



Field Nursery Production

Cheryl Kaiser¹ and Matt Ernst²

Introduction

Field nurseries are the traditional method of producing and marketing ornamental trees, shrubs, fruit trees, and perennial flowers. Until the mid-1900s, nearly all nursery crops were produced in the field. Even with the advent of above-ground container and pot-in-pot production, field nurseries are still widely used. Some of the advantages of field production over other production methods include: less maintenance and labor requirements during the growing period, ability of plants to overwinter in the field without additional protective measures, and lower start-up costs. In Kentucky, most field-grown trees and shrubs are sold as balled-and-burlapped (B&B), meaning that the soil surrounding the plant's root system is dug with the plant and wrapped in burlap.

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.

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

► **LANDSCAPE NURSERIES** usually produce



¹Cheryl Kaiser is a former Extension Associate with the Center for Crop Diversification.

²Matt Ernst is an independent contractor with the Center for Crop Diversification.

plants for their own in-house landscaping service, but some may also sell plants at a retail outlet.

Licenses and Shipping Regulations

Any business that sells plants capable of overwintering outdoors must obtain 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

The primary consideration in selecting a site for a field

nursery is the soil. Fields should be free of large stones and hard pans that interfere with root development. Not only must the soil be fertile and well-drained, but it must hold together around the roots when plants are dug as B&B products. Production of bare-root plants requires a soil that will easily fall away from the roots. Bare-root production of trees and shrubs is not common in Kentucky.

Locations that flood periodically must be avoided. The ideal site has a slightly sloping topography (less than 5 percent) and offers water drainage to a pond or retention basin for recycling back to the crop. A reliable source of clean, pest-free water is an important consideration if irrigation is to be used.

Knowledge of the field history, including previous crops, herbicide use, and soil-borne disease incidence, is important in choosing the appropriate plants for the selected site. If the field has previously been in soybeans, the site should be tested for soybean cyst nematode infestation. The presence of this pest in the soil could severely limit out-of-state export. Procedures to allow shipment of plant materials based on plant pest quarantines or other restrictions are based on the requirements of the receiving state and/or federal restrictions.

Site preparation includes testing soil fertility so appropriate fertilizer applications and soil pH adjustments can be made prior to planting. Compost, animal manure, and/or green manure are commonly incorporated into fields to increase organic matter.

Although winter protection for field-grown plants is not necessary in Kentucky, well-placed barriers can help reduce burn and desiccation from winter winds.

Crop selection

There are thousands of plants and cultivars produced and marketed by field nurseries. These include ornamental trees and shrubs, fruit trees, ornamental grasses, and woody small fruits. 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.

Planting

Liners are planted in rows between late fall and early spring either by hand or with a mechanical transplanter. Trees and shrubs should be planted in the field at the same depth at which they were previously grown. Factors such as plant form, anticipated length of time until sale, and equipment size must be considered when determining appropriate plant spacing. Sufficient in-row spacing must be provided to permit healthy, unrestricted growth until plants are sold; very narrow spacing can result in over-crowding and low-quality plants. Tall liners, as well as those that are top heavy, may require staking during their first year.

Maintenance

Many tree and shrub producers in Kentucky use irrigation only during periods of drought. However, routine irrigation may be more practical depending on plant species, size, spacing, and value. Field nursery crops can be watered via overhead irrigation using hand-moved systems or traveling guns, or via drip (trickle) irrigation. Maintenance fertilizer is applied through side-dressing or through a drip irrigation system (fertigation).

Field-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. Plants grown for the landscape trade tend to require specialized pruning. Some growers root-prune either routinely or prior to harvest to increase fine root growth, which aides with plant survival during digging and transplanting. Trees may need to be staked to maintain a straight trunk.

Pest management

Insect and disease pests vary, depending on the plant species and cultivar. Management requires integrated pest management (IPM) strategies, such as planting resistant cultivars, scouting, managing irrigation times, and practicing best management practices.

