Opportunities in Stone Fruits

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Cherry Production in the US

1. Washington – 193,000 t
2. California – 91,000 t
3. Oregon – 47,000 t
4. Idaho – 3,000 t
5. Montana – 2,500 t

1. Michigan – 23,000 t
2. New York – 2,000 t
Sweet Cherry Production in Cold and Humid Climates

- Tree mortality. "Cherry trees love to die".
- Bacterial canker
- Fruit cracking due to rain
- Inconsistent fruit set
- Large trees
- Low yields
- Small, soft cherries
- Bird predation
- Poor shelf life

The introduction of **dwarfing and precocious rootstocks and new varieties and new management strategies** offer new opportunities to grow cherries for a large local market.
1. Strategies for keeping trees alive in humid cold climates

- Plant on large berms
  - Berms should be 30cm high.
  - Berms provide improved root zone oxygen.
  - Berms prevent water logging of root system.
  - Berms reduce winter injury associated with excess water.
  - Trees on berms require irrigation.

- Control bacterial canker.
  - Intensive Copper spray program
    - Two sprays in the fall 20% leaf fall and 80% leaf fall
    - Two sprays in the spring (bud swell and immediately after pruning.
  - Never cut flush on the trunk. Leave a 15-20cm stub whenever removing branches on the trunk.
  - Make major pruning cuts after harvest.
2. Control Rain Cracking

• Berms and tile drainage down each row alley to remove surface water and excess soil moisture can help reduce soil moisture induced rain cracking
• Rain shields provide good protection against rain cracking but there is still some damage
  • Open shelters when first cherries turn pink.
  • Divert Rain water to alley between rows.
• Manage soil moisture with a constant high water content using daily trickle irrigation.
Control of Rain Cracking of Fruit

- Rain Diversion Nets
- CaCl2 Sprinkler System
- Unprotected Control

% Cracked Fruit vs. Year

Year:
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
Cherries under Plastic Tunnels

Tall Spindle trees – pick with ladders or platforms
Bush trees (KGB) – pick from the ground
Effect of the Tunnel

• The tunnel increased yield, reduced fruit cracking and improved cumulative crop value.
• The tunnel has not paid for itself in the first 3 cropping years.
3. Control Tree Size with Dwarfing and Precocious Rootstocks and Renewal Pruning

Gisela series
- Gi.3 (in most cases too dwarfing)
- Gi.5
- Gi.6
- Gi.12

Weiroot series
- Wi.72 (suckers badly)
- Wi.158 (suckers badly)

Edabriz

PiKu series
- PiKu.1
- PiKu.3
- PiKu.4

Krymsk 86
Tree Size

Trunk Cross-sectional area (cm²)

- **Lapins**
  - Gi.5
  - Gi.6
  - Gi.12
  - Mazzard

- **Regina**
  - Gi.5
  - Gi.6
  - Gi.12
  - Mazzard

- **Hudson**
  - Gi.5
  - Gi.6
  - Gi.12
  - Mazzard
Production

11 Yr. Cumulative Yield (t/ha)

Lapins
Regina
Hudson

Gi.5
Gi.6
Gi.12
Mazzard
Fruit Size

Average Fruit Size (g)

- **Lapins**: Gi.5, Gi.6, Gi.12
- **Regina**: Gi.5, Gi.6, Gi.12, Mazzard
- **Hudson**: Gi.5, Gi.6, Gi.12
Conclusions on Dwarfing Rootstocks

Gisela 5
• Trees on Gi.5 are about 45-50% the size of trees on seedling rootstocks
• Trees on Gisela 5 are 3.5-4.5 times as productive as trees on seedling stocks
• Trees on Gisela 5 should be planted at densities from 1500-2000 trees/ha
• Irrigation is essential
• Aggressive crop load management is required

Gisela 6
• Trees on Gi.6 are about 60-70% the size of trees on seedling rootstocks
• Trees on Gisela 6 are 3-4 times as productive as trees on seedling stocks
• Trees on Gisela 6 should be planted at densities from 1000-1500 trees/ha
• Slightly smaller fruit size

Gisela 12
• Trees on Gi.12 are about 75-80% the size of trees on seedling rootstocks
• Trees on Gisela 12 are 3.3-4.3 times as productive as trees on seedling stocks
• Trees on Gisela 12 should be planted at densities from 750-1200 trees/ha
• Productive with good fruit size
4. Productive Orchard Systems
Group 1. Open Center

Quad Axis
3.0 X 5.4m = 598 trees/ha

Spanish Bush
2.4x5.4m=748 trees/ha

KGB
1.5x4m=1,666 trees/ha
Group 2. Central Leader Systems

Central Leader Spindle
2.4 X 5.4m = 748 trees/ha

Vertical Axis
1.8x4.5m=1235 trees/ha

Tall Spindle
1.5X3.5m=1905 trees/ha

Super Spindle
0.75x3.5m=3810 trees/ha
Group 3. Angled Systems

V System
1.8X5.4m=1029 trees/ha

V-Spindle System
0.75x4m=1,666 trees/ha

Marchant System
(Angled tree system)
2.4 x 3.5 m
1190 trees/ha

UFO
1.5 X 3.0m = 2,223 trees/ha
Yield Performance of 4 Orchard Systems

**Lapins**

- **Vertical Axis**
- **Central Leader**
- **Spanish Bush**
- **Quad Axis**

**Regina**

- **Vertical Axis**
- **Central Leader**
- **Spanish Bush**
- **Quad Axis**
Increasing Tree Density Improves Cumulative Yield

