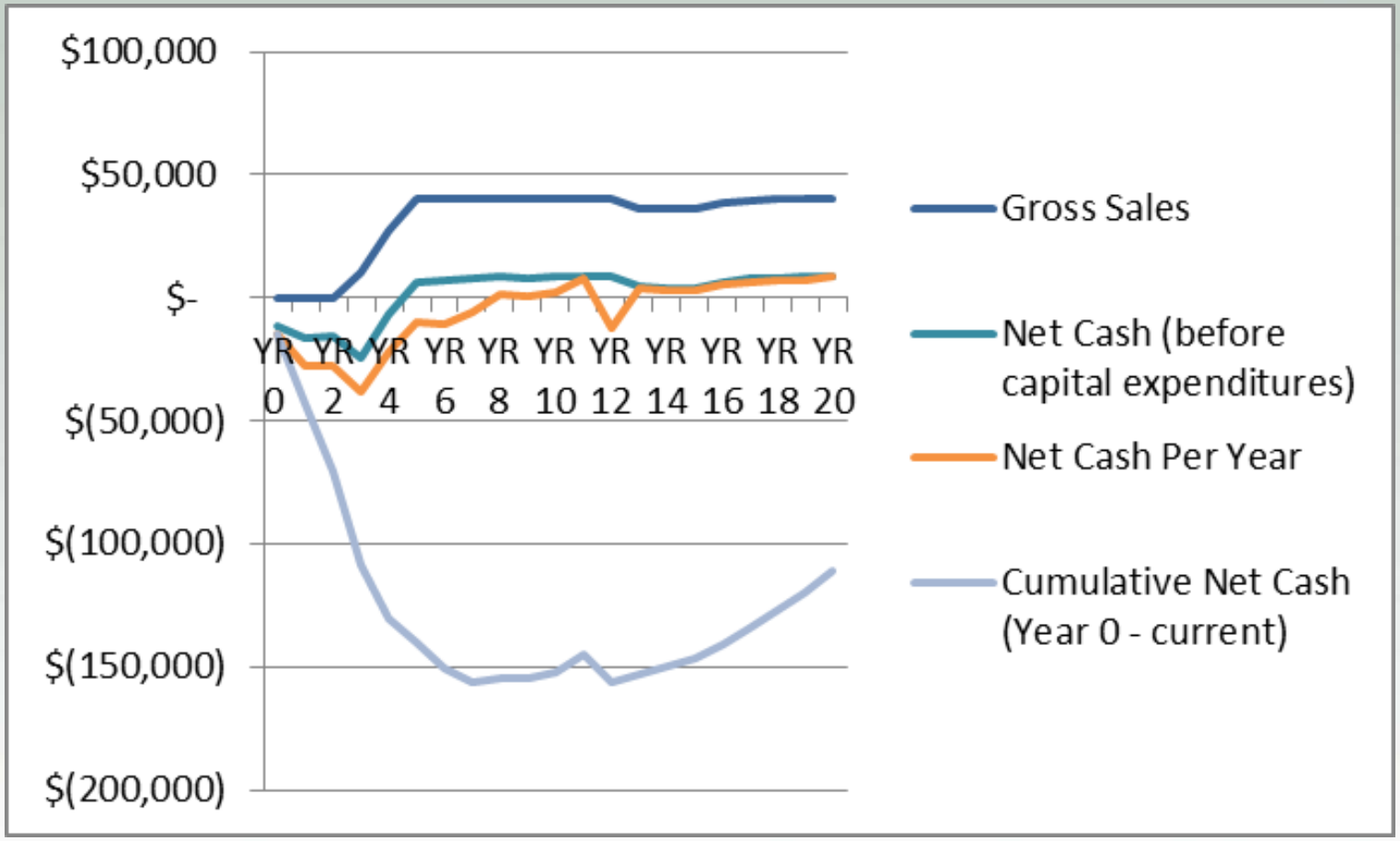
20 Acre Vineyard

- Positive cash flow after year 5
- Positive cumulative net cash after year *19*
- Assumptions:
  - 4 tons/acre
  - $2000/ton



5 Acre Vineyard

- Positive cash flow after year 8
- No positive cumulative net cash after 20 years
- Assumptions:
  - 4 tons/acre
  - $2000/ton



Where does the money come from?

