Constraints and Opportunities in Growing Apples for the Cider Market

VERMONT TREE FRUIT GROWERS ASSOCIATION ANNUAL MEETING
FEBRUARY 15, 2018
Annual Cider Category CE Vol

In Thousands

<table>
<thead>
<tr>
<th>Year</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015 Est</th>
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<tbody>
<tr>
<td>Vol</td>
<td>4,245</td>
<td>4,673</td>
<td>5,616</td>
<td>9,800</td>
<td>16,148</td>
<td>27,169</td>
<td>32,602</td>
</tr>
</tbody>
</table>

Source: Beer Institute, TTB and Commerce Department 2014. 2015 - BBC Projections
Production and Prospects in Vermont

• Growth of industry is seen as an opportunity for apple growers and cider makers

• But
  • Adequate apple price is a threat for growers
  • Adequate fruit supply is a threat for cider makers

## What the Cider Makers Want

<table>
<thead>
<tr>
<th>Dessert</th>
<th>Dual-Purpose</th>
<th>Specialty cider</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cortland (1)</td>
<td>Ashmeads Kernel (4)</td>
<td>Ashton Bitter (1)</td>
</tr>
<tr>
<td>McIntosh (1)</td>
<td>Calville Blanc (1)</td>
<td>Bittersweet (1)</td>
</tr>
<tr>
<td>Organic empire (1)</td>
<td>Cox's Orange Pippin (1)</td>
<td>Chisel Jersey (1)</td>
</tr>
<tr>
<td>Pinova (1)</td>
<td>Esopus Spitzenberg (4)</td>
<td>Dabinett (4)</td>
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<tr>
<td></td>
<td>Golden Russet (4)</td>
<td>Ellis Bitter (2)</td>
</tr>
<tr>
<td></td>
<td>Liberty (1)</td>
<td>Foxwhelp (1)</td>
</tr>
<tr>
<td></td>
<td>Lodi (1)</td>
<td>Kingston Black (5)</td>
</tr>
<tr>
<td></td>
<td>Northern Spy (3)</td>
<td>Major (1)</td>
</tr>
<tr>
<td></td>
<td>Roxbury Russet (1)</td>
<td>Orleans Reinette (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reine des Reinnette (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Somerset Redstreak (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stoke Red (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wickson (4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yarlington Mill (2)</td>
</tr>
</tbody>
</table>

What orchards are growing

Vermont Apple Cultivar Acreage, 2011

- ‘McIntosh’ family: 81%
- Red Delicious: 6%
- Honeycrisp: 6%
- ‘Desert cider’: 7%
- Other: 7%
- ‘Misc. Heritage var.’: 4%
- Jonagold: 2%
- Jonamac: 2%
- Spartan: 2%
- Macoun: 2%
- Golden Delicious: 2%
- Liberty: 1%
- Empire: 1%
- Cortland: 1%
- Northern Spy: 1%
- ‘Desert cider’ family: 7%

**2015-16 “Kitchen Table” Surveys**

Small scale orchards:
- 11.5 productive acres
- 2015 mean yield 341 bushels per acre

Large scale orchards
- 167.5 productive acres 2015 mean yield 650 bushels per acre.
Table 1. Cost of production by main categories on small and large orchards.

