Challenges & Opportunities in the Production & Marketing of Fruit & Nut Crops

David W. Lockwood
UT/UGA
2017
Fruit Crops Production

Negatives:
• High risk
• High inputs
  – Labor
  – Management
  – Capital
• Relatively little mechanization
• Several years before a return on investment
• Perishable crops

Positives
• Can be done on smaller acreages
• Can utilize hilly land
• Potentially high returns per acre
• High level of interest by consumers in locally produced crops
Getting Started in Fruit Production

• Lag time between planting & 1\textsuperscript{st} crop
  – No return on investment
  – Determines productive potential of planting over its entire life

• Trees/vines/bushes live for many years
  – What you do this year affects what happens next year

• Fruit buds initiated in the growing season of the previous year

• Multiple pests

• Perishable commodity
What to Grow?

• **Market demand**
• Site limitations
  – Winter damage
  – Spring frosts
  – Pest pressures
• Water:
  • Quantity
  • Quality

• **Species**
  – Cold hardiness
  – Chilling requirement
• **Varieties**
  – Bloom time
  – Pest resistance
• **Rootstocks**
  – Pest resistance
  – Size control
  – Precocity
What To Grow?

- What is not being grown in your area?
  - Is this an opportunity?
    - No competition
    - High returns
  - Or a **Red Flag**?
    - No market demand
    - Serious production limitations
    - Limited availability of equipment & supplies
What to plant?

<table>
<thead>
<tr>
<th>Yes</th>
<th>Maybe</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>Peach</td>
<td>Apricot</td>
</tr>
<tr>
<td>Pear: European Asian</td>
<td>Nectarine</td>
<td>Plumcot</td>
</tr>
<tr>
<td></td>
<td>Plum</td>
<td>Pluot</td>
</tr>
<tr>
<td>Grape: American Hybrids</td>
<td>Tart Cherry</td>
<td>Aprium</td>
</tr>
<tr>
<td></td>
<td>Sweet Cherry</td>
<td>Fig</td>
</tr>
<tr>
<td>Blackberry Raspberry</td>
<td>Grape: <em>V. vinifera</em> muscadine</td>
<td></td>
</tr>
<tr>
<td>Blueberry: Rabbiteye</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. Highbush</td>
<td>So. Highbush</td>
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</tr>
<tr>
<td>Crop</td>
<td>May</td>
<td>June</td>
</tr>
<tr>
<td>--------------</td>
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</tr>
<tr>
<td>Strawberries</td>
<td></td>
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<tr>
<td>Raspberries</td>
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<tr>
<td>Blackberries</td>
<td></td>
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<tr>
<td>Stone Fruits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grapes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muscadines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pears</td>
<td></td>
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<tr>
<td>Apple</td>
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<tr>
<td>Pecans</td>
<td></td>
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</table>
# Tree Crop Timeline

<table>
<thead>
<tr>
<th></th>
<th>Planting to 1st crop</th>
<th>Planting to full crop</th>
<th>Life expectancy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Apples (semi-dwarf)</strong></td>
<td>3 to 4 years</td>
<td>6 to 8 years</td>
<td>20+ years</td>
</tr>
<tr>
<td>250 – 550 trees/acre</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Apples (dwarf)</strong></td>
<td>2 years</td>
<td>5 to 6 years</td>
<td>? (15 + years)</td>
</tr>
<tr>
<td>600 + trees/acre</td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Stone fruits</strong></td>
<td>3 years</td>
<td>5 to 6 years</td>
<td>17 -20 years</td>
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<td></td>
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</tr>
</tbody>
</table>
Who’s the Boss? (Managerial Needs)

- Fruit production is unique, intense & needs high levels of management
  - Who will be the manager?
    - You or an employee
  - How capable
  - How much time to devote
  - Interest level –
    - Just a job or a real passion
  - Is there a back up person in case the manager is unavailable
Labor

- How much is available?
  - Low level of mechanization
  - Relatively narrow time window on some operations

- How skilled are they?
  - Can be left to work without close supervision

- How consistent are they?
  - Will you be frequently training new employees or retraining existing ones?