- 4 tons per acre
- $2,000/ ton =
  $8,000 gross revenue per acre
- 4 tons per acre * 125 gallons wine/ton = 500 gallons wine
- 500 gallons wine *
  5 bottles/gallon = 2500 bottles
- 2500 bottles * $15 each=
- **$37,500 gross revenue wine per acre**

http://ediblenetwork.com/greenmountains/editorial/winter-2014/vermont-wine-party/

UNIVERSITY OF VERMONT EXTENSION
CULTIVATING HEALTHY COMMUNITIES

Income = Quantity * Price

QUANTITY

Reduce risk

Improve horticultural management

Improve farm efficiency

PRICE

Quality = Price

Get the price you need to for your crop

Buy what you can't affordably grow

Cultivar selection for quantity and quality (price)

Know your climate and what works in it

Grapes:

- Most Minnesota cultivars hardy to -20, -30°F
- Not all “Hardiness” is equal

General Cold Hardiness of Select Grape Varieties in Vermont

Very Hardy (riparia-based)
- Kay Gray, Sabrevois, Prairie Star, Frontenac, LaCrescent, *Plocher cultivars*

Hardy
- Marquette, LaCrosse, St Croix

Less Hardy
- Marechal Foch, Leon Millot, Seyval, Cayuga, Corot Noir

Protection necessary
- Vignoles, Vidal blanc, Baco noir

Not hardy
- Pinot noir, Riesling, Zweigelt, Traminette

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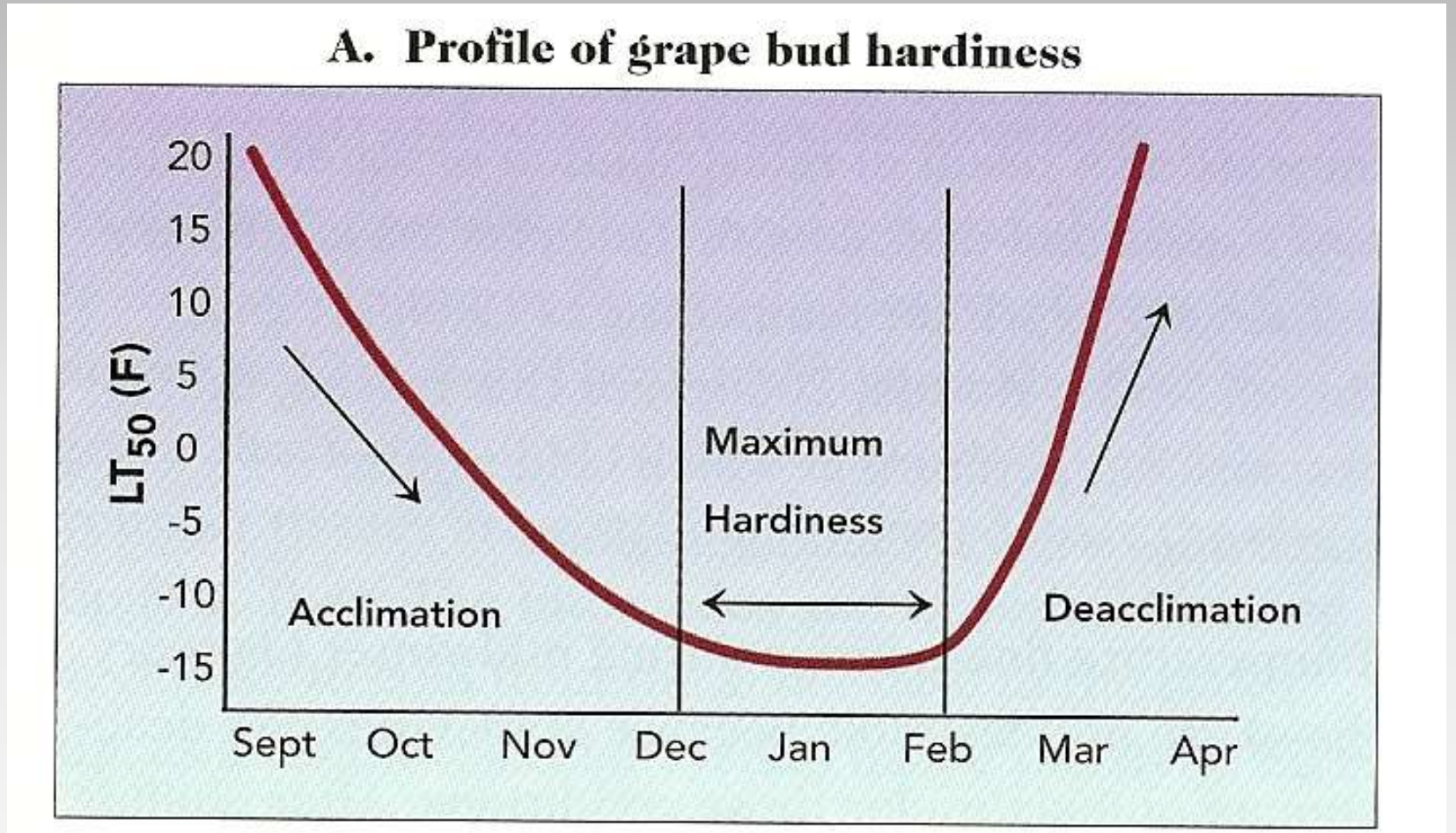
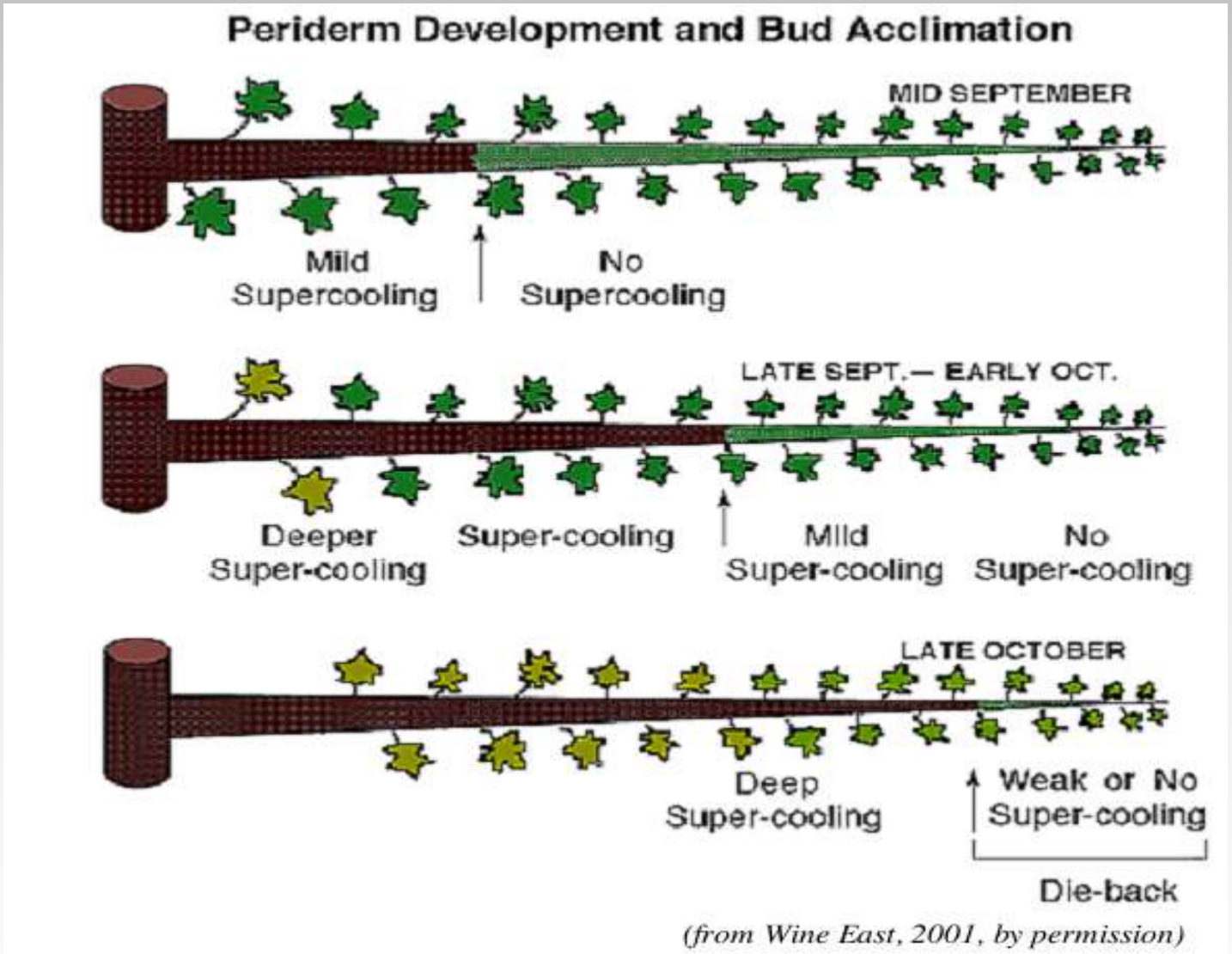
Seasonal grape bud hardiness curve



