

Grove Planning and Establishment¹

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Many factors need to be considered when preparing for new tree plantings. Careful planning and preparation is necessary to ensure success and reduced frustrations in the future. Site selection, rootstock and scion selection, planting density, quality of trees, tree planting, irrigation, nutrition, and disease control are all important factors that contribute to success of new grove establishment. For more information on irrigation, fertilization, and variety/rootstock selection, please see the chapters focusing on those topics.

SITE PREPARATION

Site preparation begins with choosing a site with desirable features. Ideal features of a citrus grove include good drainage, balanced soil pH, and access to sufficient water of good quality for irrigation. The optimum pH of the soil and irrigation water is between 6.0 and 6.5. Testing the quality of irrigation water well before planting is necessary. The best quality water should not be high in bicarbonates and salt levels. Alkalinity caused by carbonate (CO_3^-), bicarbonate (HCO_3^-), and hydroxyl (OH^-) anions, has been shown to be detrimental to HLB-affected trees. It is recommended to neutralize high alkaline water by adding acid to the irrigation water prior to irrigation. Lowering the soil pH can also be accomplished by using acid-forming fertilizers and/or applying elemental sulfur to the soil. Likewise, rootstock selection should be made based on drainage and soil pH. Constant adjustment of soil/irrigation water pH adjustment can incur high production cost which may not be sustainable for long term. Therefore, in such case a pH tolerant rootstock variety is recommended (pH sensitivity: Swingle > Carrizo > Sour orange > Cleopatra).

The wet “flatwoods soils” of the southwest and eastern production areas are poorly drained and *Phytophthora* is likely to be a risk. Therefore, *Phytophthora* resistant rootstocks should be considered. Poorly drained sites require a drainage system in combination with raised beds to provide an adequate rooting zone. Drainage systems consist of water furrows, ditches, tile drains if needed, and a perimeter ditch to remove excess water. The crown of raised beds should be 3-4 feet above the bottom of the furrow. The drainage system in the flatwoods should be designed to remove 4 inches of water per day. Drainage is usually adequate in the sandy soils of central Florida and therefore does not require bed preparation.

The history of the site should also be considered. Make sure that there are no residual herbicides remaining in the soil, which may be harmful to your trees. Likewise, pest history of the previous grove can help you select the varieties that will perform best. Especially, groves with a history of *Diaprepes* root weevil should only be planted with rootstocks that are tolerant to this pest.

TREE SELECTION

It is important to start with high-quality nursery trees purchased from a registered nursery. A tree that is inferior from the start will not be productive and will result in economic losses. Healthy trees should have retained the majority of their foliage and have a well-developed root system that is not bound within the pot. Foliage should be free of insect pests, nutrient deficiencies, and diseases. Scion selection will depend on grower’s preference and the predicted economic potential of the variety. Rootstock should be based on soil characteristics, pest and disease pressure, desired size control and tree spacing, and other desired traits.

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TREE SPACING

After the site has been prepared and scion/rootstock are chosen, a wise consideration must be given to decisions about tree spacing. Tree spacing is an important factor in the profitability of a planting. Sunlight is the source of energy for tree and fruit growth. The focus of grove design is the arrangement of tree canopies to capture sunlight efficiently. Tree spacing should be based on the vigor of the scion/rootstock combination and the expected life of the grove. Tree rows are typically oriented north to south for maximum sunlight interception. However, row orientation may also depend on the row length and water drainage direction at the site. A good design results in healthier, more productive trees and better fruit quality with only minor pruning. Groves planted at higher densities provide an earlier return but are more expensive to establish and more difficult to maintain. A spacing of 18-22 feet between rows is generally the norm for citrus groves. Tree spacing within rows depends on rootstock and generally ranges from 8-15 feet.

IRRIGATION SYSTEM

Due to the non-uniform distribution of the rainfall in Florida, citrus plantings need to have an irrigation system. The irrigation system has to be properly designed and installed before planting. Microirrigation systems are cost-effective and use less water than other irrigation systems. Microirrigation systems are easily automated and operate at lower pressures, hence using less energy. Microsprinkler systems also offer some degree of cold protection. Properly managed microirrigation provides uniform irrigation, improves water use efficiency, and minimizes water losses to evaporation, runoff, and deep percolation below the root zone. Microirrigation also reduces incidences of diseases that are conducive to a moist environment and a wet canopy. Microirrigation can efficiently deliver fertilizers (fertigation) and other chemicals (chemigation) through the irrigation system and allows irrigation of land too steep for other means of irrigation.

