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Nursery Series

Starting a Wholesale Nursery – Part II

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Container Production – Specifics

Facilities and Equipment

A container production nursery typically contains the following basic components or features. Your business usually includes some type of office building with space for administrative functions and usually sales. When starting a nursery business, your home typically serves this function. A nursery of any type and size will require some type of storage building. Covered storage is usually considered for fertilizers, chemicals and materials not contained in waterproof packaging. Storage of chemicals requires special consideration and handling. Your local county office of the University of Arkansas Cooperative Extension Service can help you in the proper storage and handling of chemicals.

Medium to large nurseries usually designate a building or shed as an area for potting or canning. Although canning is often done in the field directly off the ground or from wagons, it is certainly more enjoyable for workers to perform this function in a covered area with minimal environmental control (e.g., heat for winter; fan cooling for summer). A nursery operation will use a number of vehicles and some machinery, so larger operations include facilities for storing and repairing equipment.

Since most nurseries conduct some type of propagation on site, specialized facilities are usually

reserved for this function. The type (e.g., tissue culture, seed, cutting, grafting or budding) and amount of propagation will determine the type and size of facilities required.

Most of your nursery parcel will be devoted to general container growing areas. This may include covered (lathe, glass, plastic or fabric) or open production areas. The initial investment in preparing a container growing area can be expensive depending on the amount of grading required and type of bed preparation materials. Production bed preparation minimally includes clearing, grading, installing drainage and irrigation systems and development of roads and aisles. Most growers will opt to cover the ground in gravel or a weed barrier fabric to reduce weeds and make for a cleaner production pad. When grading container beds, give serious consideration to "crowning" beds so that water does not stand under the containers. Grading should also account for the general flow of water around production areas to avoid problems with erosion and washouts. Although not yet required by law in Arkansas, growers would be wise to design the container nursery layout so all surface runoff can be contained on-site and recycled.

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In Arkansas, it is likely that a container nursery will devote some growing space to either permanent or temporary overwintering structures. The most common type is constructed from bent steel hoops covered with white polyethylene sheets. A container nursery may also use a permanent shade structure constructed from poles, cables and plastic shade fabric.

All nurseries need to designate an area to "stage" loads for shipping. Loading or staging areas should include adequate irrigation and may be covered to reduce stress on workers and plants. Loading trucks from a dock is easier than from the ground.

Production Terms and Schemes

Like other industries, there are some unique terms that apply to container nursery production. "Direct stick" is a term used when an unrooted cutting is placed directly in a container skipping the rooting stage in propagation. "Liners" are rooted plants used in production that can vary in size from 2" pots up to larger sized containers (e.g., #5) and are serving as the source for the next stage in production. As an example, you may be growing #5 junipers for sale (finished stock), or those same plants may be used as a "bump-up liner" for a #7 finished crop. "Bump-up" is the term used when plants are moved from a smaller to a larger container size. In most cases growers are starting with smaller-sized plants that they will "grow-up" to a finished size. In a few cases you may wish to purchase in "finished" sizes rather than grow everything yourself as these items will help broaden your sales mix.

Specific Production Considerations

When dealing with container production, we need to focus on several specific production considerations. The first is the type of container media. One of the main reasons for growing in a container is that you have a unique opportunity to optimize the growing conditions for chemical and physical properties. Your extension specialist can help you in evaluating appropriate materials for your container mix. There are several components that are generally used in containers including bark, peat, compost, parboiled rice hulls and sand. Each of these components is added to achieve specific objectives from aeration to weight. A common mix might consist of 80 percent pine bark, 10 percent peat and 10 percent sand.

The other unique requirement deals with the type of irrigation system. While overhead irrigation of containers is the most common, specific drip irrigation systems are readily available to increase irrigation efficiency of container nurseries especially for #5 containers or larger.

Because the root system is exposed to extremes in temperature, consideration must be given to some type of overwintering protection. The amount and type required will vary depending on your location and type of crops grown. Overwintering systems range from simply pushing cans together in the fall to covered houses with supplemental heat.

