Developing an Orchard Site
Selection, Orchard Renewal
Plan & preparation, Rootstock
Selection and Planting

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Topics to be covered

• Site Selection
• Site Planning and Preparation
  – Renewal
• Rootstocks and Variety Selection
• Orchard Systems and Design
  – Spacing
  – Trellis Support
• Planting and Establishment

Elevation/Topography Important

• With respect to surrounding area
• **Cold air drainage**
• Aspect; important for heat units and sugar accumulation in fruit
• Soil should be at least 3 feet deep and be friable with good “tilth”.

Soils for Orchards

• If subsoil is dense, need to plant on “raised beds” if stone fruit.
• If planting apples and pears, not as much a limitation.
• Know the soil series and where changes in delineations for the site change (called Polygons- soil series/mapped for site).
• Rootstock selection and orchard layout may be affected.
  – Important for stone fruit; Cherry; Mazzard or MXM clones, vs Mahaleb;
  – Apples; if dense profile avoid M.26 and MM.106
  • If course; avoid weak rootstocks/depends on system

Tree health and performance affected by soil depth and maladies

7 yr-old Tart Cherry / Mahaleb

Shallow soil profile = stress in this Orchard with large crop loads & Mid season when fruit is a major sink

Basically, most roots are found in the top 1.5 to 2 ft of the soil surface.
Shallow rooting and Phytophthora root and crown rot

Peach roots limited by clay layer
Phytophthora on Mahaleb Cherry root system

Experiment at Clarksville Hort Station; 1981-1990

- Peach and Sour Cherry trees had improved productivity and survival after 10 yrs on medium size, wide bed (30 cm high, 2 m wide).
- Apples on MM 106, not affected by bed treatments

Polygons = Soil Series mapped

Understand and know your soil; Series

Elevation – Slope – Frost Pockets

Cool air
Warm air
Cool air

Slope: Aspect (compass direction)
Grade (steepness)

Early Fall Cold Oct 15, 2009 Leelanau Peninsula, Mich
Trittenheim, Moselle River, Germany
South facing slope

Crop loss below 5-10 ft

Lake Michigan

The Great Lakes moderates our climate to allow Michigan to Grow 130,000 acres of fruit crops.

Large Body of Water helps neutralize effects of low temperatures even in microclimates. Tart Cherry orchard with Lake Michigan background

Topography; slope important to insure air and moisture drainage

Near Freesoil, MI: peaches on a site, Some 30 feet above surrounding field Crop land

Even slight elevation differences can make a huge difference in microclimate

Traverse slope (avoid erosion)
Or Down slope (insight erosion?)

20
22
23
24
Select crop species and varieties for the site

- Sweet Cherries, top of slope
- Apples, down slope near valley
- Dwarf apples, up slope
- Standard apples, bottom of slope
- Tart cherries – on hill

Wind machines can protect flowers by mixing cold and warm air, disrupting temperature inversions.

Orchard Renewal/Replant

1. Remove old trees.
   a. Remove as much old root debris as possible.
   b. Root fragments that are infected with pathogens, nematodes or viruses serve as reservoirs and carry disease over into the new planting
   • Do not replant for at least two years with several crop rotations (primarily an Eastern recommendation where replant disease more prevalent)
   • Most growers re-establish after 1 year of cover/green manure crop.
   • Cover or green manure crops can help suppress plant-parasitic nematodes and soil-borne fungi.
     - Sudan grass, Rye grass, Brassicas (mustard), Marigold, etc. will suppress pests and effects of Apple Replant Disease (Merwin, et. al. 2002).
   • Cover Crops incorporate Organic Matter, provides opportunity to add fertilizer, lime, suppress weeds.
   • Do not leave a site fallow because of the weed, nematode and virus pressure that can develop.

Removal of an old orchard. Economics and Markets dictate frequency

- HD Apple growers = 7% annually

Remove all old trees and Establish a cover crop for one year prior to replanting a site.

Remove as much of the remains of old roots
Sourcing Trees
• Custom bud orders
  – Can order the scion and rootstocks wanted
  – Usually lower price
• Sources
  • Local VS Distance
  • North VS South
  • General VS Specialized
  • Reputation – ask questions
  • “Certified”, Heat treated, Virus free, Virus tested,
  Bud-wood source, rootstock source, patented

Design and Layout of Orchard Block
• Spacing and Row directions
  – based on slope and orientation
  – In north latitudes: prefer N/S
    • Multiply 1.3 X tree height = Alleyway width
    – More alleyway width given for E/W orientation
  – Multiply 1.5 X tree height = Alleyway width
  – Irrelevant re:
    • Tall Spindle system which calls for 3-4’ X
      11-12’ spacing: basically 1.0 X tree height
    • Super Slender Spindle systems which
      calls for 1.5’ X 8-9’

Design and Layout of Orchard Block
• Drain Schemes
• Raised beds
• Irrigation systems
• Contouring where necessary
• Headlands
  – Set aside about 30 ft for headlands

Planting
• Planting with Mechanical
  Planters, union at a
  minimum of 4 - 6 inches
  above ground line
• Augered holes, a minimum
  6-8 inches high (apple).
  More settling following
  planting is experienced
  with augered holes.
• Do not fertilize until mid
  summer.
• Roots can and should be
  pruned back to fit hole / furrow

Trees settle after planting in augered or large holes
• Expect trees to settle
  in soil planted the
  previous spring.
• Reduce settling with
  packing soil around
  roots and watering
  immediately after
  planting.
• Minimize hole size to
  reduce potential for
  settling.

Keep Root Systems Moist and Back Fill With Soil to Remove Air Pockets
Apples on Dwarfing Clonal Rootstocks

- Use a 2”X6” on edge (2-4 ft long) piece of wood to help as a reference.

