



Container Nursery Production

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Introduction

The container nursery business involves the production and marketing of ornamental trees and shrubs, fruit trees, and perennial flowers grown in aboveground containers. This production method has helped revolutionize the nursery business in the last few decades. Some of the advantages of container production include: less acreage required for production, handling convenience, and a nearly year-round harvest and planting season.

Marketing

Nursery crops are marketed in several different ways.

► **RETAILERS** market directly to the end consumer, typically homeowners. This is most commonly done either through retail nurseries, which produce some or all of their own plant material, or garden centers, which purchase their inventory from a wholesale nursery. These businesses must be conveniently located for consumer access, ideally near urban or high-traffic areas. Retail nurseries additionally require adequate space and facilities for production, either on-site or at a nearby location.

► **MAIL-ORDER NURSERIES** also sell directly to the end consumer, but their plants are shipped directly to the customer rather than sold at a retail outlet. This is a great option for nurseries that produce specialty plants and whose customers are plant enthusiasts located across the country or globe. The vast majority of mail-order nurseries sell either bare root or small container-grown plants (1-gallon containers or smaller) due to high shipping costs and difficulties in packaging, but larger



plants can also be sold by mail-order nurseries if they are highly valuable.

► **WHOLESALERS** produce plants that are typically sold in large batches at significantly lower prices to landscapers, retailers, or other nurseries that grow and resell the material at a larger size. Wholesale production is usually most efficient when a limited number of plants are grown in large numbers.

► **RE-WHOLESALERS** purchase large orders of various plants from wholesale producers and resell the plants to landscapers requiring diverse but smaller orders.

► **LANDSCAPE NURSERIES** usually produce plants for their own in-house landscaping service, but some may also sell plants at a retail outlet.



Nursery Licenses and Shipping Regulations

Any business that sells plants capable of overwintering outdoors must obtain

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a nursery or nursery dealer license. In addition, businesses that sell plants to out-of-state customers should also obtain a license, regardless of the plants' ability to overwinter. In Kentucky, these licenses are obtained from the Office of the State Entomologist. Additionally, shipment of plants or plant parts across state lines can, in many cases, require a Phytosanitary Certificate. A Phytosanitary Certificate is also required for most international shipments of plant material. Nurseries can contact the Office of the State Entomologist to determine if a certificate is needed and how it can be obtained.

Market Outlook

The nursery industry is driven by new home construction and healthy consumer spending, and the nursery sector was challenged by broader economic conditions from 2006 to 2012. Some economic growth since 2012, particularly in housing starts for 2015-16, increased demand for many green industry products, particularly trees, shrubs and sod. Nursery producers will want to develop a business plan that takes into account broader economic cycles while gauging uncertainties in the housing market. Consolidation in the green industry has also created large firms that may realize economies of size and scale outside the grasp of smaller firms. Smaller firms may wish to focus on specialty production, new market niches, add-on services and other activities adding value to a nursery's plant production.

Nurseries continued cautious capital investments after the economic downturn, positioning for demand growth observed in 2015-16. About one-third of Kentucky nurseries indicated in 2012 that they planned some capital improvements, and many nurseries indicated beginning or continuing improvements in 2014. Nursery producers will want to develop a business plan that takes into account the cyclic nature of the economy and the potential for a related uncertain housing market.

Production considerations

Site selection and preparation

Container-grown plants need to be frequently irrigated, often multiple times per day, throughout the growing season. Consequently, a reliable source of clean, pest-free water is one of the most important considerations in selecting a suitable location. The ideal production site will have a slightly sloping topography (less than

5 percent slope) and offer water drainage to a pond or retention basin for recycling back to the crop. Fields with hardpans and those that flood periodically should be avoided.

Low areas, which can serve as frost pockets, and windy hilltops should also be avoided. The site's native soil type is not nearly as important as it is with field-grown crops because container-grown plants are grown in customized soilless media. However, poorly drained soils can require site modifications to ensure that excess water moves out of the growing area. It is important that standing water not be permitted to collect around containers. Production areas may be topped with gravel, landscape fabric, or UV-treated black plastic.