$y = 0.074x + 11.1$

$y = 0.067x + 13.1$

$y = 0.062x + 12.5$

$y = 0.044x - 14.5$

44-74 kg of fruit/additional tree
Effect of Tree Density on Fruit Size

![Graph showing the effect of tree density on fruit size. The graph compares average fruit size (g) and fruit size adjusted for crop load (g) across different tree densities (trees/ha) for Gi.5, Gi.6, Gi.12, and Mazzard varieties.](image-url)
5. Produce Large Fruit Size with Dwarfing Stocks

- Manage crop load
  - Aggressive pruning.
  - Remove small diameter twigs (<25cm long).
  - Remove whole branches.
  - Stub shoots by 1/4 on self fertile varieties.
- Spur Pruning
  - Remove spurs on underside of branch.
  - Chemical thinning (ATS)

- Additional Nitrogen fertilizer to keep vigor up.
- Planting on berms has given good continued vigor with Gisela stocks in NY
- Irrigation is especially important from straw color until harvest
6. Increasing Tree Density Improves Cum. Crop Value

$27-67$/additional tree
6. Improving Fruit Set

- With some varieties like Regina the flower ovule dies before pollen tube reaches it. Thus fruit set is often low.
- Retain applied at popcorn stage improves ovule longevity and improves fruit set
- Apply 1-2 pouches per acre when first flower opens but 98% of flowers are at popcorn stage
The Integrated System for Producing Sweet Cherries in the East

- High Tree Densities (>500)
- Dwarfing Rootstocks (Gi.5 for Regina, Gi.12 for self fertile’s).
- Minimal pruning during first 4 years and bud removal to obtain branching
- New varieties (e.g. Regina, Black Pearl)
- Rain Protection (Nets or Tunnels)
- Berms and Tiling
- Copper spray programs
- ReTain to improve fruit set
- Irrigation
- GA sprays
- Bird Protection - Bird Nets
- Hydrocooling and
- MAP bags for season extension
Peach Opportunities

Systems
Rootstocks
Thinning
BiAxis-Vee

- High tree density (300 to 600 trees/acre)
- Suggested Spacings
  - 4-6 feet inrow X 14-16 feet between rows
- Training System
  - Do not use a trellis in NY due to fungal canker problems.
  - Use 2 scaffold branches.
  - Use columnar pruning of scaffolds (No secondary scaffolds).
  - Fruiting branches should originate on main scaffold.
  - Fruiting branches renewed back to main scaffold.
  - Tree height should be 10-12 feet.
QuadAxis-Vee

- **Suggested Spacings**
  - 8-10 feet inrow X 16-18 feet between rows

- **Training System**
  - Use columnar pruning of scaffolds (No secondary scaffolds).
  - Fruiting branches should originate on main scaffold.
  - Fruiting branches renewed back to main scaffold.
Central Leader/Vertical Axis

- This system is common in France
- Moderate tree densities (180 to 350 trees/acre)
- Suggested Spacings
  - 8-12 feet inrow X 16-20 feet between rows
- Training System
  - Permanent bottom tier of branches.
  - Renewal of upper branches back to central leader.
  - Tree height should be 10-12 feet.
Slender Spindle/Fusseto

- This system is common in Italy.
- High tree densities (400 to 800 trees/acre).
- Suggested Spacings
  - 4-7 feet inrow X 14-16 feet between rows.
- Training System
  - No permanent branches.
  - Renewal of all branches back to central leader.
  - Tree height should be 9-10 feet
## New Peach Rootstocks We are Testing

<table>
<thead>
<tr>
<th>Stock</th>
<th>Tree Survival (%)</th>
<th>TCA 2014 (cm²)</th>
<th>Cum Sucker No.</th>
<th>Cum. Yield (kg)</th>
<th>Av Size (g)</th>
<th>Cum Yield Eff (kg/cm² TCA)</th>
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<tbody>
<tr>
<td>Controller5</td>
<td>100</td>
<td>69</td>
<td>2</td>
<td>58.55</td>
<td>157.5</td>
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<td>Krymsk1</td>
<td>75</td>
<td>97</td>
<td>1.8</td>
<td>68.4</td>
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<td>KV010123</td>
<td>88</td>
<td>123</td>
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<td>77.18</td>
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<td>Fortuna</td>
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<td>27.92</td>
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<td>LSD P ≤ 0.05</td>
<td>32</td>
<td>40</td>
<td>10.4</td>
<td>27.8</td>
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The V-shaped systems are more productive than the vertical systems:
- the Quad Vee system works well with current vigorous rootstocks.
- the Bi Vee system works well with semi-dwarfing rootstocks like Krymsk 1.
Pruning Concepts for V trained peaches

- Select 2, or 4 semi erect scaffolds in second year
Bench cut each of the 2 or 4 scaffold branches to an outside bud each year to create the steep angled V
Cut back lateral branches to first live bud
Keep top of each scaffold narrow
Renewal pruning with peach
Peach Thinning with the Darwin Machine
Thinning with ATS
2 Applications during bloom at 30 and 90% bloom
Rate=3-4%
Recommended Peach Systems

QuadAxis-Vee
- Rootstock= Bailey, Lovell or new HBOK10 or HBOK32
- Spacing= 8 X 16 feet
- Tree Height= 10 feet
- Scaffolds= 4
- Pruning= Renewal pruning on each of 4 scaffolds
- Thinning= Darwin with follow-up hand thinning
- Harvest= Multi-level platform

BiAxis-Vee
- Rootstock= Krymsk1
- Spacing= 4 X 14 feet
- Tree Height= 10 feet
- Scaffolds= 2
- Pruning= Renewal pruning on each of 2 scaffolds
- Thinning= Darwin with follow-up hand thinning
- Harvest= Multi-level platform