Zabadal et.al. 2007, “Winter Injury to Grapevines and Methods of Protection”

Grapevine acclimation

- Acclimation is an active process
- Requires resources from the vine during ripening and immediately after harvest
- Management will improve acclimation = hardiness = yield



Management factors that affect cold hardiness

Improves cold hardiness:	Decreases cold hardiness:
Site selection!!	Poor site selection
Good soil drainage	Poor soil drainage
Moderate cropping	Over cropping
Canopy exposure to sunlight	Over-dense (shaded) canopy
Good weed control	Poor weed control
Balanced growth	Unbalanced growth
Good vine nutrition	Poor vine nutrition
Good vine moisture	Poor vine moisture

Soil Drainage

Crop load management
With a nod to Andy Farmer

- Getting the yield up (Eastern conditions):
  - Clusters have to get to 90 g.
  - 5 shoots per foot, 2 clusters per shoot. Grow a big canopy.
    - 10 clusters/foot, 6 foot vines = 60 clusters/vine
    - *Dr. Zach Miller recommendation, as well*
  - At 9’ row spacing potential for 4.8 tons per acre.
  - However, we also can occasionally have blind wood and bud damage. Pruning adjustments help correct this.

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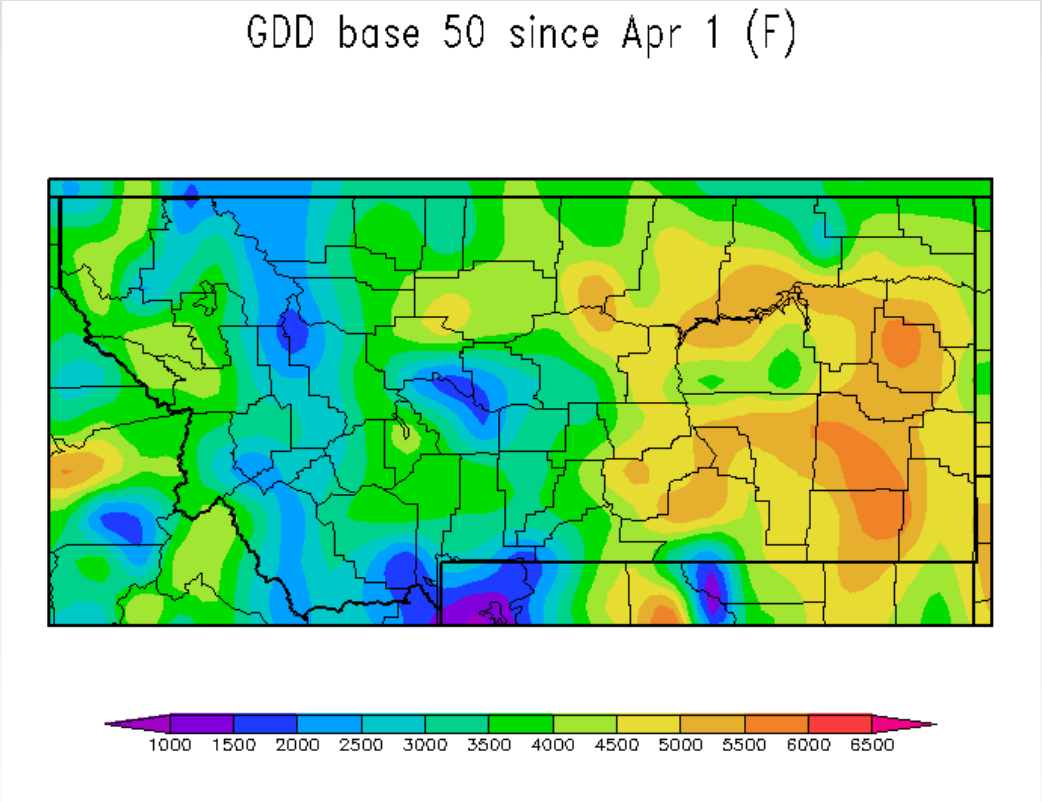
Crop management & Canopy Management Go Hand-in-Hand

Thin shoots early, just past fruit set

Expose fruit early to acclimate to increased sun exposure

- In a cool region, you need to soak up every drop of sun



https://pestweb.montana.edu/Owbm/Home/Gdd

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Keep shoots combed, pull leaves as necessary during the season

‘Corot Noir’ at UVM Vineyard, 7/19/2011

Weed management

Use whatever tools you must, but DO IT!