<table>
<thead>
<tr>
<th>Material and labor</th>
<th>Production Costs (US$)</th>
<th>Production costs * ha(^{-1}) (US$)</th>
<th>Production costs * t(^{-1}) (US$)</th>
<th>Percent expenses</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Small orchard</td>
<td></td>
<td></td>
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<tr>
<td>Pruning and training</td>
<td>1,904.00</td>
<td>413.90</td>
<td>26.80</td>
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<tr>
<td>Chemicals</td>
<td>6,303.00</td>
<td>1,370.20</td>
<td>88.60</td>
<td>18.7</td>
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<tr>
<td>Beehive</td>
<td>130.00</td>
<td>28.30</td>
<td>1.80</td>
<td>0.4</td>
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<tr>
<td>Maintenance &amp; Repairs</td>
<td>3,417.00</td>
<td>742.80</td>
<td>48.10</td>
<td>10.2</td>
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<tr>
<td>Harvest</td>
<td>6,727.50</td>
<td>1,462.50</td>
<td>94.60</td>
<td>20.0</td>
</tr>
<tr>
<td>Other(^z)</td>
<td>15,136.50</td>
<td>3,290.50</td>
<td>212.90</td>
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<tr>
<td>Total costs</td>
<td>33,618.00</td>
<td>7,308.30</td>
<td>472.80</td>
<td>100.0</td>
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<tr>
<td></td>
<td>Large orchard</td>
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<td></td>
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<tr>
<td>Pruning and training</td>
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<td>Maintenance &amp; Repairs</td>
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<td>530.30</td>
<td>18.20</td>
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<td>Harvest</td>
<td>192,291.20</td>
<td>2,836.10</td>
<td>97.20</td>
<td>24.9</td>
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<td>Other(^z)</td>
<td>349,098.10</td>
<td>5,148.90</td>
<td>176.50</td>
<td>45.1</td>
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<tr>
<td>Total costs</td>
<td>773,659.60</td>
<td>11,410.90</td>
<td>391.20</td>
<td>100.0</td>
</tr>
</tbody>
</table>

\(^z\)Other includes: miscellaneous supplies and labor, overhead expenses, taxes, insurance, and depreciation.

Net present value

• Method used for comparing two investment options over time

• ‘Time value of money’

@ 6%, ‘Discount rate’ = 0.940 Year 2 - 0.309 Year 20

• Considered different production scenarios

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.
Figure 3. Net present value for large scale orchard selling 25% of the dessert cultivar orchard run production to cider under various price and management scenarios.

Net Present Value for established orchards: change in prices and percent of production going to cider market
New orchard establishment

<table>
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<th>Training system</th>
<th>Est Cost</th>
<th>Trees/ac</th>
<th>Mature Yield</th>
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<tr>
<td>Tall spindle</td>
<td>25000</td>
<td>1000</td>
<td>1100</td>
</tr>
<tr>
<td>Vert axe</td>
<td>15000</td>
<td>600</td>
<td>900</td>
</tr>
<tr>
<td>Freestand CL</td>
<td>8000</td>
<td>250</td>
<td>750</td>
</tr>
<tr>
<td>Standard</td>
<td>4000</td>
<td>100</td>
<td>750</td>
</tr>
<tr>
<td>Established Low</td>
<td>0</td>
<td>250</td>
<td>750</td>
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</tbody>
</table>

Apple Production Scenarios ($US/acre)

- $24/bu **US#1** apples
- 1100 bu/ac tall spindle
- 750 bu/ac FS Cent Lder

$52,162

$118,282

$52,162

$118,282
Apple Production Scenarios ($US/acre)

$24/bu **cider** apples
1100 bu/ac tall spindle
750 bu/ac FS Cent Idr

- **FSCL, FM**
- **TS, Cider**
- **FSCL, Cider**
- **TS, FM**
Apple Production Scenarios

Effect of yield ($US/acre)

$169,805

TS, Cider, 1100 bu
Apple Production Scenarios

Effect of yield
($US/acre)

TS, Cider, 800 bu
TS, Cider, 1100 bu

$200,000
$150,000
$100,000
$50,000
$-

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

$103,770
$169,805

TS, Cider, 800 bu
TS, Cider, 1100 bu
Apple Production Scenarios

Effect of yield
($US/acre)

- TS, Cider, 800 bu
- TS, Cider, 600 bu
- TS, Cider, 1100 bu

$103,770
$59,747
$169,805

$200,000
$150,000
$100,000
$50,000
$0

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

($50,000)
Apple Production Scenarios

Effect of yield ($US/acre)

