Orchard Establishment, Site Selection and Preparation

The success of an orchard is only as good as the planning and site preparation that go into it. This is a simple maxim, but one that is often overlooked by novice and experienced grower alike.

Orchard Establishment

Site Selection and Soil Preparation

Shortcuts and haphazard approaches can result in less-than-ideal growth and other problems during the orchard's life. It is easier to amend a site before the trees are planted than it is once they are in the ground. Penn State has an excellent video on soil preparation that you may view on line.

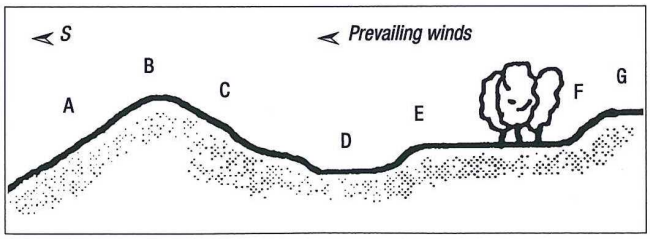

Figure 1-1. *Considerations for orchard sites.*

Typical site arrangements. A - a warm location that receives more sun. This site is not affected by late spring frosts because cold air drains to lower-lying areas. B - also misses late spring frosts, but the top may be too cold in winter because of exposure. C - similar to site A but colder, warming up later in the spring. D - the most susceptible to spring frosts because cold air drains into it from elevated areas. E - can still be frosty, but the woods act as a windbreak. F - not desireable. G - like B.

To build a good orchard, you need a good foundation. The ideal site is on rolling or elevated land so that cold air can drain during spring frosts. Figure 1-1 shows typical site arrangements. Site A is a warm location that receives more sun. This site is not affected by late spring frosts because cold air drains to lower-lying areas. Site B also misses late spring frosts, but the top may be too cold in winter because of exposure. Site C is similar to site A but colder, warming up later in the spring. Site D is the most susceptible to spring frosts because cold air drains into it from elevated areas. Site E can still be frosty, but the woods act as a windbreak, sheltering this site from prevailing winds. Site F is not desirable because of the dense woods at the base of the hill. Woods can trap cold air and prevent it from draining to lower-lying areas. Site G is similar to site B.

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
8	1,815	1,361	1,089	907	777	680												
9	1,613	1,210	968	806	691	605	537											
10	1,452	1,089	871	726	622	544	484	435										
11	1,320	990	792	660	565	495	440	396	360									
12	1,210	907	726	605	518	453	403	363	330	302								
13	1,116	838	670	558	478	418	372	335	304	279	257							
14	1,037	778	622	518	444	388	345	311	282	259	239	222						
15	968	726	580	484	414	363	322	290	264	242	223	207	193					
16	907	680	544	453	388	340	302	272	247	226	209	194	181	170				
17	854	641	512	427	366	320	284	256	232	213	197	183	170	160	150			
18	806	605	484	403	345	302	268	242	220	201	186	172	161	151	142	134		
19	764	573	435	382	327	286	254	229	208	191	176	163	152	143	134	127	120	
20	726	545	414	363	311	272	242	217	198	181	167	155	145	136	128	121	114	108

Table 1-1. Number of trees per acre a at various tree spacings.

To use this table, locate the desired or planned in-row spacing of trees on either the vertical or horizontal axis. Next, locate the between-row spacing on the other axis. The number of trees per acre can be found at the intersection of the two spacings. a To determine trees per acre for values not listed in the table use the following formula:Trees/A = 43,560/(In-row spacing x Cross-row spacing)

Slope exposure should be considered for its effect on fruit trees as they come out of dormancy. A southern-facing slope warms up faster in spring, while the opposite is true of a northern slope. Eastern-facing slopes are intermediate. In Mid-Atlantic areas, a western-facing slope tends to be windier. Wind can cause spraying problems during the growing season.

While uphill or rolling land is the most desirable, the degree of slope can also limit its suitability. The ideal site has a 4 to 8 percent slope. It may be difficult to operate machinery on slopes of more than 10 percent.

Selecting a site for an orchard involves below-ground considerations as well, primarily soil depth and soil texture. An old recommendation for a desirable orchard soil is that it be deep and well drained.

Soil drainage is probably the most important factor in the longevity of an orchard. This is because of the inherent inability of certain types of fruit trees to survive when planted in imperfectly drained soils. Stone fruits (peaches, cherries, and plums) are the most susceptible to poor drainage. Apples are intermediate, and pears can survive on the more poorly drained soils.

Soils are made up of four basic ingredients: mineral elements, pore space, organic matter, and other items consisting mainly of living organisms, including fungi, bacteria, and nematodes. One classification of soils is based on the mineral part of soil and consists of four sizes of particles. Clay particles are the smallest, followed by silt, sand, and gravel. The USDA has devised another system of classifying soil particles. In this system soil is divided into seven categories: clay, silt, and five sizes of sand.