Herbicides

Many options

- Preemergent Postemergent
- Systemic Non systemic

Consumer/environmental concern

Tree safety

Worker safety

Long-term groundcover management systems trials in New York

Merwin et. al, 1992-2008

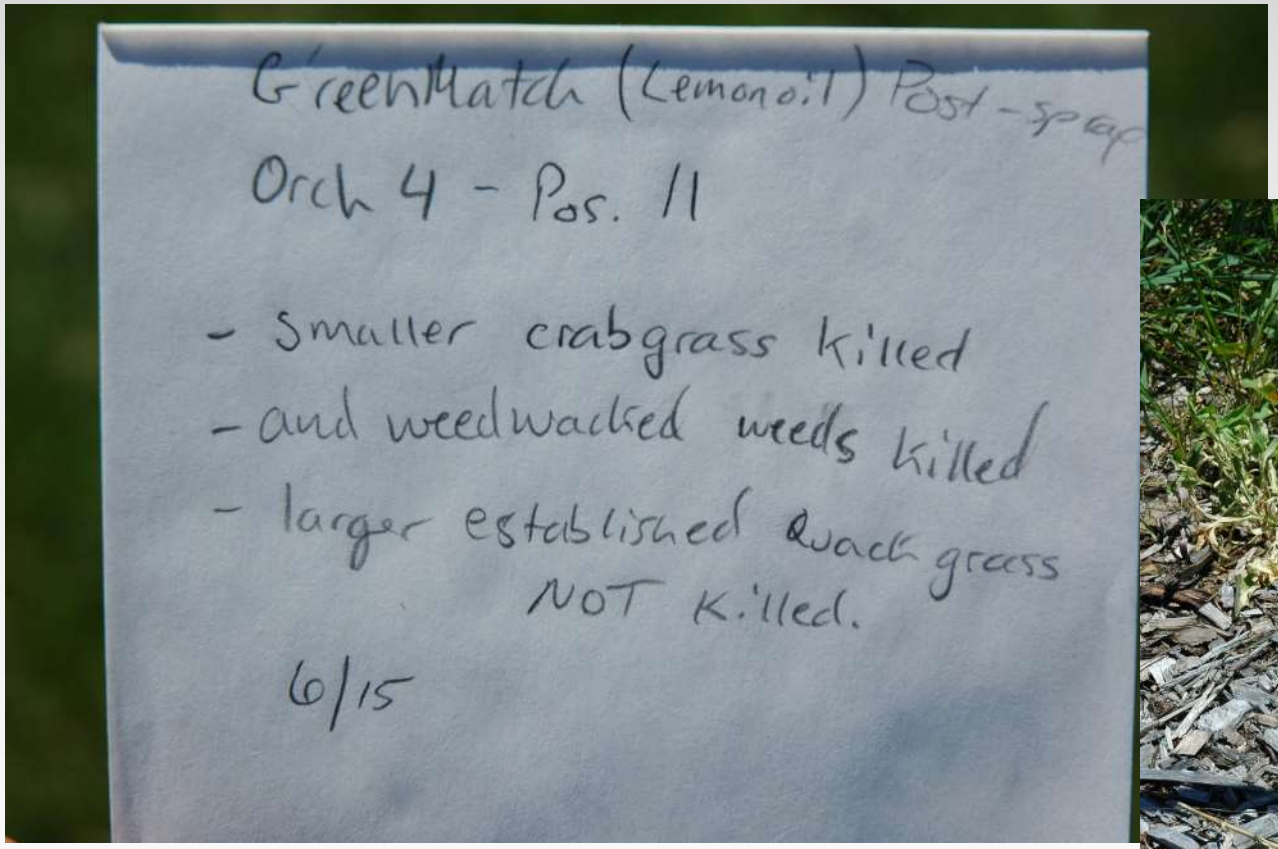
- Tree growth crop yield affected by GMS
  - Mulched & postemergent herbicide peformed best
  - Mowed sod performed worst
  - Preemergent herbicide had greatest root growth but did not translate to yield of tree growth