- TS, Cider, 800 bu
- TS, Cider, 600 bu
- TS, Cider, 600 bu, bienn
- TS, Cider, 1100 bu
Apple Production Scenarios
800 bu/ac, variable fruit price

$103,770

TS, Cider $24
Apple Production Scenarios
800 bu/ac, variable fruit price

- TS, Cider $20
- TS, Cider $24
Apple Production Scenarios
800 bu/ac, variable fruit price

$120,000
$100,000
$80,000
$60,000
$40,000
$20,000
$-
$(20,000)
$(40,000)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

TS, Cider $20  TS, Cider $16  TS, Cider $24

$103,770
$74,078
$44,386
Apple Production Scenarios
800 bu/ac, variable fruit price

- $103,770
- $74,078
- $44,386
- $(14,999)
Labor cost reduction:

NESARE Project ONE16-254: Orchard Pruning for Cider Apple Production
Light interception throughout canopy influences crop yield (Robinson & Lakso, 1991)

- Ignoring differences between cultivars...
- Narrower canopies resulted in higher PAR interception
- High-intensity Y-canopy resulted in highest PAR and crop yield
- Cumulative intercepted PAR was highly correlated ($r^2=0.86$) to crop yield

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Research basis and question:

• Growers are adopting ‘cider orchard management’ on limited acreage
  • Established, dessert cultivars
  • Depreciated orchards
  • Contracts or agreements for fruit purchase
  • Pricing: $6-12/bushel

• At reduced fruit price compared to dessert fruit, but guaranteed markets and reduced packing costs, can pruning labor inputs be reduced to meet price points?
Experimental design

• Two orchards, similar tree age & size:
  • ‘Empire’ M7, pl. 1992, loamy sand
  • ‘McIntosh’ M26, pl. 1980s, clay soil

• Four pruning regimes:
  • No pruning
  • Winter pruning only
  • Summer pruning only
  • Winter + Summer pruning

• Parameters measured:
  • Tree size, % light interception, crop yield, pest damage, USDA grade, juice quality
<table>
<thead>
<tr>
<th>trt</th>
<th>m from ground</th>
<th></th>
<th>Orchard 1</th>
<th></th>
<th>Orchard 13</th>
<th></th>
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</thead>
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<tr>
<td></td>
<td></td>
<td>Trunk</td>
<td>1.0 m</td>
<td>1.5 m</td>
<td>2.0 m</td>
<td>Trunk</td>
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<td>18.5</td>
<td>23.3</td>
<td>9.5</td>
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<td>9.3</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>15.7</td>
<td>23.3</td>
<td>9.5</td>
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<td>1</td>
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<td></td>
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<td></td>
<td>11.3 a</td>
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<tr>
<td>Winter +</td>
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<td>4.1</td>
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<td>24.2</td>
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<tr>
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<td>22.0</td>
<td>20.8</td>
<td>40.8</td>
<td>3.2 b</td>
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<td>14.9</td>
<td>33.5</td>
<td>47.5</td>
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<td>12.1</td>
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<tr>
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<td>3.8</td>
<td>12.0</td>
<td>4.2</td>
<td>3.4 b</td>
<td>6.4</td>
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<td></td>
<td>3</td>
<td>31.0</td>
<td>28.7</td>
<td>21.0</td>
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<td>14.7</td>
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<tr>
<td></td>
<td>2</td>
<td>6.9</td>
<td>28.7</td>
<td>21.0</td>
<td>4.2</td>
<td>14.7</td>
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<td>30.3</td>
<td>29.0</td>
<td>4.4 b</td>
<td>3.4 b</td>
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<td>Summer</td>
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<td>22.5</td>
<td>4.0 b</td>
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</table>

Measurements taken at four transects (N,S,E,W) within canopy compared to above canopy full-light measurement. Data collected with LI-COR LI-190R Quantum Sensor (Lincoln, NE).
### 2016 Yield and packout