Container Production Costs[1]

Estimated Initial Capital Investment:

land: purchase or lease ($500 to $5,000/acre)
land improvement: grading, gravel ($3,000 to $15,000/acre)
buildings: office ($25-$50/ft^2); storage ($15-$20/ft^2)
greenhouse ($15-$25/ft^2), quonset-style poly house ($1.50-$4/ft^2) and/or overwintering structures ($0.50 to $0.70/ft^2)
equipment: tractor ($10-$20,000); trucks; trailers; sprayers; irrigation system

Average Total: $22,000/acre

Estimated Annual Fixed Costs:

land: taxes and interest
roads and retention ponds: maintenance
buildings: interest, insurance, taxes, maintenance
equipment: interest, insurance, taxes, maintenance
general overhead: utilities, salaries, etc.

Average Total: $8,250/acre

Estimated Annual Variable Costs (directly attributable to crops):

media	fertilizer
pots	labor
chemicals	plant material

Average Total: $47,000/acre

Considering the space required for roads, aisles, buildings and space lost between containers, the following are average numbers of containers per acre.

#1 can tight:	110,000 to 130,000 #1/A
#3 can tight:	35,000 to 50,000 #3/A
#3 1-X spacing:	8,500 to 12,000 #3/A

Shipping statistics: 5,000-6,500 1-gal/48' semi-truck; approximately 1,500 #5/48' semi-truck.

[1]Adapted from *Nursery Production: An Agricultural Alternative*. University of Georgia Bulletin 1015.

Field Production – Specifics

Site Considerations

There are three primary site considerations for a field nursery. They include topography (slope), soil type and air movement. Topography is particularly critical if harvesting is conducted by mechanical equipment that requires minimal slope. Rolling topography can be compensated for when laying out the planting direction for field rows.

Soil type is a critical factor. While sandy soils may be fine for bare-root field production, they are generally undesirable for B&B field production. Heavier soils that make forming a root ball easier also tend to increase the weight of the finished plant. Consideration should also be given to sites with soils that are well drained and relatively free of rocks.

Some consideration should be given when evaluating a piece of property for the type of air movement. Unlike container plants that can be moved or have temporary protection built over them, field-grown plants are susceptible to cold pockets and areas with little air movement. These unique areas can be compensated for by selecting plants that will be less affected by these special situations.

Facilities and Equipment

Unless you are dealing with bare-root field production, the necessary facilities for field production are minimal. The primary facility in field production might be covered storage for the various tractors, sprayer and digging equipment. A field production nursery would still require some type of office, up-to-date chemical storage and preparation facility and a loading dock. A bare-root nursery will require an expensive and specialized walk-in cooler for storage of harvested bare-root plants.

Equipment for a field nursery will likely be specialized and include larger tractors, U-blades for root pruning, specialized harvesters for B&B and bare-root production and specialized sprayers for field applications.

Production Scheme

Planting

Before planting the soil should be tested and any adjustments made. The most common treatment would be to adjust the soil pH. Planting rows should also be properly cultivated and weed-free.

Spacing for field production depends on the type of production and consideration for maintenance and harvesting equipment. Planting density for a bare-root whip nursery will be higher than for 3" caliper trees. An example of plant spacing for larger caliper trees might be two rows of trees (8' between trees and 8' between rows) with a 10' access aisle on either side of the double row planting. Knowing the clearances for equipment used in maintaining or harvesting these field plants will help determine some spacing requirements.

In many cases fields will be planted with liners or seedlings in the fall or early spring months. For spring planting the field may be cultivated and prepared the previous fall when soils are likely not as wet. On a small scale, planting can be completed by hand; however, for larger operations some type of specialized transplanter similar to those used in vegetable operations is more efficient. In certain areas consideration should be given to seeding the rows and aisles with a cover crop of grass to reduce weeds and minimize erosion. A key to planting success is providing supplemental irrigation during the establishment period.

Maintenance

The major advantage of field production over container operations is that once the plants are planted your daily maintenance during the growing period is greatly reduced. Consideration will need to be given to irrigation, fertilizing, monitoring and responding to disease and insect problems and staking and pruning.

In most cases supplemental irrigation will be required. Irrigation is typically applied by either overhead application or by drip irrigation methods. Overhead irrigation will require larger volumes than drip irrigation, but the irrigation system may be simpler. Installation of irrigation equipment and piping should be considered as to how it relates to cultivation and harvesting operations.

