



Chinese Chestnuts

Cheryl Kaiser¹ and Matt Ernst²

Introduction

American chestnuts (*Castanea dentata*), once prominent in the eastern U.S. landscape, all but disappeared in the mid-1900s when chestnut blight eradicated nearly all of these popular trees. Blight-resistant varieties of Chinese chestnut (*Castanea mollissima*) and their hybrids are viable alternatives for commercial chestnut production.

Chestnuts are low in fat compared with other nuts and are receiving attention from the health food industry. These nuts are eaten roasted, boiled, or sautéed. Chestnuts may be incorporated into various recipes, such as stuffing, vegetable dishes, casseroles, and desserts. Dried chestnuts can be ground into flour as a substitute for wheat flour or corn meal.

Marketing

The most promising outlets for chestnuts include the domestic fresh (roasting) markets, upscale restaurants, and ethnic/specialty food groceries. Chestnuts can also be used to make gluten-free chestnut flour for sale as a specialty food. Specific fresh chestnut markets include restaurants, roadside stands, on-farm markets, farmers markets, retail groceries, and specialty food retailers. The University of Missouri Center for Agroforestry reported selling direct to consumers from on-farm stands and farmers markets, and selling direct to restaurants, as the most common marketing methods. Chestnut growers in the Eastern U.S. have also sold chestnut value-added products online.

Chestnuts are often considered a holiday food item, so growers could take advantage of this potential market by timing sales accordingly. Demand for chest-



nuts peaks from September through December, then declines dramatically. Proper post-harvest handling, including cold storage and marketing the chestnuts from refrigerated containers at retail, is essential for maintaining market quality. Because consumers are relatively unfamiliar with chestnuts, the producer will want to provide recipes and instructions for use and handling at the point of sale.

Market Outlook

Chestnuts have potential for production on marginal land in Kentucky. Local growers who can consistently supply high quality, good tasting, and weevil-free chestnuts have the advantage of freshness over imported chestnuts, which may be viewed by consumers as expensive or of lesser quality. However, many U.S. consumers are unfamiliar with chestnuts, and chestnut growers will need to be willing to educate and promote their crop to a new generation of consumers.

Michigan is the leading chestnut state with 360 bearing acres in 2017. California and Florida also have around



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.

300 bearing acres, with larger acreages per farm than Michigan. The number of states reporting 100 or more acres of chestnut trees for nuts increased from eight in 2012 to 13 in 2017, according to the 2017 Census of Agriculture. Iowa, Missouri, Ohio and Virginia tallied substantial new plantings since 2012.

Marketing channels for U.S.-grown chestnuts have mainly focused on niche, upscale foodservice and specialty food markets. Production for local sales, such as at farm festivals, is a possible way to add value to small-scale production. The agricultural cooperative Chestnut Growers, Inc., developed as a processing and marketing outlet in Michigan, as has the Route 9 Cooperative in Ohio, where its members could access a commercial-scale chestnut peeler for processing.

Production Considerations

Planting material and cultivar selection

Chestnut trees may be established from seeds, seedlings, or grafted trees. Planting grafted trees is preferred for consistency in yield, ripening, size, and quality of the nuts produced. While seedling trees are generally more readily available and less expensive to purchase, grafted trees come into bearing sooner than seedlings. Grafted trees should have a genetically similar rootstock to avoid delayed graft incompatibility several years after planting. Grafted tree survival is more likely when the rootstock is a seedling of the scion cultivar.

There are a number of Chinese chestnut cultivars and hybrids that are well adapted to Kentucky conditions. Nut characteristics, such as size, flavor, cracking quality, and storage life can vary among varieties. It is particularly important to choose selections resistant to chestnut blight, and cultivars that produce the largest nuts such as Qing. Most markets require large chestnuts. Chinese chestnuts are self-sterile, so two or more different cultivars are required for good pollination. Refer to Nut Tree Growing in Kentucky (ID-77) for recommended varieties. Custom grafted trees may have to be ordered a year in advance.

Site selection and planting

Chestnuts can be grown on land that is considered unsuitable for other crops, such as sandy or gravelly soils. Heavy, poorly drained sites should be avoided, as chestnuts are very susceptible to *Phytophthora* root rot. Chestnuts prefer soils that are somewhat acidic

(pH 5.5 to 6.5) and will not tolerate high pH soils. While trees are cold hardy when dormant, swelling buds are susceptible to frost damage in the spring. Do not plant in frost pockets or locations with poor air drainage.

Mature chestnuts require a final 40 feet by 50 feet spacing; however, it may take 20 or more years before trees actually fill this space. Some growers interplant chestnut seedlings at a closer spacing among grafted chestnuts. As the permanent grafted trees mature and come into full production, these filler trees are removed.

Trees are trained to a modified central leader shape, with only limited pruning needed on bearing trees. Young trees require protection against sunscald injury to their smooth bark with white spiral trunk guards. Supplemental watering helps promote tree growth and to reduce stress, especially in the first year. Once established, trees are relatively drought tolerant; however, irrigation will help bearing trees to produce larger nuts and improve nut fill.

Pest management

Eliminating undesirable vegetation prior to planting is essential for tree establishment. Weeds should be controlled within 3 feet of young trees. Weed control strategies include the use of herbicides and mowing between tree rows. Chestnut blight is still present in the U.S., but using blight-resistant varieties may reduce disease incidence. Potential insect problems include aphids, Japanese beetles, potato leafhoppers and chestnut weevil. Insecticide applications will be required annually for weevil control and as needed to control Japanese beetles. The Asian chestnut gall wasp (ACGW) is also present in Kentucky. Biological control through parasitoids is showing some control. There are no insecticides cleared for ACGW, but adult wasps are easily killed with sprays applied for Japanese beetle.