Impact of scion rooting in apples

Golden Del / M.26

Problematic if roots become strong and dominant after 5-7 years; no solution to correct.

Plant apples so that the Union is 4-6 inches above soil level.

Plant stone fruit (peach, cherry, plum, apricot) so that the Union is 1 inch above soil level.

Mounding apple trees following planting to avoid Dogwood Borer in the Midwest and Eastern US

- Primarily a problem on dwarfing clonal rootstocks such as M.9, B.9, M.26, etc.
- Follow planting recommendation to place union at 4-6 inches above soil line.
- Mound (individual trees) or form berms (using “Green Hoe”).
  - Soil should reach 2-3 inches above union on recently planted tree trunks (within 1 month following planting).
- Berm or mound encourages root primordia to initiate and extend into soil. Root primordia no longer present to provide haven for larvae and carbon source.
- Allow mound or berm to stay in the first 3 years. Much of berms erode or deflate after 3 years. If not, manually pull berm down below union to avoid scion rooting at the end of 3 years.

Union of Apple with burr knot

BK common in dwarfing rootstocks
Soil berm (mound) on new apple planting

Mounding Individual Trees

Forming a Berm soon after planting. Form with “Green hoe”. Keep mound narrow; < 1’ wide base.

Scion and clonal rootstock

P. McGhee

Soil berm (mound) on new apple planting

Recommended based on research, applied to organic or conventional growers


Keys to Mounding – Scion Rooting

• Initially, ok to mound above union.
• WITH IN THE SECOND TO THIRD GROWING SEASON; REDUCE HEIGHT TO JUST BELOW UNION, if it has not eroded naturally.
• Natural erosion will reduce height, but if not, use a hoe, rake or high pressure water to accomplish
• Scion roots that develop, while less than ‘1/4” to ‘3/8” can be exposed or cut, without fear of harm to tree.
• Wait too long (‘1/2” +) and scion roots have influence on vigor

Removing soil mound after 1 growing season

3 years later; if not eroded, remove mound/berm with high pressure water
Water as soon after planting to drive air pockets from soil

“Tank-water

Trickle system

Mulch as soon after planting as possible if water is not easily accessible. New root system is shallow And drought stresses readily in first year.

Trellis Support; Many different approaches to design for HD apples.

Trellis Construction

- 4-Wire System
  - String high tensile wire at 36, 56, 76 and 96 inches apart in height.
  - Connect leaders of trees to wires using the 4 inch tree fix rubber bands (only necessary if two wires such as 36 in and 76 or 96 in). Can do more if needed in second or third year.

- 2/3-Wire System
  - String wire at 36, 66, and 96 inches (3-wire) and 30 in and 84 in (2 wire) apart in height.
  - Fix 5/8-3/4 in. bamboo, 8 ft long from bottom wire past top wire. Use “Wire Clips” (6 or 8 in long) to fasten bamboo to bottom and top wires. The bamboo is used to support a rapidly growing leader with some fruit crop. The leader should be supported to 10 feet in height and be achieved by the 3rd leaf.

Constructing a trellis; The anchor should not be an afterthought.
By Geraldine Warner

Anchors

1. Place anchor at least the same distance away from the end post as end-post height.
2. Avoid digging a hole for the anchor and tamping with soil. If must do that, use crushed limestone (tamped). Screw anchors, rotate into ground (1 ft pilot hole to start).
3. Anchors can be many materials buried or screw anchors. Most commonly used, 3 ft long shafts are ok but 4 ft is standard and 5 ft long best for long rows. Best are 6 in diam (8 inch plates for long rows or sandy soil).
4. Double or triple the wire strength connection anchor to end post.
   1. 12.5-gauge high tensile wire breaking strength is 1400 lbs (each strand). 3 – 4 wires means tripling or quadrupling pressure up to 4000 lbs.
5. Many growers do not like “H-Brace” if large load as they may come out of ground.

End Posts

Driven; superior to tamped

Organic Orchard; Pipe
Line Posts

- Pressure treated 12 to 14 ft tall X 4 in topped posts. Place at 30-36” depth in soil.
- Steel posts or pipe for Organic.
- Interval Spacing:
  - 25 ft = Best and most expensive (most important if attach overhead micro-sprayers for frost/pest application (future).
  - 30-35 ft = Best
  - 40 ft = Standard
  - 50 ft (not recommended for Tall Spindle and VA systems with weight)

Wire

1. Typically 12.5 gauge Class III galvanized high tensile (breaking strength 1380 lbs).
2. Use a “Spinning Jenny” Reel to deliver wire.
3. Workers must wear eye protection and gloves.
4. Tighten to 200 to 250 lbs PSI to be able to support a crop.
5. Wire should be tacked with staples on the “upwind” side of posts (west side) (row direction should be N/S). Staple with 2” barbed staples.
6. Threading through posts with ½” holes can work, particularly short rows. The only negative is that posts can settle in line dropping or rising in elevation over time.

Wire and tree support

- Bamboo attached with wire clip
- No bamboo or individual tree support
- 4-5 wire system

PNW Bamboo/Wire System

- Top Wire at 9’
- 2nd Wire at 7-7.5’
- 1st Wire at 6 ft

This system allows workers to work across rows
Pruning and Training After Planting Bare-rooted Fruit Trees

Heading cut at 36-40” for most systems

Recently planted Tall Spindle Trees

1. Unpruned at planting
2. Leader connected to bottom wire
3. Mounded
4. Branches brought down using 20 ga. floral wire

Leave trees unpruned in Tall and Super Slender Spindle

- Only recommended where trees are planted 2-3 ft or less in distance.
- Prefer trees to begin weak and maintain weakness (reproductive)

Tie directly To wires

4 inch Tree Fix Rubber band

Girdling a problem.