Soil texture is determined by the percentage of sand, silt, and clay in the soil. Arendtsville gravelly loam, Highfield channery silt loam, and Steinsberg sandy loam are examples of soil types having different textures. The structure of a soil is influenced by soil texture and also by the aggregation of small soil particles into larger particles. The amount of aggregation in a soil is strongly influenced by the amount of organic matter present.

The pore spaces in a soil are normally filled with air or water. As the amount of water increases, the amount of air must therefore decrease. The pores of a well-drained soil have certain physical characteristics that, after a period of heavy rainfall, enable water to rapidly drain away and allow air to return to its original percentage.

The amount of organic matter in soil is an important factor in soil structure. Organic matter consists of dead and decomposing plant and animal parts. Living organisms break down plant debris into organic matter.

The cation exchange capacity, or the ability of soil to store cations (positively charged particles) is highly dependent on the amount of clay and organic matter in the soil. Clay and organic matter contain predominantly negatively charged sites that attract cations. Applied nutrients such as ammonium nitrogen, potassium, calcium, and magnesium attach themselves to the negatively

charged soil particles. This phenomenon is called cation exchange, and it allows the soil to be a reservoir for plant nutrients.

Before selecting a site for an orchard, consult a county soil map. Soil surveys are available at most Natural Resources Conservation Service offices in Pennsylvania. These publications are valuable in determining if your particular site has the detailed requirements for a long-term viable orchard operation. In addition to hard copies of soil maps, growers can access detailed soil information online. You may access soil information specific to your site at the USDA NRCS Web Soil Survey. A more detailed site evaluation is probably warranted, and we recommend that a backhoe be used to dig holes 5 to 7 feet deep so that the soil profile can be examined. A test similar to a percolation test used for installing septic systems may also be advisable where internal soil drainage is questionable. Poorly drained soils often have horizontal layers of light-colored material.

Although pH and fertility are often considered important factors for orchard soils, internal soil drainage is actually the most important. Soil fertility can often be corrected by applying fertilizer or by increasing the level of organic matter in the soil. Soil pH can be corrected and is not usually a limiting factor unless a site is highly acid. In this case only the plow layer depth can be corrected with applications of lime.

The best soil is a well-drained loam a minimum of 3 to 4 feet deep. Good drainage, however, should take preference over depth. In Figure 1-1, soils at site B are most likely to be the shallowest because of erosion, while those at site D tend to be the richest. Soil fertility should be medium to low. Overly fertile soils can lead to excessive tree growth at the expense of fruit production. Adding fertilizer to increase tree vigor is easier than trying to reduce vigor. Fruit trees grow well in soil with a pH of 6.0 to 6.5. Higher or lower levels can cause nutrient deficiencies.

Once you have selected a site, you must prepare it. If you are replacing an existing orchard, particularly a stone fruit orchard, it is important to take a nematode test before the old trees are removed to determine the need for fumigation. For more information on nematode management, see Nematode Problems in Deciduous Fruit Trees in Part II in the Tree Fruit Production Guide. Next, take a soil test to determine soil fertility. Penn State provides a soil testing service through the Agricultural Analytical Services Laboratory for a fee. You can contact them by going to lab's website or by calling 814-863-0841. Private labs that can analyze your soil are also available. When starting a new orchard, you may want to consider also having the lab test the organic matter level in your soil. Organic matter is an important consideration in determining how vigorous or fertile your soil may be. If you are replacing an existing orchard or clearing the land for a new one, take the soil sample after removing the trees and as many of the roots as possible. An initial plowing and leveling should also be done before taking the soil sample. In this way, any subsoil that comes to the surface can be thoroughly mixed.

If the site has been open pasture or field cropland, be sure to take a nematode sample. Examine the field for the presence of perennial weeds before working the ground. If multiflora rose, thistle, poison ivy, or hackberry are in the field, they should be treated in the summer or fall with glyphosate. If the problem weeds have been established for a number of years, controlling them will require two or three treatments of glyphosate. It is best to subsoil as deeply as possible. Running a deep shank in two directions across the field will break up any existing hardpans.

Plow down any stubble left from the field crop in late summer to increase soil organic matter. After the field crop has been plowed down, take a soil test before doing the final disking and leveling. Incorporate any needed amendments, such as lime, phosphorus, or potassium.

Orchard sod should be planted the fall before trees are planted. The grass cover traditionally used is Kentucky-31 tall fescue. It establishes itself rapidly and is a durable cover crop, although it does require frequent mowing during the growing season. The ideal time to plant seed is mid-August to late September. Seed the grass at a rate of 20 to 40 pounds per acre.

Source: Penn State Tree Fruit Production Guide.

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