Take-home- orchard productivity increased by:

- Weed management
- Maintaining soil organic matter

Rhizotron tubes used to examine underground root development in orchard study. Credit: Photo by Ian A. Merwin

Organic herbicides



Constant thread in the literature:
Organic herbicides ineffective in apple orchard systems

Physical Weed Management

Hand weeding
- Labor considerations
- Cost considerations
- FACE IT: It's not going to get done

Cultivation
- In-row
- Between-row
- Careful equipment selection and operation

Some Cultivation Basics

Cultivations should be shallow
- 1-2 inches

Weeds should be small
- No more than 3 inches
- Larger weeds require deeper cultivation

Sun should be out

Soil should not be saturated

Rocks??

Weed Badger™

Ground-driven Wonder Weeder

Mulching

Organic material applied to smother weeds and conserve moisture

Increase soil organic matter

Cost

Application method

Vole habitat?

Shift of weed species

Reduction in soil temperature

Mulching

Mowed sod

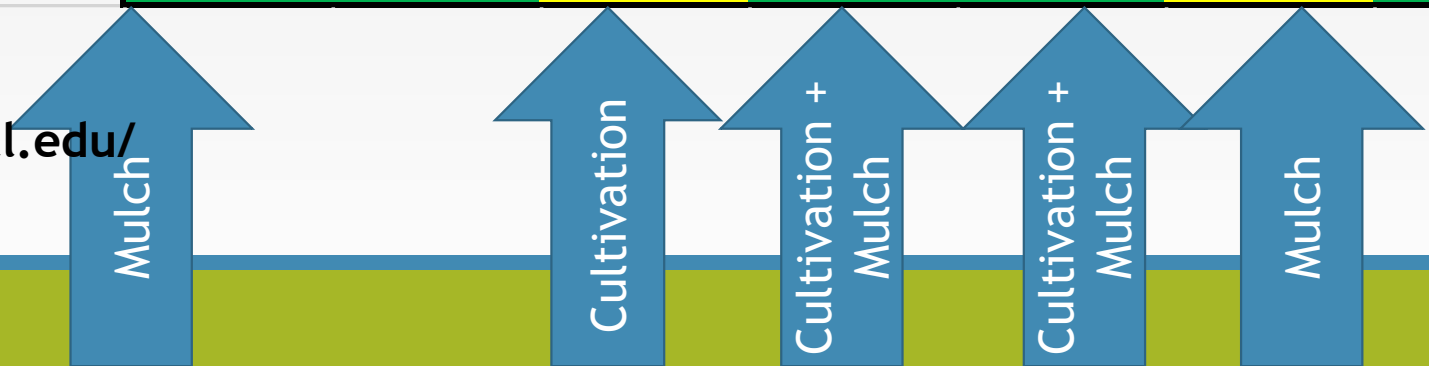
- Consistent treatment in Merwin's long-term studies
- Consistently under-performing for most metrics (tree growth, crop yield, soil N, etc.)
- Cheap

Effective on vigorous plantings

  - Especially if started on herbicide or other regime

Year	2007	2008	2009	2010	2011	2012	2013
Orchard	1	1	1	1	1	1	1
Row (1=tree; 2=drive)	1	1	1	1	1	1	1
	5/1/2007	4/23/2008	4/17/2009	4/20/2010	4/18/2011	6/1/2012	4/16/2013
Aggregate stability %	74.2	59.6	62	65.4	64.3	55.0	61.0
Available water capacity (m/m)	0.1	0.1	0.1	0.11	0.08	0.12	0.10
Surface hardness index	100	84	176	72	50	34	95
Subsurface hardness index	308	230	348	358	290	356	158
Organic matter %	3.8	4.3	3.1	5	3.7	4.3	3.4
Active carbon ppm	724	604	680	562	879	562	707
Pot. min. N (µg/gdwsoil/wk)	19.6	14	26.9	12.8	48.1	3.1	16.1
Root health rating	2.7	4.8	3.7	3.4	5.7	3.5	4.0
pH	7.2	7.2	7	7.2	7.1	7.3	7.3
Extractable P	101	90.5	95.5	82.1	59.6	99.6	73.6
Extractable K	250	253	180	122	107.9	241.9	244.1
Overall	75	77.5.	68	73.1	73.8	63.5	74.6

Tree row soil Q
https://soilhealth.cals.cornell.edu/



Disease management

Management factors that affect cold hardiness

IMPROVES COLD HARDINESS:

Site selection!!

