

Orchard Design and Planting Establishment Overview

Presented By: Hermann G Thoennissen

Hort 421

February 28, 2008

On Site Pullman; via WHETS Tri-Cities, WA

HTG International

6855 W. Clearwater, Suite A101-116

Kennewick, WA 99336

email: m9hermann@msn.com

I. Orchard Design Factors

- ✓ Soil Characteristics
- ✓ Rootstocks
- ✓ Tree Spacing
- ✓ Support Systems

II. Planting Establishment

- ✓ Soil Preparation
- ✓ Pre-plant Tree Care
- ✓ Planting Procedures
 - When to plant
 - How to plant

II. Planting Establishment (Cont'd)

- ✓ Post-planting Care
 - Water
 - Weed, pest control
 - Fertility management
 - Training and pruning

III. Economics

✓ The Bottom Line

I. Orchard Design Factors

✓ Soil Characteristics

- Soils are a highly complex biophysical mixture of minerals, organic matter (dead or living), air, and water.
- Particle size varies widely. The soil needs to supply nutrients and water for the tree to grow.
- It serves as a medium in which the roots anchor, support system is placed, irrigation systems are buried and on which the farmer travels with equipment or on foot.

I. Orchard Design Factors (Cont'd)

✓ Soil Characteristics (Cont'd)

- It is also, at times, a reservoir for water and nutrients.
- Ideally one looks for soils which are categorized as loam, loamy sand, sandy loam, or sandy clay loam.
- These soils have good characteristics for orchards.

I. Orchard Design Factors (Cont'd)

✓ Soil Characteristics (Cont'd)

- They drain well, warm up fast, can stand heavy traffic without compacting, are easy to work and till, allow for root penetration evenly in all directions, and insulate well during cold spells.

I. Orchard Design Factors (Cont'd)

✓ Rootstocks

- For all major tree fruits we grow in Washington, there are many different rootstocks available, about 30 to 40 choices for Apple, Pear, Cherry, and other stone fruits.
- Many of them are selected for special purposes and have relatively little commercial significance.

I. Orchard Design Factors (Cont'd)

✓ Rootstocks (Cont'd)

- Rootstock selection is important, as the rootstock is what connects your variety to the soil.
- The rootstock has to meet or exceed all needs of the variety.
- In addition to these, it has to meet as many grower demands as possible, for example, resistance to diseases, no suckering or aerial rooting, and correct amount of vigor for chosen spacing.

I. Orchard Design Factors (Cont'd)

✓ Rootstocks (Cont'd)

- The rootstock is part of the farmer's orchard puzzle and has to fit perfectly with the other pieces.
- Rootstocks should have a well-proven commercial record in the area one wants to plant them.

I. Orchard Design Factors (Cont'd)

✓ Tree Spacing

- Tree spacing has to “interlock” with rootstock, variety, and support system in the orchard puzzle.
- There are two spacings-between the rows and between trees in the row.
- Row spacing is largely determined by either existing equipment or, in the case of a new planting, by what is available on the market.

I. Orchard Design Factors (Cont'd)

✓ Tree Spacing (Cont'd)

- Row spacing needs to accommodate the most efficient use of equipment. This is especially true in large operations where the number of bins to be moved in a short amount of time can be high.
- The row spacing has to handle the logistics of harvest.

I. Orchard Design Factors (Cont'd)

✓ Tree Spacing (Cont'd)

- With the standard orchard bin at 48" x 48" plus 18" on either side, that is seven feet of free space in the row middle.
- Add three feet for limbs from the two tree rows on either side of the middle and you have a thirteen-foot spacing.
- Most spacings in new plantings today are 12-16 feet for row spacing in apples and pears.

I. Orchard Design Factors (Cont'd)

✓ Support Systems

- Support systems are the subject of many discussions among growers everywhere.
- What type of support system (trellis system) to choose?
- There are different types of support systems.
- Systems with post and wire in one plane. Systems with post and wire in two or more planes.
- What do you want from a support system?

I. Orchard Design Factors (Cont'd)

✓ Support Systems (Cont'd)

- Why do you select a support system?
- Is the support system to stay the entire length of the anticipated orchard life or only the first few years?
- Support systems can range in price from \$1200.00 to \$4000.00 per acre.

