Center for Crop Diversification
Martin-Gatton College of Agriculture, Food and Environment

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Strawberries

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Introduction

To many, nothing says summer like the first local ripe strawberries of the season. A versatile fruit, strawberries (*Fragaria* spp.) can be consumed fresh, frozen or in processed foods. Growers able to provide the earliest crop of these popular berries will often have the marketing edge.



Harvested strawberries

Marketing

The quality of Kentucky-grown strawberries can be far superior to berries that are shipped in. There is a strong market for local berries, particularly near population centers. Strawberries have in the past been a popular U-Pick crop; Kentucky producers report rising interest in buying pre-picked strawberries. Other direct marketing options include roadside stands, farmers markets and community supported agriculture (CSA) shares. Wholesale volumes are sold through produce auctions and to local grocers and restaurants. Some producers use crop surpluses to produce jams and jellies for local sale. During Kentucky's season, wholesalers actively source strawberries from Ohio and North Carolina.

Market Outlook

Fresh strawberry consumption in the U.S. increased from about 6 pounds per capita in 2001 to 8 pounds in 2016. Increased availability of fresh strawberries year-round, including imported berries, helped drive up consumption. Consumer demand supported stronger wholesale fresh strawberry prices in the early 2010s, helping producers match higher costs of production. Based on U.S. Census of Agriculture reports, Kentucky producers harvest 200 to 300 acres of strawberries annually.



Harvested strawberries

Production Considerations

Site selection

For best results, select a site with deep, sandy loam soil well supplied with organic matter. Clay soils can produce a good crop if the site has been prepared to drain well and has added organic matter. Fields with heavy perennial weed pressure should not be planted to strawberries. Avoid fields that have been in potatoes, tobacco, peppers, eggplants or tomatoes due to potential problems with Verticillium wilt. Strawberries need to be located on ground higher than the surrounding area to reduce the chance of spring frost damage. A water supply needs to be available nearby since irrigation is a necessity for commercial production. Some growers install overhead sprinklers if an ample water supply is available, because this system can also be used to help prevent frost and freezing injury. Other growers cover the planting with a floating row cover or rake straw back over the plants to provide frost protection.

Cultivar selection

Strawberries are commonly grouped as either June-bearing, everbearing or day-neutral. June-bearing varieties have been grown in Kentucky for many years. They are typically planted in early spring and blossoms are removed during this first season to encourage runner establishment. A full crop is harvested during the second and subsequent seasons. June-bearing varieties produce flowers under short-day conditions.

Everbearing and day-neutral strawberries are very similar under Kentucky conditions. Both produce few runners and flower buds develop regardless of the day length. They typically yield three crops during a season: a moderate spring crop, a summer crop of small berries, and a heavier fall crop. Total season-long yields, however, are similar to those of June-bearing strawberries. The fall crop depends on having a cooler summer for obtaining good fruit size and yields. During the first year of establishment, blossoms are removed so that only a fall crop is produced. Spotted wing drosophila is a new pest in Kentucky that is of particular concern to any soft fruit that matures after July 1. Populations tend to be low enough prior to that time that they are not a serious concern for June-bearing varieties. It would be extremely difficult to produce everbearing or day-neutral varieties without committing to a rigorous insecticide spray program.

Commercial growers should select well-adapted cultivars that have the necessary disease and pest resistance for their locale. Consideration should also be given to the qualities in demand by the intended market. Strawberries are fairly site-specific, so a grower should try several varieties to see what performs best on their farm prior to committing to a large planting.

Planting and maintenance

Strawberries are generally grown in Kentucky using the perennial matted row system of production. Kentucky growers are adopting the annual plasticulture production system, and a separate profile is available. Plasticulture production requires a higher initial cash outlay but the system is more productive and the berries are produced earlier in the season and can be sold at a higher price.

The best time to plant matted row strawberries in Kentucky is early spring, as soon as the ground can be worked in March or early April. Approximately 5,000 vigorous, disease-free mother plants will be required per acre. Removing blooms the first season is necessary to encourage the early production of runner plants in June-bearing cultivars. Blossoms on everbearing/day-neutral varieties are removed until July during the establishment year. These plants are then allowed to produce a full crop in subsequent seasons.