- How conscientious are they?
  - Impact current & successive years crops
In It For The Long Haul: 
Plant ~ 3 to 5% Every Year

• Stable production year after year  
  —Avoid having everything “over the hill” at the same time

• Ability to keep up with:  
  —newest varieties  
  —rootstocks  
  —training systems  
  —technologies
Site Selection

• Most important decision a grower can make

• Every aspect of crop development and marketing will be influenced by the site
“Live Where You Farm” - - -

NOT

“Farm Where You Live”

David W. Lockwood
Plant Sciences
Univ. of TN/Univ. of GA

S.E. Apple Growers, 2007
Orchard Site Score Sheet

• Accessibility
• Full sun
• Elevation
• Slope – aspect and steepness
• Soil Characteristics – drainage (internal & surface), potential rooting depth, fertility
• Water – quantity & quality
• Wildlife
• Adjacent agricultural operations
Market Considerations

- Retail on farm:
  - Distance from customers
  - Quality of roads
  - Easy to find
  - Parking

Apples
25 miles

Single lane next
20 miles
For every 100’ increase in elev., expect 5 to 10°F increase in temp. during a radiation frost event (also fog)
Components of a Desirable Site

• Full sun
• Elevation (frost & disease protection)
• Soils:
  – pH of 6.0 to 6.5 (4.8 to 5.2 for blueberry)
  – High organic matter content
  – Well-drained (internal & surface)
  – Min. of 30 – 36” rooting depth
  – Moderate fertility
• Available water supply
Wildlife Damage Control
Wildlife Damage to Selected Fruit Crops – 1998 Estimate

- Survey conducted by USDA, APHIS, Wildlife Services
- Included 8,850 producers in California, Michigan, New Jersey, New York, North Carolina, Pennsylvania & Washington
- $41 million dollars loss reported
Site Preparation

- Soil testing
- Elimination of noxious weeds
- Remove barriers to good air drainage
- Address poor water drainage areas (if applicable)
- Remove wild/abandoned fruit near the planting site
- Establish desired orchard floor cover
Need for Cross Pollination?

- Strawberries: No
- Blackberries: No
- Raspberries: No
- Grapes:
  - American bunch, French hybrids, & V. vinifera: No
  - Muscadine: Yes (female flowered varieties)
  - Blueberry: Yes
Planning vs. Planting

• A Critical Year In Fruit Production Is The One Prior To Planting – Don’t Cut Corners
  – Soil/site preparation (pH, P, K, weeds, air drainage)
  – Use reputable nurseries
• Don’t compromise on varieties, rootstocks
  – Delay planting, custom propagation
Getting Started

• Start small –
  – Makes mistakes on a small scale
  – New technology & intense work can be overwhelming
Constantly evaluate your market

• Consider alternative marketing strategies
  – Retail vs. wholesale
    • Agritourism
    • Pick-your-own
    • Value added
Ease of Pest Control

• Blueberries
  – Rabbiteye
  – Highbush
• Muscadines
• Blackberries
• Raspberries
• Grapes
  – American bunch
  – French-American hybrid
  – V. vinifera
• Stone Fruits
• Apples
Blueberries

• Time to 1\textsuperscript{st} crop: 3 years
• Time to full production: 6 to 8 years
• Expected yield: 8,000 to 10,000 lbs./acre
• Harvest period:
  – Mid-June to mid-July for highbush
  – Mid-July to Sept. for rabbiteye
• Productive lifespan: 30+ years
Blueberry Production Timeline

-1 year

Preplant Site Preparation

Planting

+1 year

Defruit

+2 years

+3 years

1st crop – rabbiteye
Biennial Life Cycle of Canes

• Primocane Year
  – Cane grows throughout summer
  – Fruit bud initiation occurs in late summer to early fall

• Floricane Year
  – Fruit bud initiation is completed
  – Bloom
  – Fruiting
  – Cane death
Floricane-bearing Blackberries

- 2\textsuperscript{nd} year: partial crop
- 3\textsuperscript{rd} and succeeding years: full crop
  - 6,000 to 8,000 lbs. or more
- Productive life: 8 to 10 years or more
Trellis Systems

