

Open Hydroponics/Advanced Production Systems Florida Introduction

By
Peter Spyke

Basic Principles of OHS/APS

The Open Hydroponics/Advanced Production Systems approach to growing commercial citrus in Florida is based on the central concept of "Precision". The idea is to achieve the highest possible fruit production and desired quality attributes, especially in the early years of the planting. Grove design is an important part of achieving the goals, and management practices are approached differently than in the past.

The following are some central concepts of commercial citrus production. OHS/APS and conventional systems both must address these principles.

"Static Factors" are things that cannot be changed without recapitalization, such as variety and rootstock, spacing, irrigation and drainage systems, etc. Once a grove is planted, the static factors can greatly affect the outcome of the project, so a great deal of thought is usually devoted to these choices.

"Dynamic Factors", on the other hand, are basically the production inputs such as water, fertilizer, pruning, weed and pest control, and other programs that can be easily and rapidly adjusted at any time. With OPS/APS, dynamic factor management programs are planned out for the year, and then modified according to climate and other observations and measurements.

"Bearing Efficiency" is simply the amount of fruit per canopy volume. Bearing efficiency is the most useful measure when evaluating OHS/APS management programs since total yield per acre is most strongly related to the size of the trees (a larger tree will almost always produce more total fruit than a smaller tree). When determining the success of OHS/APS, bearing efficiency is a better way to view the outcome of management. The OHS/APS approach attempts to increase the amount of fruit produced in any given canopy volume.

"Canopy Coverage" is an important concept for OHS/APS. Irrigation and fertilization programs are based on the volume of canopy per acre. Tree spacing takes into account the soil type and variety/rootstock combination to optimize canopy volume per acre. Pruning practices are designed to maintain dense canopies on the trees in order to maximize the fruit production surfaces and leaf volume.

OHS/APS systems attempt to combine the grove design, or the static factors, with management, or the dynamic factors, to achieve the highest canopy coverage possible per acre, and maximum bearing efficiency. These goals are achieved by managing with greater precision utilizing higher levels of technology and knowledge about how citrus trees grow and produce fruit.

Advantages and Limitations of OHS/APS

The commercial citrus industry in Florida is in a transition from production systems that have been economically successful in the past to systems that are capable of producing a positive return on investment that is appropriate for the risk associated with developing new groves. Existing groves are being managed in a way to prolong their useful life from the economic standpoint, but planting a new grove in today's situation using past configurations and management increases risk to the point where it may not make sense.

Advantages: OHS/APS offers alternatives that reduce risk and increase net revenue, which are both necessary to justify investment in new groves.

- **Time** - Closer tree spacing and rapid growth of young trees shifts the fruit production curve of a new grove towards the present, allowing recapture of capital costs and attainment of net income earlier in the life of the grove.
- **Lower Cost of Development:** While it is true that the cost per acre to prepare and plant a grove using an OHS/APS design is higher than a conventional grove, when the investment is examined from the cost **per tree** point of view, it is actually lower. Since the tree becomes the productive unit for at least 5 years, this is a significant advantage when evaluating the feasibility of planting a new grove. Only the cost of the trees themselves has a direct relationship to the number of trees planted. All of the drainage, irrigation, and other engineering costs of planting a new grove are lower **per tree** because they are basically the same regardless of how many trees per acre are planted.
- **Revenue** – Better fruit quality on young trees results in higher returns/box. More boxes per acre also increases income.
- **Lower Cost/Tree and Cost/Box** – More trees per acre means that the cost per tree of grove care inputs is less. For example, as a mower moves down the row, it's passing more trees during the same amount of time, so the mowing cost per tree is lower. In the early years before a dense hedgerow is formed, the fruit production per acre is proportionate to the number of trees – if the number of trees is doubled, so is the fruit production per acre. So, combining the lower cost per tree and the higher boxes per acre results in a much lower cost per box in the early years of the planting. Some costs, such as fertilizer and irrigation operation and maintenance, are just lower overall. Another way of looking at this factor is that it allows a grower to plant the same number of trees on fewer acres, which means that a smaller number of acres have to be developed to achieve the same total fruit production for the first 5 years or so.
- **Profit** – Lower costs/tree means that annual operating profits (fruit revenue with caretaking costs subtracted) are reached much earlier in the life of the grove.
- **Reduced HLB Risk** – More trees per acre means that as a tree is lost to HLB, the impact is less because the vacant space that results is smaller. The neighboring trees fill the space rather than requiring a reset, which preserves production per acre for a longer period during the life of the planting. A secondary benefit is that the effective delivery of systemic pesticides prolongs control of psyllids and citrus canker.

Limitations: There are two basic things that growers will encounter when considering OHS/APS that may limit their success with OHS/APS. Overcoming these limitations will be necessary in order to achieve the full potential of OHS/APS.

- **Design and Operation of OHS/APS in Florida is New** – These systems have been developed in other countries around the world, all of which have different climates and soils than Florida. A number of years and attempts will be required before the depth of our knowledge about the best way to grow commercial citrus using this approach reaches the same levels as growers in other countries, so we will be playing catch-up for awhile. We will make mistakes that later will seem obvious.
- **New Knowledge and Skills are Required** – The need for more precision, and reliance on technology, will require that everyone involved with managing and operating groves will have to learn new things and develop new skills. This is a time-consuming process, and while people are learning, the management of an OHS/APS grove will not be as smooth or effective as it will be as we all learn more. So, a significant investment in Human Resources must be part of adoption, and actually may be the largest risk factor in the adoption process of each organization.

Can we overcome these limitations? The simple answer is that growers in many other countries around the world have adopted OHS/APS successfully. If they can do it, so can we. However, these limitations are real, and must be addressed as carefully as deciding which variety and rootstock to plant.

For the time being, we will rely on knowledgeable advisors from other countries where OHS/APS has become routine and successful. We are growing the same crop – citrus – so many things are directly applicable to our situation. The recommended approach is to involve these advisors as much as possible to both reduce the number of mistakes we make in designing and operating groves, and for training people. They are the fastest route to overcoming the obstacles of adoption.

The longer term challenge will be to learn how to adapt the techniques from other countries to Florida. This will involve extensive trial plantings, and an organized program for measuring and communicating the results. Once again, since the same cultivars of citrus we're growing have been produced successfully in other countries with great success using OHS/APS, there is every reason to expect the same overall result here in Florida.

*Arapaho Agricultural Services
13300 Okeechobee Road
Fort Pierce, Florida 34949
772-464-3391
ArapahoCitrus.com*