<table>
<thead>
<tr>
<th>Orchard</th>
<th>TRT</th>
<th>Kg fruit/tree</th>
<th>Fruit weight (g)</th>
<th>All US#1</th>
<th>utility</th>
<th>cull</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>WP</td>
<td>40.6</td>
<td>161.3</td>
<td>76.3</td>
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<td>WSP</td>
<td>68.7</td>
<td>151.6</td>
<td>84.0</td>
<td>15.3</td>
<td>0.7</td>
</tr>
<tr>
<td>1</td>
<td>NoP</td>
<td>73.9</td>
<td>158.0</td>
<td>76.0</td>
<td>22.7</td>
<td>1.3</td>
</tr>
<tr>
<td>1</td>
<td>SP</td>
<td>30.7</td>
<td>152.0</td>
<td>73.7</td>
<td>21.0</td>
<td>5.3</td>
</tr>
<tr>
<td>13</td>
<td>WP</td>
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<td>114.0</td>
<td>78.3</td>
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<td>SP</td>
<td>62.3</td>
<td>115.9</td>
<td>76.7</td>
<td>23.3</td>
<td>0.0</td>
</tr>
</tbody>
</table>

- No differences in yield, fruit size, or distribution among USDA grades
- Irrigated (orchard 1) vs non-irrigated (Orchard 13)
- Different cultivars (‘Empire’ Orchard 1; ‘McIntosh’, Orchard 13)
- Overall, good crop for low-input system
### Percent packout (USDA grades)

<table>
<thead>
<tr>
<th>Orchard</th>
<th>TRT</th>
<th>Kg fruit/tree</th>
<th>Fruit weight (g)</th>
<th>All US#1</th>
<th>utility</th>
<th>cull</th>
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<tbody>
<tr>
<td>1</td>
<td>WP</td>
<td>68.6 ab</td>
<td>164</td>
<td>83.6</td>
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<td>160</td>
<td>89.3</td>
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<td>161</td>
<td>85.7</td>
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<td>1.3</td>
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<td>SP</td>
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<td>83.9</td>
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<td>WSP</td>
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<td>13</td>
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<td>126 ab</td>
<td>51.0</td>
<td>48.6</td>
<td>0.5</td>
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</table>

- More fruit in one non-pruned orchard
- Summer pruning reduced that yield (cut it off)
- Few differences in fruit weight
- No differences in fruit quality/grade within orchards
### 2016 Juice quality measurements

<table>
<thead>
<tr>
<th>Orchard</th>
<th>TRT</th>
<th>% juice yield</th>
<th>SSC °brix</th>
<th>pH</th>
<th>g/l malic acid</th>
<th>mg/l phenols (GAE)</th>
<th>mg/l YAN</th>
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<td>64.8</td>
<td>11.78</td>
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<td>5.98</td>
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<td>11.48</td>
<td>3.38</td>
<td>5.52</td>
<td>210.14</td>
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<td>1090.41</td>
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<td>7.17b</td>
<td>834.29</td>
<td>26.16</td>
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</table>

*Essentially no differences in juice quality measurements by pruning treatment*
## Juice quality measurements

<table>
<thead>
<tr>
<th>Orchard</th>
<th>TRT</th>
<th>% juice yield</th>
<th>SSC °brix</th>
<th>pH</th>
<th>g/l malic acid</th>
<th>mg/l phenols (GAE)</th>
<th>mg/l YAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>WP</td>
<td>65.6</td>
<td>11.78</td>
<td>3.33</td>
<td>5.90</td>
<td>205.1</td>
<td>30.73</td>
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<tr>
<td>1</td>
<td>WSP</td>
<td>65.3</td>
<td>11.91</td>
<td>3.30</td>
<td>5.86</td>
<td>213.3</td>
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<td>NoP</td>
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<td>11.49</td>
<td>3.32</td>
<td>5.68</td>
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<td>11.40</td>
<td>3.32</td>
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<td>200.6</td>
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<td>969.2</td>
<td>25.93</td>
</tr>
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</table>