Crop selection

There are thousands of plants and cultivars produced and marketed by container nurseries. These include ornamental trees and shrubs, vines and ground covers, ornamental grasses, and fruit trees and bushes. Most nurseries produce a variety of plants with known high market demand, while other nurseries produce specialty crops, such as native plants or uncommon cultivated plants. As is true for any outdoor nursery, the selected species and cultivars must be well-adapted to local climatic conditions.

Growing media

The most frequently used substrate for container nurseries is aged pine bark. Peat and sand are common amendments used in varying amounts. It is important that media be well drained. Mixes remaining overly wet for prolonged periods can result in root death from lack of oxygen or root rot. Media that dries out is difficult to re-wet and will also inhibit root development.

Maintenance

Container production relies heavily on irrigation to provide plants with sufficient moisture. Irrigation systems used for container production include overhead sprinklers, capillary mats, spray stakes, and spaghetti tubes. To maximize irrigation efficiency, plants with similar water requirements should be grouped together, and overhead watering systems should be avoided when plant spacing creates wide gaps between each container. Nutrients are

generally supplied using a controlled-release fertilizer incorporated into the media.

Plants grown for the landscape trade tend to require specialized pruning. Nursery-grown trees and shrubs are pruned to control size, thin canopy, and improve quality. Shade trees are often top-pruned in both winter and summer to ensure that a central leader is maintained and the shape of the tree canopy is in proper proportion to the trunk. Shrubs are pruned regularly to establish a height and density for the planned market. Trees may need to be staked to maintain a straight trunk.



Winter protection is necessary for aboveground container-grown plants in Kentucky. Many growers place containerized plants in a protective overwintering structure.

Pest management

Insect and disease pests vary depending on the plant species and cultivar. Effective management requires integrated pest management (IPM) strategies, such as planting resistant cultivars, scouting, managing irrigation times, and practicing best management practices. Fungicides and insecticides are applied when necessary to maintain plant quality.

Weeds need to be managed in pots, growing areas, and perimeters. Methods of control include a combination of hand-weeding, mowing, mechanical cultivation, mulching, ground cloth, and chemical control.

Algae can be a serious problem in irrigation systems and in ponds serving as sources of water. Two major contributing factors are over-fertilization and over-irrigation, which increase nutrient run-off into ponds. Shallow, stagnant water also increases algal growth in ponds, so shallow areas may need to be dredged and deepened.

Harvest

Plants may be sold as liners, whips, or finished plants.

The term LINER refers to any plant placed ('lined out') into a production system so it can be grown to a larger finished plant. WHIPS are plants consisting of a straight stem with little branching. FINISHED PLANTS have all the characteristics expected in the market place, such as proper form, size, branching, and trunk size.

Nursery crops grown in containers can be harvested any day of the year. The time it takes for plants to reach a saleable size varies depending on the type of plant and growing conditions. Plants can be grown in a single container for only a limited length of

time. In general, container-grown plants may be in propagation for six to 12 months. Plants then spend one year in a #1 container and one more year in the larger #3 container, for a total of 30 to 36 months. Plants must be re-potted to a larger container before they outgrow their current container, otherwise plant quality is greatly reduced and plants become unsalable.

Labor requirements

Labor is required for potting, pruning, irrigating, weed control, staking, pesticide applications, and harvest. The level of management for container-grown plants is significantly higher than in field production. A common rule of thumb is to employ one worker per acre of container production.

Economic considerations

Beginning a nursery business requires a large capital investment, even if land does not need to be purchased. Expenses for establishing a container nursery include grading for drainage, gravel beds to set the plants on, overwintering structures, equipment, buildings, supplies, plant material, and the installation of an irrigation system. Additional costs include labor, utilities, insurance, and licenses. With the large overhead investment required, the minimal size for a container nursery to be economically profitable is generally about 17 acres.

The return on a container nursery operation will be realized more quickly than for field-grown stock.

However, the initial investments and production costs are much higher for container-grown plants. A grower must be prepared to make substantial investments for several years before realizing any positive returns. It can take two to four years of operation before significant returns can be expected, and an additional three to five years before showing a profit. In addition, the nursery operator will need to be able to handle the cash flow ups and downs associated with seasonal sales.