I - Trellis

T - Trellis

Rotating Crossarm Trellis

USDA-ARS Appalachian Fruit Research Station
SWD Adults on Raspberry Fruit

Pam fisher, Berry Specialist/OMAFRA
Strawberries - Matted Row Culture

- Years to bearing: 1
- Expected life of planting: 3 to 4
- Expected yields: 25 plants can give in excess of 40 lbs. of fruit in one year after planting
- Varieties: Earliglow, Allstar
Plasticulture
Strawberries
Plasticulture Strawberries - Planting

• **Time:**
  – In fall (last ½ of Sept. – 1\textsuperscript{st} ½ of Oct. depending on location)

• **What to plant:**
  – Plant plug transplants or greenhouse runner tips

• **Spacing:**
  – 2 rows 12 in. apart on top of raised bed
  – plants 12 in. apart in the rows & offset 6 in. from plants in the adjacent row
Grapes

- Market options:
  - Wine
  - Table
  - Juice
  - Processing (jellies)
Seedless Grapes

Jupiter

Vanessa

Neptune

Marquis

Saturn
Vineyard Establishment

Preplant

1st yr.

2nd yr.

3rd yr.

4th yr.

Site selection & development

Planting, trunk development

Cane/cordon selection

Cane/cordon selection

Cropping

Trellis construction ➔
Grapes

• Time to:
  – 1\textsuperscript{st} harvest: 4 years
  – Full crop 5 to 6 years

• Expected vineyard life: 25+ years

• Establishment cost (excluding land):
  – $10,000 to $12,000 per acre

• Annual production costs (excluding harvest):
  – $1,500 to $1,800 per acre
Grapes

• Yield potential:
  – American bunch – 5 to 7 tons/acre
  – French American hybrids – 4 to 5 tons/acre
  – Vitis vinifera – 2 to 2.5 tons/acre

• Prices received by growers for wine:
  – American bunch - $900 to $1,000 per ton
  – French American hybrid - $1,100 per ton
  – Vitis vinifera - $2,000 to $2,500 per ton
Grape Training Systems

4 Arm Kniffin

Umbrella Kniffin

Single curtain cordon

Geneva double curtain
Season Extension
For successful apple production,
Apples

<table>
<thead>
<tr>
<th></th>
<th>SEEDLING</th>
<th>SEMI-DWARF</th>
<th>DWARF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years to 1st Crop</td>
<td>6 to 8</td>
<td>4 to 6</td>
<td>2 to 3</td>
</tr>
<tr>
<td>Years to Full Crop</td>
<td>12 to 14</td>
<td>9 to 11</td>
<td>5 to 6</td>
</tr>
<tr>
<td>Expected Orchard Life (years)</td>
<td>30+</td>
<td>20+</td>
<td>14+</td>
</tr>
<tr>
<td>Yield at Full Production</td>
<td>12 to 16 bu/tree</td>
<td>5 to 7 bu/tree</td>
<td>3 to 4 bu/tree</td>
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<tr>
<td></td>
<td>(576 to 768 bu/A)</td>
<td>791 to 1210 bu/A</td>
<td>1360 to 1815 bu/A</td>
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</table>

Harvest Period: Late July (Lodi) through late October (Pink Lady)
Storage Life of Fruit: Early maturing apples have a storage life of only a few days. Late summer and fall varieties will last several weeks under proper storage conditions. Certain varieties such as Arkansas Black and Goldrush will last several months.
Value-added opportunities: PYO, apple cider, baked goods, dried fruit
Why Graft Trees?

• Size control
• Increased precocity
• More consistent quality
• Higher yields?
• Uniformity
• Insect and disease resistance
• Cold hardiness
• Tolerance to certain soils (drought, excess H₂O, pH, salts)
Exhibit 4: Apple cultivar Zestar!™ on rootstocks B9, M26, and M7
Rootstock Effect on Tree Size & Precocity
## Dwarf Geneva Apple Rootstocks – Comparison