Essentially no differences in juice quality measurements by pruning treatment
**Cumulative economics**

<table>
<thead>
<tr>
<th>Orchard</th>
<th>TRT</th>
<th>Bu/Ac</th>
<th>Gross $ rev fresh + utility</th>
<th>Gross $ cider, $6/bu</th>
<th>Gross $ cider, $8/bu</th>
<th>Gross $ cider, $10/bu</th>
<th>Pruning cost, $/ac</th>
</tr>
</thead>
<tbody>
<tr>
<td>1WP</td>
<td>1277.1</td>
<td>22016.3</td>
<td>14708.9</td>
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<td>24514.9</td>
<td>586.5</td>
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</tr>
<tr>
<td>1WSP</td>
<td>1720.8</td>
<td>31195.6</td>
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<td>1NoP</td>
<td>2014.4</td>
<td>34940.5</td>
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<tr>
<td>13WP</td>
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<td>14911.6</td>
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<tr>
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<td>20623.5</td>
<td>11215.2</td>
<td>14953.6</td>
<td>18691.9</td>
<td>588.3</td>
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</tr>
</tbody>
</table>

**** Very, very preliminary! Small sample size.

Typical annual gross revenue fresh market ‘modern’ orchard: >$20,000
‘Cider IPM’

NORTHEAST IPM CENTER:
‘ADDRESSING UNIQUE IPM NEEDS IN NORTHEAST CIDER ORCHARDS’
Central concepts of *Integrated Pest Management*

- Pest tolerance (economic thresholds)
- Knowledge of pest life cycles
- Knowledge of agroecosystem
- Cultural pest management
- Biological pest management
- Chemical pest management
Cosmetic fruit injury

No concern for cidermaking:

- **Abiotic defects**
  - Russeting, frost rings

- **Minor**, healed insect damage
  - (plum curculio, tarnished plant bug)

- **Surface fungi**
  - (sooty blotch, flyspeck, Brooks spot)
Direct fruit arthropod pests of concern

Pest damage where open wounds encourage fruit decay, preharvest drop, microbial infection

• Codling moth
• Plum curculio
• European apple sawfly
• Apple maggot
Indirect pests and diseases of concern

Pests and diseases that may not affect fruit but could reduce yield and tree growth

- European red mite/Two-spotted spider mite
- Aphids
- Apple scab
- Cedar apple rust
- Powdery mildew
Project objectives

• Evaluate reduced-input pest management programs on dessert cultivars for effects on crop yield, juice quality, and profitability;

• Test novel crop load management programs on specialty cider apples to reduce biennial production and potentially eliminate carbaryl from thinning programs used on them;

• Develop and deliver research-based IPM training programs to growers to increase adoption of reduced-input cider orchards.
Potential profitability

- *If crop is sold on a split market model...*
  - ‘Cider IPM’ yield less profit
  - Lower costs not offset by change in distribution grade to reflect more utility fruit
Potential profitability

- If crop is sold on a split market model...
  - ‘Cider IPM’ yield less profit
  - Lower costs not offset by change in distribution grade to reflect more utility fruit

- If crop is sold on a cider market model...
  - Declining productivity & time value of money = declining/negative profitability

Net Present Value Projections

Cider Market

$US/acre

<table>
<thead>
<tr>
<th>Year</th>
<th>Est, IPM</th>
<th>Est, Cid IPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>$12,000</td>
</tr>
<tr>
<td>2</td>
<td>$12,000</td>
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<tr>
<td>3</td>
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<tr>
<td>4</td>
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<td>5</td>
<td>$6,000</td>
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<tr>
<td>7</td>
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<tr>
<td>8</td>
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<td>$12,000</td>
</tr>
<tr>
<td>13</td>
<td>$12,000</td>
<td>$14,000</td>
</tr>
</tbody>
</table>
Two worlds of cider apple production