Below are 1996 University of Kentucky budget estimates for 17 acres of above-ground container production and an estimated cost range for a similar operation in 2012. Cost estimates remain similar to 2012 or slightly higher in 2016. These figures should be used only for comparative purposes as costs can vary greatly between production situations, and businesses should develop budget estimates based on their own scenario.

Selected Resources

- Kentucky Office of the State Entomologist (University of Kentucky) <http://www.uky.edu/Ag/NurseryInspection/>
- Marketing Your Nursery (University of Kentucky, 2008) <http://www.ca.uky.edu/HLA/Dunwell/marketingyournursery.html>
- Nursery Crop Production (University of Kentucky, 2012) <http://www.ca.uky.edu/HLA/Dunwell/Nlgetstart.html>
- University of Kentucky Horticulture Nursery Crop Extension Research website <http://nursery-crop-extension.ca.uky.edu>
- Nursery Crops (Win Dunwell’s web page) (University of Kentucky) <http://www.ca.uky.edu/HLA/Dunwell/win1.html>
- Plant Material Shipments: Federal and State Plant Protection Regulations Relevant to Your Nursery Business (University of Kentucky, 2011) <http://www.ca.uky.edu/agc/pubs/ho/ho99/ho99.pdf>
- Getting Started in the Nursery Business: Nursery Production Options (Virginia Cooperative Extension, 2014) <http://pubs.ext.vt.edu/430/430-050/430-050.html>
- Principles and Approaches for Optimizing Efficiency in Nursery and Landscape Businesses (University of Kentucky, 2014) <http://www.ca.uky.edu/agc/pubs/ho/ho110/ho110.pdf>
- Sustainable Production Systems: Efficient Wholesale Nursery Layout (University of Kentucky, 2013) <http://www.ca.uky.edu/agc/pubs/HO/HO109/HO109.pdf>
- Trees, Shrubs, Ground Covers and Vines Suitable for Kentucky Landscapes, HO-61 (University of Kentucky, 1997) <http://www.ca.uky.edu/agc/pubs/ho/ho61/ho61.pdf>

UNIVERSITY OF KENTUCKY BUDGET ESTIMATES FOR 17 ACRES OF ABOVE-GROUND CONTAINER PRODUCTION IN 1996 AND AN ESTIMATED COST RANGE FOR A SIMILAR OPERATION IN 2012. 2016 COST ESTIMATES ARE SIMILAR TO 2012 OR SLIGHTLY HIGHER.

Item	1996 Costs	2012 Estimates
Capital requirement	\$223,170	\$265,000 to \$300,000
Machinery/equipment operation	\$15,650	\$19,560
Fixed cost	\$350,450	\$380,000 to \$420,000
Fixed cost per plant	\$16.35	\$17.72 to \$19.60
Variable cost	\$157,650	\$178,000 to \$203,000
Variable cost per plant	\$7.36	\$8.30 to \$10.70
Total cost	\$508,100	\$560,000 to \$625,000
Total cost per plant	\$23.71	\$26.11 to \$29.14

- Best Management Practices: Guide for Producing Nursery Crops (Southern Nursery Association, Version , 2013) <http://www.sna.org/Default.aspx?pageId=1140025>
- Crop Profile Container and Field-Produced Nursery Crops in GA, KY, NC, SC, and TN (Southern Nursery Integrated Pest Management Working Group, 2009) 1 MB file <http://www.ipmcenters.org/cropprofiles/docs/GA-KY-NC-SC-TNnurserycrops.pdf>
- IPM for Select Deciduous Trees in Southeastern US Nursery Production (Southern Nursery IPM Working Group, 2017) http://wiki.bugwood.org/IPM_book
- Nursery Crop Science website (North Carolina State University) <http://www.ces.ncsu.edu/depts/hort/nursery/>

- Preparing Nursery Plants for Winter (North Carolina State University) <https://content.ces.ncsu.edu/preparing-nursery-plants-for-winter>
- Sustainable Small-scale Nursery Production (ATTRA, 2008) <https://attra.ncat.org/attra-pub/summaries/summary.php?pub=60>
- Nursery Budgets (Auburn University, 2000) <http://www.ag.auburn.edu/landscape/budgetguide.html>

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