While strawberries don’t require supplemental pollination, a strong colony of bees is recommended to pollinate 1 acre of strawberries. A protective straw mulch is applied when plants become dormant in late fall and is removed the following spring. Following

a post-harvest renovation program will maximize profits and yields, as well as prolong the life of the planting. Most commercial fields in Kentucky produce marketable fruit for two to three seasons, with weed problems the primary reason for terminating a planting.

Pest management

Insect pests include slugs, strawberry clippers, sap beetles, spittlebugs, strawberry rootworm, strawberry root weevil, eastern flower thrips and tarnished plant bug. Insect pests not only affect yields, but they can drive away U-Pick customers. Botrytis blossom blight and fruit rot, various fungal leaf spots, leather rot, Verticillium wilt, and red stele are diseases that can affect strawberries. June-bearing and plasticulture strawberries generally do not require an extensive spray program for diseases and insects if disease resistant varieties are used. Other pests include birds and deer, which can cause serious damage in some sites.

Harvest and storage

The harvest season for strawberries begins in May and lasts two or three weeks. Only fully colored strawberries at their peak of flavor should be harvested because sugar content will not improve after harvest. Rainy weather during harvest reduces photosynthesis and as a result berry sugar content, as well as the number of U-Pick customers. Refrigeration will be needed for berries that are stored for a few hours or longer. Strawberries are usually sold in pint and quart plastic or fiber pulp containers.

Labor requirements

Establishment through the first commercial year of production requires approximately 100 hours of labor per acre. Harvest, beginning with the second year, will require 525 hours per acre for fields where pickers are hired and approximately 125 hours per acre for U-Pick operations.

Economic Considerations

The investment for strawberry production can initially be high primarily due to the costs of land preparation, planting and the installation of an irrigation system. In addition, strawberries must be established for a year before harvest, with no returns generated in that first year. The cost of establishment, including all labor valued at $12.50 per hour, is assumed to be $3,910 per acre. Expenses during the production years (years 2 to 4) are approximately $6,280 (U-Pick) or $7,890 (hired harvest).

The return to land and management for strawberries is very good, and even greater for growers who produce high yields. Since returns can vary depending on actual yields and market prices, the following per acre returns to land and management estimates

are based on three different economic scenarios. Conservative estimates represent the University of Kentucky's 2014 statewide average cost and return estimates updated for the 2018 season.

	Pessimistic	Conservative	Optimistic
IRRIGATED, HIRED PICKER	$1,842	$3,308	$4,688
IRRIGATED, U-PICK	$3,922	$4,920	$6,318

References/Resources:

- Annual Plasticulture Strawberry Production (University of Kentucky, 2014) http://www.uky.edu/ccd/sites/www.uky.edu.ccd/files/plasticulturestrawberry.pdf
- Kentucky Strawberry Profitability Estimated Costs and Returns (University of Kentucky, 2014) http://www.uky.edu/ccd/sites/www.uky.edu.ccd/files/strawberryreturns.pdf
- Midwest Fruit Pest Management Guide, ID-232 (University of Kentucky and Midwest Fruit Workers Group, 2018) https://ag.purdue.edu/hla/Hort/Pages/sfg_sprayguide.aspx
- Midwest Small Fruit Pest Management Handbook, B-861 (University of Kentucky and Midwest Fruit Workers Group, 2004) http://plantpathology.ca.uky.edu/files/mw_sm_fruit_pest_mngmt.pdf
- Southern Region Small Fruit Consortium: Strawberries (Clemson University, North Carolina State University, Virginia Tech, University of Arkansas, University of Georgia, University of Tennessee) http://www.smallfruits.org/crops/strawberries.html
- Southeast Regional Strawberry Integrated Pest Management Guide (Southern Region Small Fruit Consortium, 2017) http://www.smallfruits.org/assets/documents/ipm-guides/2017/2017StrawberryIPMGuide_Final.pdf
- Southeast Regional Strawberry Plasticulture Production Guide (North Carolina State University, University of Georgia, and Clemson University, 2005 http://www.smallfruits.org/assets/documents/ipm-guides/2005culturalguidepart1bs1.pdf
- Strawberries: Organic Production (ATTRA, 2007) https://attra.ncat.org/attra-pub/summaries/summary.php?pub=13
- N.C. State University Strawberry Budget (Interactive Excel worksheet, 2015) http://strawberries.ces.ncsu.edu/strawberries-budgets/

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