Young trees are very prone to damage by animal pests, such as rabbits, mice, squirrels and deer. These pests will need to be controlled to reduce nut losses. Placing plastic guards around each tree soon after planting will help deter feeding damage from voles or rabbits when population pressure is low. Deer fencing and tree shelters should be used until trees are large.

Harvest and storage

The first harvest for seedling chestnuts can be expected in five to six years. Grafted trees will begin to bear within three to five years, with larger yields beginning six to nine years after planting. Soil moisture is important prior to harvest because half the kernel growth takes place during the last two weeks before ripening.

Chestnuts are hand-picked off the ground once they have fallen from the tree. Daily harvesting is necessary to prevent the fallen nuts from drying out and to ensure that area wildlife does not steal or damage the crop. Alternatively, where deer or squirrel losses are severe, nuts in burs may be shaken from the tree once the burs begin to split. Chestnuts harvested too early will be smaller, softer in texture and hard to remove from burrs.

Harvested nuts are separated from any debris gathered at harvest and cleaned so they are free of dirt. Promptly refrigerate (32° F or slightly above) in ventilated plastic bags. Nuts should not be allowed to dry out. Curing and storing chestnuts is a fairly involved process, and interested individuals should consult the harvesting and storage article from Michigan State University listed in the Selected Resources at the end of this document.

Labor requirements

Based on 1,000 to 2,000 pounds produced per acre, labor needs are approximately 80 hours for establishment in the first two years, 25 hours for production, 70 hours per ton for hand harvest, and 16 hours per ton for packaging and grading.

Economic Considerations

Chestnuts require three to six years for establishment before any nuts may be harvested, and 10 years before yields are significant. This delay will mean a period without any cash income, presenting a significant financial and production risk. For this reason, many chestnut growers start with the crop as a hobby or source of generating farm income from underutilized land.

Initial investments for chestnuts include land preparation, the purchase of trees, deer fence installation and the installation of an irrigation system. Other costs may include a sprayer, a nut shaker, cleaning equipment, a grader, and cold storage. Significant costs may



be incurred protecting seedlings from animal pests. Substantial losses due to graft incompatibility may also occur if grafted trees are not selected carefully.

Establishment costs will vary depending on production systems and tree costs. Total establishment costs for 1 acre of chestnuts in Kentucky would likely range from \$4,500 to \$8,000 per acre for the first five years of grafted tree production. Estimates from Michigan calculate a five-year establishment cost at \$7,797, including a \$1,187 deer fence cost. Estimates for Kentucky production (2019), based on a price of \$2.50 per pound, show establishment costs recouped after seven to nine years. Annual returns to labor, land and management of \$1,000 to \$1,450 per acre of chestnuts could be realized after year 7.

Financial returns may increase as trees mature and produce substantially greater yields of nuts per acre. Higher prices will also generate greater profitability from chestnuts. Product quality (particularly, weevil-free) and market development are essential for profitable chestnut production. Potential chestnut producers can utilize a detailed financial projection tool, developed by the University of Missouri Center for Agroforestry, to estimate long term profitability.

Selected Resources

- Nut Tree Growing in Kentucky, ID-77 (University of Kentucky, 2007) <http://www2.ca.uky.edu/agcomm/pubs/id/id77/id77.pdf>
- Chestnuts (Michigan State University Extension) <http://msue.anr.msu.edu/topic/info/chestnuts>
- Chestnut Growers, Inc. <http://www.chestnutgrowersinc.com/>

- Chestnut Decision Support Tool (University of Missouri Center for Agroforestry, 2012) <http://www.centerforagroforestry.org/profit/> (under Specialty Crops: Chestnuts)
- Chestnuts (Agricultural Marketing Resource Center, 2018) <http://www.agmrc.org/commodities-products/nuts/chestnuts/>
- Commercial Chestnut Costs of Production and Comparative Analysis with Tart Cherry Production (Michigan State University, 2013) <https://www.canr.msu.edu/chestnuts/establishing-orchards/cost-of-production>
- Chestnut: American Chestnut (Northern Nut Growers Association, Inc., 2009) <https://nutgrowing.org/research-and-resources/types-of-nut-trees/chestnut-american-chestnut/>
- Growing Chinese Chestnuts in Missouri (University of Missouri Center for Agroforestry, 2012) 6.74 MB <http://www.centerforagroforestry.org/pubs/chestnut.pdf>
- Commercial Chinese Chestnut Production in Virginia (Virginia Tech, 2017) https://www.pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/ANR/ANR-279/ANR-279.pdf
- “Harvesting and Storage” (Michigan State University) https://www.canr.msu.edu/chestnuts/harvest_storage/
- Asian Chestnut Gall Wasp (ACGW) in Kentucky (UK Entomology) <https://entomology.ca.uky.edu/entfact/asian-chestnut-gall-wasp-acgw-kentucky>
- Route 9 Cooperative <http://www.route9cooperative.com>

Suggested Citation:

Kaiser, C. and M. Ernst. (2020). *Chinese Chestnuts*. CCD-CP-66. 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/chestnuts.pdf>

Reviewed by John Strang, UK Extension Specialist, and Daniel Becker, UK Extension Associate
Photos courtesy of [Pixabay.com](https://www.pixabay.com)

April 2020

For additional information, contact your local **County Extension** agent

Educational programs of Kentucky Cooperative Extension serve all people regardless of economic or social status and will not discriminate on the basis of race, color, ethnic origin, national origin, creed, religion, political belief, sex, sexual orientation, gender identity, gender expression, pregnancy, marital status, genetic information, age, veteran status, or physical or mental disability.