A vegetation-free area needs to be maintained around trees and shrubs in field nurseries. Methods of weed control include mowing, mechanical cultivation, mulching, hand weeding, applying herbicides, and laying down landscape fabric. Strategies for between

row (middles) weed management include cover cropping (most often with fescue or crimson clover), mowing, mechanical cultivation, and/or chemical methods.

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, the final stage of production, have all the characteristics expected in the marketplace regarding form, size, branching, and trunk size.

Nursery crops grown in-ground are ideally harvested during the dormant season to minimize transplant stress; however, it is not uncommon for digging to continue through mid- to late spring. Summer digging may be done in small numbers in special cases for custom orders. The time required for plants to reach a saleable size varies depending on the type of plant and growing conditions. In most B&B operations, plants are harvested three to five years after planting.

Plants are harvested either by hand or with a mechanized tree spade. The size of a B&B root ball is determined by the caliper of the tree trunk. Immediately after being dug, the root ball is placed into a burlap-lined wire basket. The burlap and wire basket are then secured around the root ball to provide greater stability during transport. Once dug, roots should not be allowed to freeze or dry out. Potential new growers often inquire about the ability to rent or borrow tree spades from established nurseries. This would be difficult to accomplish as these tree spades would most likely be used fully by their owners throughout the digging season. New growers would do well to invest in their own tree spade.

Labor requirements

Key activities requiring labor include planting, pruning, weed control, staking, applying pesticides, irrigating, harvesting, and loading shipments. While labor demands for field-grown nurseries are considerably less intensive on a per acre basis than other production methods, it is still the single greatest production expense in this type of nursery. A common rule of thumb is to employ one worker for every 7 to 8 acres in production.

Economic considerations

Beginning a nursery business requires a large capital investment, even if land does not need to be purchased. Expenses include: equipment, buildings, supplies, plant material, and the installation of an irrigation system. Additional costs include labor, utilities, insurance, licenses, and inspections. The minimal size for a general tree or shrub field nursery to be economically profitable is 200 acres, unless production is focused on high-value crops grown at relatively high densities.

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 field 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/marketingournursery.html>
- Nursery Crop Production (University of Kentucky, 2012) <http://www.ca.uky.edu/HLA/Dunwell/Nlgetstart.html>
- Nursery Crops Development Center (University of Kentucky, 2012) <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>
- Soybean Cyst Nematode: A Potential Problem for Nurseries (University of Kentucky, 2011) <http://www.ca.uky.edu/agc/pubs/id/id110/id110.pdf>

UNIVERSITY OF KENTUCKY BUDGET ESTIMATES FOR FIELD 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	\$210,840	\$255,550 to \$290,000
Machinery/equipment operation	\$26,370	\$32,960
Fixed cost	\$352,880	\$380,000 to \$420,000
Fixed cost per plant	\$18.58	\$20.00 to \$22.10
Variable cost	\$97,790	\$115,000 to \$140,000
Variable cost per plant	\$5.15	\$6.05 to \$7.38
Total cost	\$450,670	\$505,000 to \$560,000
Total cost per plant	\$23.73	\$26.62 to \$29.52

- 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>
- Best Management Practices: Guide for Producing Nursery Crops (Southern Nursery Association, 2007) <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, 2012) https://wiki.bugwood.org/IPM_book

- Nursery Crop Science Commercial Horticulture Information Portal (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>

Suggested Citation:

Kaiser, C. & M. Ernst (2017). *Field Nursery Production*. CCD-SP-6. Lexington, KY: Center for Crop Diversification, University of Kentucky College of Agriculture, Food and Environment. Available: <http://www.uky.edu/ccd/sites/www.uky.edu/ccd/files/field.pdf>

Reviewed by Dewayne Ingram, Extension Specialist; Carey Grable and Josh Knight, Extension Associates, UK
Photo courtesy of Carey Grable

April 2017

For additional information, contact your local [County Extension agent](#)