<table>
<thead>
<tr>
<th>Traits</th>
<th>G.65</th>
<th>G.11</th>
<th>G.16</th>
<th>G.41</th>
<th>G.214</th>
<th>G.935</th>
<th>G.202</th>
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<tbody>
<tr>
<td>Size</td>
<td>M.27</td>
<td>M.9T337</td>
<td>M.9 T337</td>
<td>M.9 T337</td>
<td>M.9/M.26</td>
<td>M.26</td>
<td>M.26</td>
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<tr>
<td>WAA resistance</td>
<td>No</td>
<td>High</td>
<td>No</td>
<td>High</td>
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<tr>
<td>Fireblight Resistance</td>
<td>Very</td>
<td>Resistant</td>
<td>Resistant</td>
<td>Very</td>
<td>Very</td>
<td>Very resistant</td>
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<tr>
<td>Replant Disease</td>
<td>TBD</td>
<td>No</td>
<td>Partial</td>
<td>Tolerant</td>
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<tr>
<td>Phytophthora</td>
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<tr>
<td>Cold Hardiness</td>
<td>Yes</td>
<td>Yes</td>
<td>Partial: Good mid winter</td>
<td>Yes</td>
<td>TBD</td>
<td>Yes</td>
<td>Good mid-winter</td>
</tr>
<tr>
<td>Productivity =/&gt; M9</td>
<td>TBD</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Suckering, burr knots</td>
<td>TBD</td>
<td>TBD</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Scab-Resistant Apple Evaluations

- **Rating Scale:**
  - 1 = susceptible
  - 9 = immune
  - U = unknown

<table>
<thead>
<tr>
<th>Variety</th>
<th>Apple Scab</th>
<th>Cedar Apple Rust</th>
<th>Powdery Mildew</th>
<th>Fireblight</th>
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</thead>
<tbody>
<tr>
<td>CrimsonCrisp™</td>
<td>9</td>
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<td>Crimson® Gold</td>
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<td>Liberty</td>
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<td>Crimson® Topaz</td>
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<td>6</td>
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<tr>
<td>Galarina</td>
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<td>8</td>
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<tr>
<td>Freedom</td>
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<tr>
<td>Nova Spy</td>
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<td>U</td>
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<td>Querina™</td>
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<td>Enterprise</td>
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<td>WineCrisp™</td>
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<tr>
<td>GoldRush</td>
<td>9</td>
<td>3</td>
<td>7</td>
<td>5</td>
</tr>
</tbody>
</table>

Table taken from Adams County Nursery 2011-2012 Fruit Tree Catalog
SmartFresh™

• 1-methylcyclopropene (1-MCP, SmartFresh™)
  – Developed at NCSU
  – Ethylene inhibitor
Chamber for treating 4 bins with SmartFresh™
SmartFresh™ Ginger Gold Trial – 2010
30 days at room temperature
Peaches

- Several pest problems
- Do not consider dwarf trees
- Select varieties with a long chilling requirement
  - Contender
  - Nectar (white)
  - Carolina Gold (yellow)
  - China Pearl (white)
  - Intrepid (yellow)
- Others – Redhaven, Jefferson, Monroe, Cresthaven
Peaches

- **ROOTSTOCKS:** Halford, Lovell, Guardian
- **SPACING:** 14 X 22 (141 trees/acre) to 16 X 24 (113 trees/acre)
- **TRAINING SYSTEM:** Open Center
- **TREE HEIGHT AT MATURITY:** 8 feet
- **YEARS TO 1\textsuperscript{ST} CROP:** 3
- **YEARS TO FULL CROP:** 6
- **EXPECTED ORCHARD LIFE:** 17
- **YIELD AT FULL PRODUCTION:** 3 bu/tree for early & mid-season maturing varieties, 4 bu/tree for later ripening varieties
- **HARVEST PERIOD:** June through mid-September
- **STORAGE LIFE OF FRUIT:** 1 week or less for ripe fruit
Peaches & Nectarines

• Harvest period: June 1 – Sept. 1
  – Most varieties ripening prior to July 4 are clingstone or semi-clingstone

  – Tree-ripened peaches are very fragile and have a short shelf life.
    • Store above 60° for a couple of days to preserve flavor
    • Storage about 40° F may result in development of a bitter taste
Peaches – Main Limitations

- Frosts/freezes –
  - Passive & active controls

- Diseases –
  - Brown rot
  - Bacterial spot

- Insects –
  - Borers
  - Plum curculio
Pest Control Recommendations

• Apple:
  – Integrated Orchard Management Guide for Commercial Apples in the Southeast

• Peach:
  – Southeastern Peach, Nectarine and Plum Pest Management and Culture Guide
John Deere Tractor – vineyard model
Prepruning Unit