ORCHARD SYSTEMS IN WASHINGTON STATE

Karen Lewis
Washington State University Extension

Tom Auvil
WA Tree Fruit Research Commission
Goals

• Consistently deliver an excellent eating experience

• Positive ROI to return to the farm
  – Harvest sunshine
  – Stress management
  – Measure, manage, model
  – Precision cropload management
  – High early and sustained yields of high quality target fruit
Gala production cost per bin - 2005

From Clark Seavert, Oregon State University
Gala production cost per bin - 2014

Bins per acre

<table>
<thead>
<tr>
<th>Bins per acre</th>
<th>$ per bin</th>
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</thead>
<tbody>
<tr>
<td>10</td>
<td>550</td>
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<tr>
<td>20</td>
<td>290</td>
</tr>
<tr>
<td>30</td>
<td>203</td>
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<td>40</td>
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<td>50</td>
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<td>60</td>
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<td>70</td>
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<td>80</td>
<td>95</td>
</tr>
<tr>
<td>90</td>
<td>88</td>
</tr>
<tr>
<td>100</td>
<td>82</td>
</tr>
</tbody>
</table>
Focus on higher yields of increased quality by spending more, and labor becomes cheaper and more efficient per unit.

All post harvest expenses are reduced when number of packed boxes per acre increase.
(SNAP)
Simple, Narrow, Accessible and Productive Canopies

Random or organized / narrow = accessible

Uniform Canopy/ Uniform Crop

High Early Yields

High Mature Yields

High Quality Fruit (Target)
Single, twin or triple stem

Canopy thickness: 20-90cm

Tree height: 2.7-3.5m

Row spacing: 3-3.5m

Tree spacing: .75-2.5m depending on system
Complex system
need high degree of skill
(4th D)
Wide range of size quality

Simpler
Improved quality
Apply existing technology

Simplest
Ability to be market specific
New and existing technologies
Orchard is laid out in advance of all other activity
Take the time to organize:
- Keep spacing equal
- Don’t let trees move around
- Water
Take the time to organize:
- Keep centrals straight
Goals of new plantings:

- Quickly establish bearing surface: Two seasons
- Start bearing 2\textsuperscript{nd} or 3\textsuperscript{rd} leaf
- Sustain yields 80-150 bins/acre
- With 1600-3000 packs / acre ‘target’ fruit
Harvesting Sunlight
Harvesting Light – 50% rule
Harvesting Light – 50% rule
Harvesting Light – 50% rule
V or Angle canopy creates more spatial distribution of leaders: better light management
Focus on the Consumer

Upper Canopy

Lower Canopy
Fruit position within the canopy

Source: Whiting, 2011
Systems - Yield

- 2d W
- 3d
- 2d V

Tonnes/ha (bins/acre)
Investment Result: “Show me the Money!”

Accumulated Cashflow

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

1 2 3 4 5 6 7 8 9 10

3d
2d W
2d V

100,000
120,000
141,000
**Investment Result: “Show me the Money!”**

Internal rate of return and net present Value

<table>
<thead>
<tr>
<th></th>
<th>3D</th>
<th>2D W</th>
<th>2D V</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRR - 10 years</td>
<td>11%</td>
<td>14%</td>
<td>15%</td>
</tr>
<tr>
<td>IRR – 6 years</td>
<td>-8%</td>
<td>-6%</td>
<td>-5%</td>
</tr>
<tr>
<td>NPV @ 8% 10 yrs</td>
<td>$23,000</td>
<td>$55,000</td>
<td>$83,000</td>
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</table>

- Relative investment comparison
- Close to your opportunity cost of money
Labor
Management Changes
Beginning of 2\textsuperscript{nd} leaf

Row Spacing: 12 foot
Tree Spacing:
- Galas – 3 to 4 foot
- Honeycrisp 2.5 to 3 foot
End of 2nd leaf
V trellis system

Spacing 1.5’x12’- 2’x12’

Height 11.5’- 12.5’

Two dimensional tree training system

Nursery tree style: sleeping eyes, bench grafts, plant in place.
Year 1 goals

Gala first year
growth height:  6.5’- 7’
Side limbs:  4-6 above 36”

Honey crisp first year
growth height  6.5’ – 7’
Side limbs:  2-4 on strong trees
Weak trees - none
Years 2-5 goals

Gala
growth height: 12’
Side limbs: 14-16
Cropping on year 3

Honey crisp
growth height 12’
Side limbs: strong
trees 12-16
Weak trees - 10-14
Caliper reduction from competitive limb
New growth in 2009
The perfect taper
<table>
<thead>
<tr>
<th></th>
<th>Morning Mist Fuji 2008 Vertical Wall</th>
<th>Jazz 2009 Vertical Wall</th>
<th>Envy 2010 V trellis</th>
<th>Honeyscrisp Grafts w/ all metal V trellis 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trees cost /Acre</td>
<td>$4,982.73</td>
<td>$7,541.50</td>
<td>$7,405.96</td>
<td>$1,089.60</td>
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<tr>
<td>Growing Cost/Acre</td>
<td>$21,412.30</td>
<td>$10,166.91</td>
<td>$6,656.78</td>
<td>$7,000</td>
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<tr>
<td>Irrigation/Acre</td>
<td>$3,435.93</td>
<td>$1,402.01</td>
<td>$1,752.16</td>
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<tr>
<td>Trellis/Acre</td>
<td>$3,660.33</td>
<td>$3,045.42</td>
<td>$5,657.81</td>
<td>$6,078</td>
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<tr>
<td>Site/Acre</td>
<td>$4,000</td>
<td>$4,000</td>
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<td></td>
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<tr>
<td>Total Cost/Acre</td>
<td>$37,491.29</td>
<td>$26,155.84</td>
<td>$25,472.71</td>
<td>$14,167.60</td>
</tr>
</tbody>
</table>
Systems compared

2.5m X 1.4m
2857 trees per ha
380 mm between wires
3.4m high
36 km fruiting wood

2m X 3m
1600 trees per ha
300mm between stems
3m high
39 km fruiting wood
V iteration 46km
Bi-axe planting in Chelan, 2011

Bi-axe planting in Chelan, with 55 Bin/acre crop in 2013
Twin Stem at planting
Bi-Baum
Twin Stem 2nd spring
Twin Stem 3rd spring
different overcolor in the bottom part of the tree – Year 4
Twin Stem Pruning – Mechanical?
Compact tree = More time to fill 13 foot canopy

Plan B = 8 ft rows (56% increase in feet of row)
7 foot canopy (46% decrease in height)
Fills space end of year 2, Production = 100 bins
Short v height
2006 Vantage Fuji

Trellis up
Irrigation installed
3rd Leaf crop
Trellis for crop and covers requires precision in construction. Retrofitting a crop trellis = $$$$
Auvil Fruit Company
Vantage, Washington
New Language

Old

- TPA / Trees per acre
- Tree row volume
- Bins per acre

New

- Sticks or leaders per acre
- Miles of canopy
- Packed boxes per acre
The Word

Ex.e.c.u.t.i.o.n

Getting the task done, getting it done right and getting it done on time