Good soil drainage

Moderate cropping

Canopy exposure to sunlight

Good weed control

Balanced growth

Good vine nutrition

Good vine moisture

DECREASES COLD HARDINESS:

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Cultivar selection

Apples

- Traditional MT cultivars selected for cold hardiness
- Newer cider cultivars often originated in a completely different climate
- Cold hardiness not well-tested on them in diverse production regions in U.S.
- Test blocks, follow MSU research

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http://agresearch.montana.edu/warc/research_current/cold_injury_and_pest_management.html

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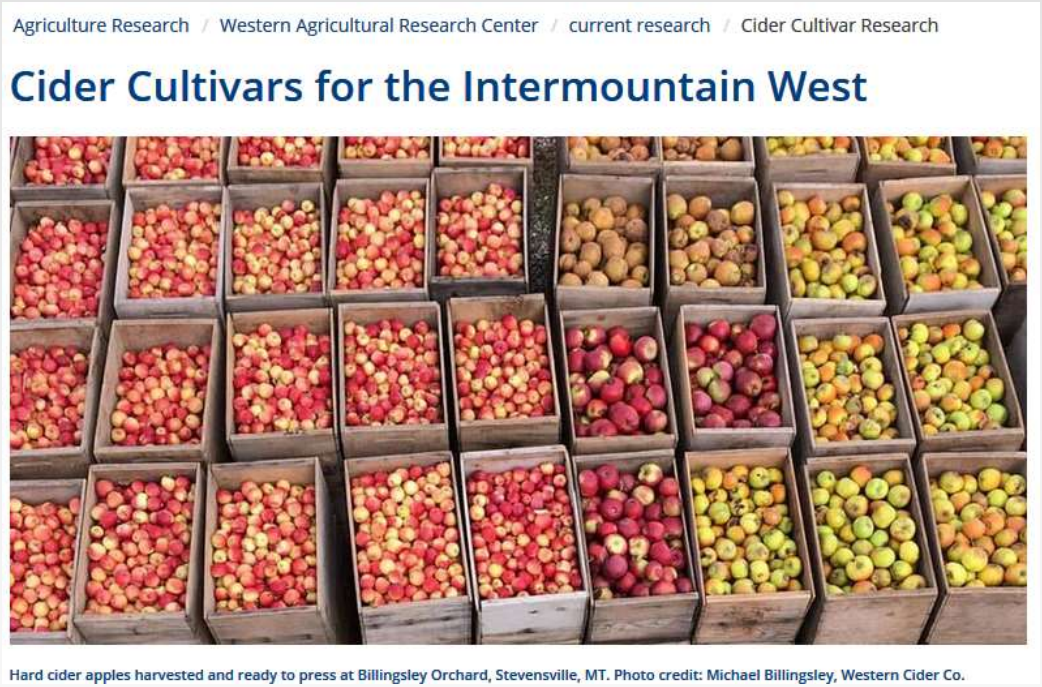

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Cultivar selection

Apples

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- Newer cider cultivars often originated in a completely different climate
- Cold hardiness not well-tested on them in diverse production regions in U.S.
- Test blocks, follow MSU research
- Learn from fellow growers

https://www.abcfoxmontana.com/news/missoula-s-western-cider-hosts-cider-tree-sale/

Price…

Management factors that affect fruit (& wine) quality (& price)

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Social:
Farming and Fermenting in the Community

THE CITIZEN

HOME | CHARLOTTE | HINESBURG | SECTIONS | COLUMNS | MILESTONES | CALENDAR | CLASSIFIEDS

CONTACT | SUBMIT A CLASSIFIED AD | ADVERTISE WITH US!

Mt. Philo Hops farm stirs controversy as project unfolds

By Gail Callahan on July 27, 2017 · 3 Comments

Above, the Mt. Philo Hops site is being prepared for planting next year. At right, hops bines grow in a Michigan field the Vermont growers visited recently. – *Photo by Garrett Brown*

Recent Posts

- Josh Panda Band headlines h Old Lantern
- Family questions suicide rulin
- Why are the snakes crossing t
- Meetings
- Hinesburg Safety Log
- Community Notes
- Charlotte Democrats elect tow officers at caucus
- E. Charlotte Tractor Parade r Sunday

Hops farm neighbors vent concerns to town

By Gail Callahan on August 31, 2017 · 1 Comment

By Gail Callahan

The Charlotte Selectboard's meeting this week was fraught with emotion as Mt. Philo Hops owner Peter Briggs and manager Julian Post defended their planned project to neighbors, while promising to work hard and manage the project well.