Harvesting

Harvesting techniques and equipment will vary depending on the type of field production. For example, a grower of bare-root liners will likely use a “U”-blade or lifter to cut the roots, lift the plant and shake much of the soil from the plant while in the field. For B&B operations, various types of mechanized “balling” or digging machines are commonly used. B&B growers may choose to dig plants simply by hand. Digging and forming a soil ball is very labor intensive. The size of the root ball should be in proportion to the top of the plant. Growers should consult the *American Standard for Nursery Stock* published by AmericanHort.

Plants that have been dug are handled either as bare-root, wrapped in a covering material like burlap, or mechanically dug and placed in a rigid container or box. Nursery stock is usually dug in the fall and early spring. Plants dug but not sold in the fall will likely be “healed-in” for spring shipments. Harvesting will either be by individual plants in rows or by harvesting entire rows. There are advantages and disadvantages to both approaches. Consideration should be given to the overall efficiency of the operation, amount of product sold and impact such as shading. Some nurseries choose to harvest alternate plants in rows, leaving additional space for remaining plants to grow and develop. Nurseries growing seedlings or small nurseries usually harvest entire beds or rows at the same time.

Operating Costs

With field production, generally the time from planting to time of harvest will be many years. In most B&B operations harvesting will begin three to five years after planting. Initial expenditures, maintenance costs and interest on borrowed capital can accumulate to large sums before a single plant is sold. A report published in 2002 concluded that the total production costs over a three-year production cycle for a hypothetical 15-acre nursery with 10 acres in production was lowest for a field system versus the container or pot-in-pot systems. When calculated on a *per* harvested *plant* basis, the total cost was lowest for the pot-in-pot ($21.52) and highest for the field ($23.73) production system.

Pot-in-Pot (PIP) Production – Specifics

Site Considerations

The primary consideration in selecting land for a pot-in-pot (PIP) production is drainage. The selected site must either be well drained or a drainage system must be installed at additional expense to ensure proper drainage of the "socket" pot. Similar to conducting a perk test, the grower should dig several practice holes of the same dimension as the final socket pots, place the pots in the ground and then monitor the rate of drainage. Avoid sites with extremely slow drainage rates or install a drainage system to speed proper drainage.

Facilities and Equipment

General facilities will mirror what is required for an aboveground container operation. Because of the large size of pots often associated with PIP production, canning or pot filling may be done in the field or using a low-tech canning carousel rather than using a standard canning machine. Some pieces of field production equipment, such as tractors, trailers and spray rigs, may also be used in the PIP system.

A helpful piece of equipment for the PIP system would be a tractor-mounted auger for digging the initial socket pot holes.

Specific Production Considerations

There are two major considerations when establishing a PIP production system: drainage of the socket pots and rooting-out from the growing pot. Proper site selection or the installation of a drainage system can address the former concern.

The rooting-out problem is a great concern since roots in the growing pot tend to grow through the drainage holes, out into the socket pot and then through the socket pot drainage holes into the surrounding soil where the plant anchors itself. This potential anchoring makes harvesting difficult if not impossible. Many approaches have been evaluated to reduce or eliminate the rooting-out problem. Most of the approaches involve some sort of fabric treated with either a herbicide or copper. Approaches using alternate locations for drainage holes does not appear to be as effective as the treated fabrics.

A final concern must be considered. In most cases first-time PIP growers have been caught off guard regarding irrigation requirements. Experience suggests that the amount of water required is decreased when switching from aboveground to the PIP system. It is also recommended that growers using drip irrigation systems group plants with similar irrigation requirements to avoid over or under watering specific plants.

Operating Costs

One of the major limitations for new growers establishing a PIP system is the significantly higher initial fixed costs associated with this system. However, when evaluating the total costs of production, PIP turns out to be the least expensive production system based on a *per* harvest *plant* basis when compared to aboveground containers and field production (Adrian et al. 1998). A paper[2] published in 1998 indicated a typical PIP site development cost of $0.86/ft^2 excluding plant costs. A more recent paper provides a thorough economic analysis of PIP production.[3]

[2]Adrian, J.L., et al. 1998 *Cost Comparisons for Infield, Above Ground Container and Pot-in-Pot Production Systems*. J. Environ. Hort. 16:65-68.

[3]Hall, C. et al. *The Economics of Producing Nursery Crops Using the Pot-in-Pot Production System: Two Case Studies*. S. Coop Series #402.

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