- **Specialty cider cultivars**
  - Heirloom
  - Low-input scab-resistant cultivars
  - Regionally-unique cultivars
  - Bittersweet cultivars

- **How do these cultivars perform in Vermont orchards?**
- **What management strategies can increase supply/profitability/cider quality?**
Juice analysis including soluble solids (SS), pH, titratable acidity (TA), total polyphenols (Tannins), and yeast assimilable nitrogen (YAN) for three lots of cider apples evaluated in 2015.

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Lot</th>
<th>SS (°brix)</th>
<th>pH</th>
<th>TA (g/l)&lt;sup&gt;y&lt;/sup&gt;</th>
<th>Tannins (mg/l)&lt;sup&gt;y&lt;/sup&gt;</th>
<th>YAN (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ashmead’s Kernel</td>
<td>1</td>
<td>18&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3d</td>
<td>10.8&lt;sup&gt;a&lt;/sup&gt;</td>
<td>667&lt;sup&gt;c&lt;/sup&gt;</td>
<td>166.3&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Brown Snout</td>
<td>1</td>
<td>18.2&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.8c</td>
<td>4.1&lt;sup&gt;d&lt;/sup&gt;</td>
<td>2148&lt;sup&gt;b&lt;/sup&gt;</td>
<td>97.4&lt;sup&gt;bc&lt;/sup&gt;</td>
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<td>Calville Blanc</td>
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<td>15.3&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.1d</td>
<td>10&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>728&lt;sup&gt;c&lt;/sup&gt;</td>
<td>86.3&lt;sup&gt;cd&lt;/sup&gt;</td>
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<tr>
<td>Chisel Jersey</td>
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<td>1.5&lt;sup&gt;e&lt;/sup&gt;</td>
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<td>Dabinett</td>
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<td>633&lt;sup&gt;c&lt;/sup&gt;</td>
<td>112.7&lt;sup&gt;b&lt;/sup&gt;</td>
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<td>Harry Master’s Jersey</td>
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<td>1.2&lt;sup&gt;e&lt;/sup&gt;</td>
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<td>36.7&lt;sup&gt;cd&lt;/sup&gt;</td>
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<td>13.6&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>3.2d</td>
<td>6.5&lt;sup&gt;c&lt;/sup&gt;</td>
<td>3268&lt;sup&gt;a&lt;/sup&gt;</td>
<td>58.6&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Yarlington Mill</td>
<td>1</td>
<td>12.2&lt;sup&gt;c&lt;/sup&gt;</td>
<td>3.8c</td>
<td>1.7&lt;sup&gt;e&lt;/sup&gt;</td>
<td>3538&lt;sup&gt;a&lt;/sup&gt;</td>
<td>8.9&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>x</sup> Lot 1 = fruit replicates (n=5) collected from one orchard in Addison County, VT; lot 2 = fruit replicates (n=5) collected from one orchard in Chittenden County, VT; lot 3 = single samples (n=1) of promising wild apple cultivars collected from Franklin and Washington Counties, VT.

<sup>y</sup> Titratable acidity measured in malic acid equivalents, total polyphenols measures in gallic acid equivalents.

<sup>z</sup> Values represent mean for all replicated for lots 1 & 2, and single values for lot 3. Values followed by the same letter within each lot do not differ at α=0.05 using Tukey’s adjustment for multiple comparisons.
Specific Management Issues with High-Value Cider Apple Cultivars

• Unknown/unproven yield benchmarks

• Orchard architecture is unsettled
  • Big or small trees?
  • Trellis or freestanding?
  • Mechanical harvest?

