Irrigation Management to Increase Young Tree Growth and Productivity in Florida

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Introduction

A management technique to counteract the devastation tree loss caused by canker and Huanglongbing (citrus greening) and improve the efficacy of mechanical harvesting is to plant at higher tree densities than are currently used in Florida. This technique gives the citrus grower the option to remove trees as they become infected and still maintain higher yields. Higher water use would result if citrus growers were to manage these higher density groves using current scheduling methods. Additionally, Florida is currently in a drought and competition between agricultural and urban waster use has increased. Therefore, it is important to help find ways for citrus producers to conserve water. The Open Hydroponic System (OHS) is a production system developed in Spain and commercialized in South Africa, Australia and California. Citrus trees are grown with an intensive fertigation management technique that is designed to provide essentially a non-limiting environment to those roots without over irrigating and leaching nutrients. This new fertilizer program will require changes to existing irrigation management programs.

Research over the last several decades has proven that growth of young trees and productivity of both young and mature trees benefit from high frequency low volume irrigation. Improved tree growth from intensive irrigation management could reduce the time required from planting to economic breakeven production, thus providing management options for trees lost during canker and citrus greening management. Florida growers must also adopt Best Management Practices (BMPs) that reduce nutrient leaching by limiting the amount of fertilizer that can be applied, and the time of year when fertilizer can be applied. These BMPs are based on research under low-intensity management systems that apply both water and nutrients at intervals that are less than optimal. However, production systems that combine grove design and irrigation management to increase yield and grove operational efficiency have not been studied. High density plantings of sweet oranges on low-vigor rootstocks have known advantages, but their long-term behavior and changes in the functional relationship of tree density, growth rate, and yield over time are not well understood.

The OHS system has the potential of conserving water through the applications of only the water required on a daily basis. The system can also reduce water quality impact due to nutrient leaching by managing the applied nutrients within the tree root zone. The OHS system was quickly commercialized in other citrus production areas and promoted with little research

support. The OHS employs drip irrigation for root control and water savings. Due to the sandy texture of Florida soils water holding capacities are much lower than many other citrus production areas. Therefore, we must determine proper management guidelines in sandy soils using microsprinklers.

The benefit to citrus growers using OHS will be rapid tree growth and increased early fruit production. Adoption of OHS by citrus growers should not only increase their early returns but also, give growers options for managing the current devastating diseases such as canker and citrus greening. Growers normally achieve their expected return on investment within 15 to 20 years of planting. If those goals could be achieved in 10 to 12 years through increased early yields, the grower would benefit even if the grove declines over time due to disease. The OHS system offers the possibility of achieving these goals and conserving water.

OHS Project Site – SWFREC/Immokalee

A concept orchard was planted on a flatwoods soil at the UF/IFAS Southwest Florida Research and Education Center (SWFREC), Immokalee, in July 2006. The trial consists of a block of Valencia and Hamlin orange trees. A scion-rootstock-spacing combination using rootstocks selected for their vigor was planted 545, 198, and 151 trees per acre.

Scions:

Hamlin
Valencia

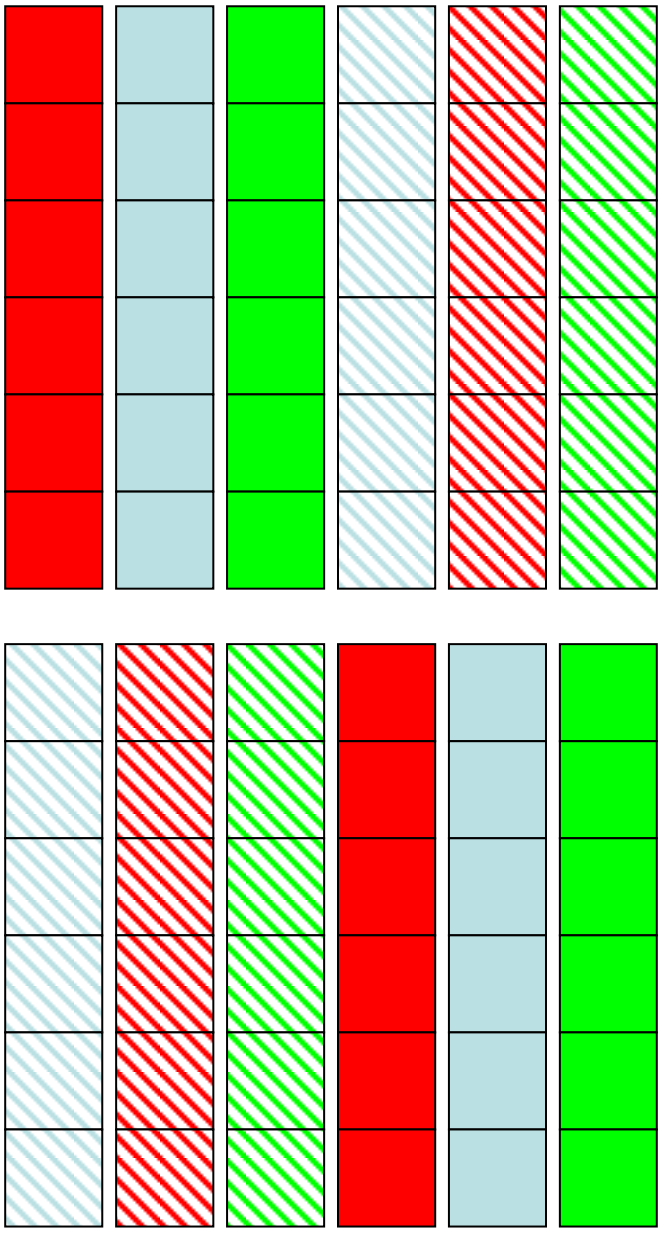
Tree spacing:

Spacing	Density (trees/acre)	Bed width	Rows per bed	Rootstock
8 x 10 feet	545	48	4	Flying Dragon
10 x 22 feet	198	44	2	Swingle citrumelo
12 x 24 feet	151	48	2	Cleopatra mandarin (Hamlin) Volkamer lemon (Valencia)

Irrigation Treatments:

Treatment	Emitter type	Frequency	Number	Fertigation
OHS-Drip	drippers	Daily	4	Daily
OHS –Micro	microsprinkler	Daily	2	Weekly
Conventional	microsprinkler	Weekly	1 to 3	Monthly

Concept Grove – SWFREC – Tree Spacing



Hamlin

8’x10’ (545)

10’x22’ (198)

12’x24’ (151)

Valencia

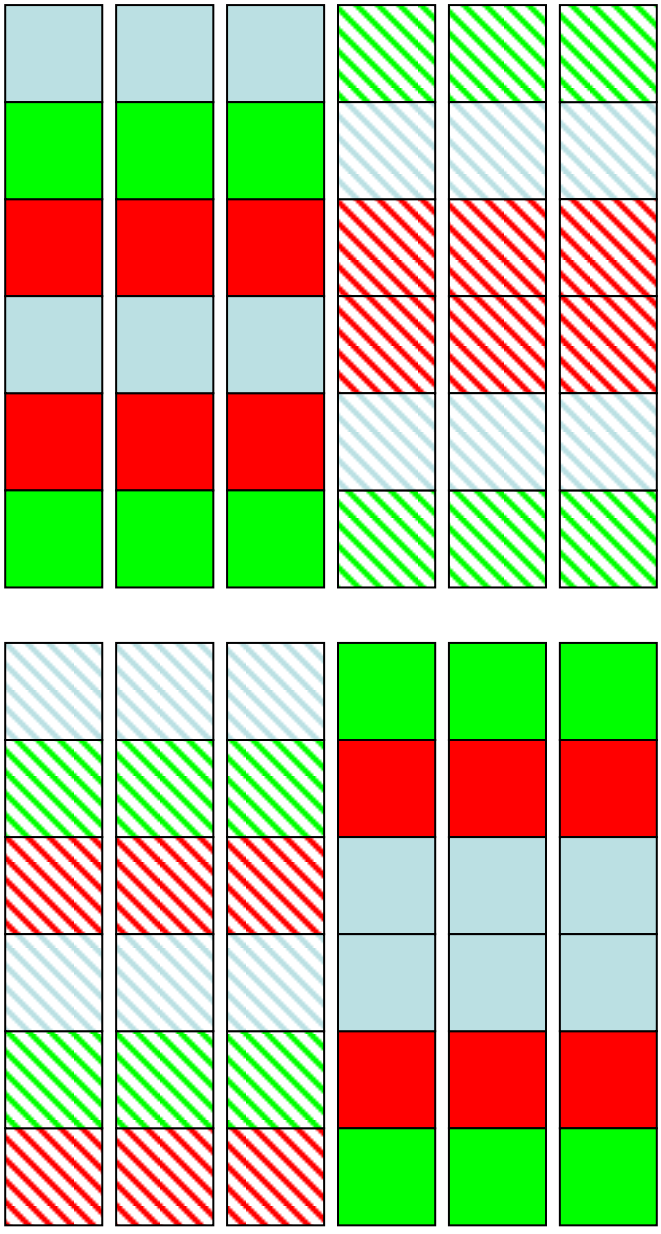
8’x10’ (545)

10’x22’ (198)

12’x24’ (151)

N

Concept Grove – SWFREC – Treatments



Hamlin

Drip OHS

Micro OHS

Conventional

Valencia

Drip OHS

Micro OHS

Conventional

N