I. Orchard Design Factors (Cont'd)

✓ Support Systems (Cont'd)

- Add the cost of netting with automation to protect from sunburn, hail, or coverage for frost or rain protection in cherries and the investment for trellis and protection can add up to \$10,000.00 per acre.
- Does your chosen support system have a proven record?

- The support system has to fit with your rootstock and variety, and your production and financial goals.

I. Orchard Design Factors (Cont'd)

✓ Support Systems (Cont'd)

- Compare the cost of several support systems.
- Remember, at the end of the orchard life you have to remove the support system.

II. Planting Establishment

✓ Soil Preparation

- Subsoil down to 30 inches! Especially in replant situations. The goal is to get air into the soil. Compacted soils are, or are close, to being anaerobic. Improperly aerated soils will not give you the full growth and rooting potential in year one.

II. Planting Establishment (Cont'd)

✓ Soil Preparation (Cont'd)

- Soil samples. Take soil samples at multiple locations at 0-16 inches, 16-32 inches, and 32-48 inches at a ratio of 10:3:1. Take at least one top sample for every ten acres in highly uniform soils. In situations of high variability, one sample for every different type of soil is a must. Following the soil analysis, amend the soils with fertilizers that match the needs for the trees and are compatible with the soils (remember to consider that some soil types are more prone to nutrient lock-up).

II. Planting Establishment (Cont'd)

✓ Soil Preparation (Cont'd)

- Soil samples... Follow university recommendations, that way you will definitely go in the right direction. When selecting fertilizers and other soil amendments, be sensitive to your pH requirements in the long run. It should be in the range of 6-7. Apply amendments prior to subsoiling for maximum incorporation.

II. Planting Establishment (Cont'd)

✓ Soil Preparation (Cont'd)

- Soil samples ... Leveling the ground, either through plowing, discing, harrowing, rototilling, or multiple pass operation of a combination of these is next. The goal is to have the field as level as you want the orchard to be. From this point forward there will be limitations due to permanent installations.

II. Planting Establishment (Cont'd)

✓ Water

- Determine your parameters and needs. There is no such thing as “free water” or an unlimited supply of water. Most of you, in professional careers in farming, will have to account for water use just as you do for money in accounting, and make no mistake about it, you will be held accountable for use, non-use, discharge, or pollution—simply for environmental impact.

II. Planting Establishment (Cont'd)

✓ Water (Cont'd)

- The needs for an orchard irrigation system are:
 - **Irrigation to replace water use by tree and evaporation.**
 - **Climate modification (frost control and cooling).**
 - **Wetting of leaf surface to enhance or reactivate applied ag chemicals.**
 - **Dust control during certain operations.**

II. Planting Establishment (Cont'd)

✓ Water (Cont'd)

- The needs for an orchard irrigation system are (Cont'd):
 - **To supply water for spray operations.**
 - **Application of ag-chemicals via fertigation and chemigation.**
 - **Supply water for wild life habitat or environmental benefit.**

II. Planting Establishment (Cont'd)

✓Water (Cont'd)

- Few irrigation systems today can do all these functions, but here are some basic numbers.
 - **Frost protection overhead 65 to 80 gpm/ac.**
 - **Cooling overhead 30 to 80 gpm/ac depending on system and cycling regimen.**

II. Planting Establishment (Cont'd)

✓Pre-plant Tree Care

- Work with a well-established nursery.
- The time between nursery and planting needs to be as short as possible. Anything other will reduce the success rate or slow growth in the first season.
- When the trees arrive, get them in the ground!
- The only thing that matters, is the performance of these trees.

II. Planting Establishment (Cont'd)

✓Planting Procedures

- When to plant
 - **As early as possible! (Late February or March-after frost danger has passed).**
 - **Have everything ready-water, equipment, etc.**
 - **Make sure everyone knows their role and what is expected of them. Do not just talk through this procedure, but actually walk through it.**
 - **In large plantings, many different tasks have to run simultaneously. This requires coordination of these tasks and steps so they transition smoothly.**
 - **Have a clearly identified chain of command.**

II. Planting Establishment (Cont'd)

✓Planting Procedures (Cont'd)

- How to Plant
 - **The best way for optimum tree development.**
 - **In my opinion, that is everything in place and operational by planting time.**
 - **Machine or hand planting.**

II. Planting Establishment (Cont'd)

✓ Planting Procedures (Cont'd)