The two-hour session gave residents of the neighborhood near the hops farm site along Palmer Lane and East Thompson's Point Road an opportunity to voice concerns about water, expected pesticide use, and the impact the farm may have on scenic views. Countering that criticism were several experts invited by town officials and the farm owners – individuals from the Vermont Land Trust, a hydrogeologist, an expert on growing hops, and a state agriculture staffer whose expertise is pesticides.

THE CITIZEN

Shelburne Vineyard continues winning ways in wine competition

By The Citizen on July 30, 2014 · Comments Off

Shelburne Vineyard recently received their results from the three competitions they entered this year, and they couldn't be happier.

In the 2014 Atlantic Seaboard event, Shelburne Vineyard's wines were tasted alongside 572 other wines from roughly 112 wineries in states along the Atlantic Coast. The vineyard was one of the few wineries that received more than one "Best of Category" designation, taking that title for their 2013 LaCrescent white wine and their 2013 Harvest Widow's Revenge, a red wine

Recent Posts

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- E. Charlotte Tractor Parade rolls through town Sunday

THE CITIZEN

Not just apples: Bumper peach crop a sweet surprise

By *The Citizen* on *September 7, 2017* · *No Comment*

– *Photo by Chea Waters Evans*

Kim Torrey of Williston found out about the bumper crop of peaches earlier this summer when she went to Shelburne Orchards to pick sour cherries and immediately added herself to the email lottery list. Here, she chats with orchard owner Nick Cowles.

Sample Spray Guide

Growth Stage	Target Pathogen	Fungicide	FRAC
Dormant	**PLC**	Copper or chlorothalonil (either autumn leaf fall or before bud swell in spring)	M
Pink	**BR/BB**	Topsin M + captan	1 + M
Full Bloom	**BR/BB**	Indar	3
Petal Fall	**BR, BS, S**	Mycoshield + Topsin M + captan (oxytetracycline for bacterial spot)	41 + 1 + M
Shuck Split	**BR, BS, S**	Mycoshield + Gem + Indar (oxytetracycline for bacterial spot)	41 + 11 + 3
First Cover	**BR, S**	Topsin M + captan (copper for bacterial spot*)	1 + M
Second Cover	**BR, S**	Gem + Indar (copper for bacterial spot*)	11 + 3
Third Cover	**BR, S**	Topsin M + captan	1 + M
Fourth Cover	**BR, S**	Gem + Indar	11 + 3
Fifth Cover	**BR, S**	Fontelis	7
Post Harvest	**BR**	Captan or Fontelis	M or 7

VERMONT
Wine & Harvest
FESTIVAL

UNIVERSITY OF MINNESOTA | EXTENSION

EXTENSION CENTER FOR COMMUNITY VITALITY

Vineyards and Wineries in the New England States

A STATUS AND ECONOMIC CONTRIBUTION REPORT

Authored by: Brigid Tuck, Extension Center for Community Vitality, and William Gartner, Department of Applied Economics

farm to plate

STRENGTHENING VERMONT'S FOOD SYSTEM

LOG IN | SUPPORT farm to plate | Get Connected click here

Entire Site | Keyword, person, location | GO | SEARCH | THE ATLAS

THE PLAN | THE NETWORK | GETTING TO 2020 | RESOURCES | THE ATLAS

BACK TO NEWSFEED

FLAG HILL FARM WORKS WITH VERMONT LAND TRUST TO CONSERVE FOREST, ORCHARD, AND TRAIL

Posted February 1, 2018 at 10:30am by Sophia Veltrop
www.vlt.org

Sabra Ewing and Sebastian Lousada of Flag Hill Farm worked with the Vermont Land Trust to permanently protect 239 acres of farmland and forest from development and subdivision. As part of the project, the couple also ensured public access to the westernmost section of the Cross Vermont Trail, which leads up to Flag Pole Hill.

The couple became interested in conserving their land through the Taylor Valley Conservation Project, a community-led initiative to conserve land within a 17,800-acre region. This area is important to protect because of large tracts of working forests, many hunting and recreation opportunities, and rare and valuable ecosystems.

Thank You!

Terence Bradshaw

tbradsha@uvm.edu