PLANTING TREES

Young citrus trees can be planted in the grove anytime of the year. However, in regions with potential for freeze damage, planting should be delayed until the spring. Ideally, trees should be planted on the same day they are received. Under no circumstances should trees be allowed to dry out. To minimize root desiccation and damage, trees should be kept cool and moist until they are planted. Trees should be removed from the container to inspect roots. Roots that are pot-bound should be pruned. Use a clean and sharp knife to make several one-inch deep vertical slashes through the root ball to encourage root branching. These slashes also allow the potting soil and roots to interface more closely with the soil in the planting hole. It may be easier to expose some of the outer roots by pulling them so

they protrude from the ball and extend into the soil in which the tree is planted. Otherwise, the tree may not grow quickly and satisfactorily. Trees with irregular root systems should not be planted. For more information on root health, refer to root the health section of this guide.

CARING FOR YOUNG TREES

Florida's sandy soils, high summer temperatures, possible low winter temperatures, and scattered rainfall patterns complicate young tree care by forcing growers to protect, fertilize, and weed control young trees regularly or face extensive losses. The primary objective during the first few years is rapid development of the tree canopy. Young trees are more sensitive and more attractive to pests than mature trees due to high levels of vegetative growth. Monitoring for insects and diseases is essential in newly planted groves and special care is needed to control them. Minor selective pruning may be beneficial during the first two years to develop good tree shape.

Weed control

Weeds compete with young citrus trees for water, nutrients, soil applied pesticides, and sunlight, and therefore they must be properly controlled. Control of weeds before planting is important. If residual herbicides are used, they should be used at proper rates and at least 30 days in advance of planting so that residues do not impact young tree growth. After planting when weeds become a problem, herbicide materials should be applied at recommended reduced rates. Be sure to read labels carefully for restrictions on the use of herbicides around young trees. To minimize herbicide contact to young trees, it is recommended to use tree wraps. When using wraps, be sure to inspect them regularly for ants or other pests that may damage the tree trunk. For more information, please refer to the weed control section of this guide.

Sprouting

Young trees require periodic sprout removal. Rootstock sprouts should be removed during the growing season before the sprouts become large enough to compete with the scion. Tree wraps usually reduces the need for sprout control.

Irrigation & drainage

Young citrus trees require frequent but moderate water application for survival and proper growth. Irrigation systems should be in place before planting trees. Trees should be checked frequently to be certain they are receiving sufficient water. For more information, please refer to the irrigation management section of this guide.

Fertilization

The goal of fertilizing young trees is to promote vigorous vegetative growth that rapidly produces a canopy with high fruit-bearing capacity. Applying fertilizer in several small doses increases fertilizer efficiency because it maintains constant nutrient availability and reduces leaching losses. Frequent application of water-soluble fertilizers with irrigation water (fertigation) or use of controlled release fertilizers can also increase overall fertilizer use efficiency. Great care must be taken to ensure that proper rates of fertilizer materials are dispensed to prevent nutritional deficiencies or toxicities. For more information, please refer to the citrus nutrition management section of this guide.

Pest control

Because young trees have more frequent flushing cycles than mature trees, they are more attractive and sensitive to pests. Therefore, special care is needed to control citrus psyllids and leafminers to reduce their damage to new leaves. This will reduce the severity of citrus canker, as well as the spread of HLB, with long-term impacts on grove productivity. Relying solely on foliar contact insecticides for young trees is not a good strategy. Soil-applied systemic neonicotinoid insecticides that provide 6-8 weeks of control are the most effective tool for managing psyllids and leafminers on young trees with the least negative impacts on beneficials. For more information on the management of citrus psyllids and leafminers, see the pest management sections in this manual. With careful planning and management, growers can get a young tree grove off to a good start and avoid headaches later on.