– How to plant (Cont'd)

- **There is no substitute for digging a hole big enough for the roots to fit in and be spread out in all directions evenly. You want all trees to be as uniform as possible in the future. They are clones of one another, but it is your job to give them all the same conditions. Uniformity now will give you uniformity later, in trees and in fruit.**

II. Planting Establishment (Cont'd)

✓ Planting Procedure (Cont'd)

– How to Plant (Cont'd)

- **Certain soil conditions (gravel) are hard to dig by hand, therefore machine planting is often done. The downside to this practice is the root damage occurring from pebbles and gravel smashing the roots, which create entry points for fungi.**
- **Use of planters in loam or sand frequently leads to rooting mostly in the trench created by the planter. The trees are not well anchored and do not explore the entire soil volume.**

II. Planting Establishment (Cont'd)

✓ Planting Procedure (Cont'd)

– How to Plant (Cont'd)

- **Use of planters almost always requires installation of irrigation systems after the planting. How long do you want young trees to be without water? The trees should NEVER go without it!**

II. Planting Establishment (Cont'd)

✓ Post-planting Care

– Water

- **During the first year, keep soil between 80 and 95 percent field capacity to insure adequate water in the top portion of the soil (until they have a chance to grow longer root systems).**

– Weed and Pest Control

- **The young tree does not need competition.**

- Stay on top of weed control during first year.
- Use materials that burn weeds.
- Do not damage bark.
- Do not use sterilants.

II. Planting Establishment (Cont'd)

✓ Post-planting Care (Cont'd)

- Weed and Pest Control (Cont'd)
 - Pest control-monitor daily first few weeks, then weekly for remainder of season.
 - Monitor above and below ground. For example, wooly apple aphid can damage a young trees roots far before symptoms above ground can be seen.
 - Treat early.

II. Planting Establishment (Cont'd)

✓ Post-planting Care (Cont'd)

- Fertility Management
 - Trees from a reputable nursery are loaded with reserves.
 - Your pre-plant soil amendments should have brought you close to ideal. Now that your trees are planted, pull another soil sample 0-18 inches (depending on soil type) and see where the nutrient levels are.
 - Do not apply around the trunk. This is a frequent mistake that results in sick or dead trees.

II. Planting Establishment (Cont'd)

✓ Post-planting Care (Cont'd)

- Training and Pruning
 - After planting, select branches you want.
 - Remove all branches that are bigger then one half the trunk diameter at point of origination of trunk.
 - During first six weeks, set crotch angles at 70-90 degrees. Remove shoots you don't want. This is a routine that is repeated several times during the first 6-8 weeks.
 - When setting crotch angles with toothpicks or spreaders, do so when weather is dry to lower risk of infection. Crotch angles can be set by tying limbs, but this is more costly.

II. Planting Establishment (Cont'd)

✓ Post-planting Care (Cont'd)

– Training and Pruning (Cont'd)

- **When followed, this will leave you with a tree at the end of your first growing season with the number of scaffolds you chose. If crotch angles were set right, there is no need for pruning if new growth is 18 to 30 inches. If growth is less than 12 inches, analyze why. You might want to start over again.**
- **Training, do it early.**
- **Pruning, do it sparingly as it delays fruiting.**

III. Economics of Orchard Establishment

✓ The Bottom Line (see II)

- If you are in the establishment phase and you already run into financial difficulties, you made a mistake. You need independent help (a consultant who has no financial or emotional connections with the orchard) who has done what you are trying to achieve successfully fast.

III. Economics of Orchard Establishment (Cont'd)

✓ The Bottom Line (Cont'd)

- If you are beyond the establishment phase and you are not getting projected returns on investment, you need independent help, who has done it successfully, even faster because of the effect of compounding interest.
- Orchard economics are some of the most long-term in natural resource management and some of the most complex. For example, apples could take 25 years, and pecans could take up to 100 years.

III. Economics of Orchard Establishment (Cont'd)

✓ The Bottom Line (Cont'd)

- It is imperative that in planning the process one incorporates a good financial planner.
- A knowledgeable tax consultant needs to be part of every business as well as a good bookkeeping, accounting, analysis, and finance unit.
- The entire business mgmt. process needs to follow established, proven, and commonly accepted accounting and business management practices.