• Unique Sensitivity to Disease and Horticultural Problems
Specific Management Issues with High-Value Cider Apple Cultivars

• Unknown/ unproven yield benchmarks
• Orchard architecture is unsettled
  • Big or small trees?
  • Trellis or freestanding?
  • Mechanical harvest?
• Biennial production
NPV Projections for Cider Apple Production Systems

- TS,Cid,$24,Ann
- TS,Cid,$16,Ann
- FSCL,Cid,$16,Ann

Initial Capital: $(25,000)

Yearly Income: $25,000, $50,000, $75,000, $100,000, $125,000, $150,000, $175,000

Years: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

NPV Growth:
- $166,266
- $84,613
- $35,379

NPV at 20 years: $175,000

NPV at 0 years: $(25,000)
NPV Projections for Cider Apple Production Systems

- TS,Cid,$24,Ann
- TS,Cid,$24,Bien
- TS,Cid,$16,Ann
- TS,Cid,$16,Bien
- FSCL,Cid,$16,Ann
- FSCL,Cid,$16,Bien
Specific Management Issues with High-Value Cider Apple Cultivars

• Unknown/ unproven yield benchmarks

• Orchard architecture is unsettled
  • Big or small trees?
  • Trellis or freestanding?
  • Mechanical harvest?

• Biennial production
  • Typically managed by:
    • Cultivar selection
    • Application of PGRs, including carbaryl
  • European cider cultivars don’t respond well to carbaryl
  • Can newer return-bloom treatments reduce biennialism and avoid use of carbaryl?
On-Farm PGR Trials for Crop Load Management

Commercial orchard in Addison County, VT

Two cultivars: ‘Ellis Bitter’, ‘Kingston Black’
  ◦ 2011 planting; MM111/M9 interstock

Two years: 2016, 2017

Six treatments:
  1. NTC
  2. Carbaryl
  3. NAA
  4. Carbaryl + NAA
  5. Ethrel
  6. Carbaryl + Ethrel
Preliminary analysis

• No juice chemistry data yet for 2017
• No return bloom data yet for 2017 (2018 collection)
• No effect on juice chemistry (2016)
• Inconsistent effects on yield
• Biennialism still an issue
• One orchard, one short trial
Cider Orchard Research: Continued Work

• Complete analysis of SARE/NEIPM project data
• Analyze packout/spray records from orchards involved with 2017 UVM Apple Scouting program to extend usefulness of 2016 data
• Continue Cider IPM education, inclusion in New England Tree Fruit Mgmt Guide
• Continue PGR trials?
• 2018-2021 Hatch Project “Rootstock and orchard architecture selection for unique apple production systems”
The Identity Crisis of Hard Cider

Nicolas Fabien-Ouellet, David Scott Conner

Abstract

In the past 5 years, the hard cider industry in the U.S. has undergone a sudden and dramatic growth period. This boom initially revealed challenges on the cider-specific apple supply side, but issues on the hard cider demand side have also emerged. This mixed methods study conducted in Vermont, a crucial player of the U.S. hard cider industry, addresses the gaps in the literature both on the apple supply side, and on the hard cider demand side. On the apple supply side, fourteen semi-structured interviews demonstrated that neither a long-term formalized contract nor a cooperative model (the two strategic partnership mechanisms used by world’s leading industries to manage cider-specific apple production) are appropriate for the current Vermont industry context. On the hard cider demand side, cider makers expressed high interest in working under a geographical indication (GI) label to develop consumers’ hard cider literacy and increase demand. This research further indicates that GIs can act as a powerful economic development tool. Introducing hard cider GIs could address current hard cider industry issues on both the supply side and the demand side.
Latest Research...

“...the core issue preventing cider-specific apple production in Vermont is on the hard cider demand side, rather than on the apple supply side”
Latest Research...

“...This research project has identified the establishment of a hard cider geographical identity as the most promising strategy ...to tackle both cider-specific apple supply issues and hard cider demand challenges”
Acknowledgements

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