



# Beekeeping and Honey Production

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## Introduction

Apiculture, the study and maintenance of honey bees, often begins as a hobby, with beekeepers later expanding their interest into small businesses. A beekeeping enterprise can provide marketable honey and serve as a source of pollinators for cultivated crops. In Kentucky, common crops needing pollination include pumpkins, melons, orchard crops, berries, and canola.

## Market Outlook

Honey production in the U.S. was valued at approximately \$321 million in 2021, according to the USDA, with Kentucky producing about \$1.2 million.<sup>1</sup> The total value of U.S. honey production is greater as these data do not account for honey produced by operations with fewer than five hives. The honey industry is technically divided into three categories: commercial (over 200 hives), sideliner (30-199 hives), and hobbyists (1-30) hives.

Attention given the U.S. beekeeping industry, in the wake of disease and other challenges to bee populations, has created consumer interest in purchasing honey and beeswax to support local and national beekeepers. The actual economic value of beekeeping is far greater than the value of honey produced. For example, a University of California study estimated \$169 million in value added by beekeepers to honey, plus \$318 million in value sold to honey packers, in 2017. That same report showed that honey added a total value of \$2.1 billion to the U.S. gross domestic product in 2017, accounting for honey packers and retail sales. A 2012 Congressional Research Service report estimated a direct benefit of \$15-\$20 billion for the pollination provided by honeybees.



Demand for honey in the United States far exceeds domestic production.

Americans consume about 1.5 pounds of honey annually, according to the National Honey Board. Total U.S. consumption in 2021 was 618 million pounds,<sup>2</sup> but domestic beekeepers produced only about 126 million pounds, so U.S. beekeepers must compete with imported honey.<sup>3</sup> Local and specialty honey continue to maintain consumer popularity, and good marketing practices can help beekeepers establish relationships with local buyers. A beekeeper producing a quality product can easily sell out before the next season's crop is ready. Honey produced from the nectar of certain trees, such as tulip tree, sourwood, and basswood, often brings a premium price. Honey prices have increased in recent years, rising to \$2.54 per pound in 2021, up from \$2.10 in 2020.<sup>4</sup> Interest in beekeeping in Kentucky and nationally has increased since the onset of the COVID-19 pandemic.



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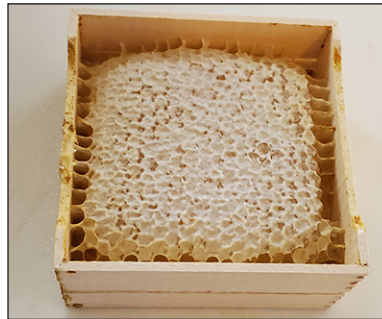
Market options include farmers markets, health food stores, restaurants, roadside stands, agritourism sites, and Kentucky-crafted stores or booths. Beekeepers producing large crops may consider selling honey in bulk to a honey packer. Honey may also be added to community supported agriculture (CSA) memberships and included in gift baskets. Honey can also be purchased wholesale from local beekeepers and re-tailed as part of the product mix at an on-farm market or other direct farm market outlet.

## Marketing

Honey can be marketed in several forms. **COMB HONEY** consists of chunks of honey-filled combs taken directly from the hive. Comb honey is often preferred by older adults. According to Kentucky State Apiarist Dr. Tammy Horn Potter, it is one of the first products to sell out at the Kentucky State Beekeepers Association Booth at the Kentucky State Fair. **EXTRACTED HONEY**, which is generally preferred by most consumers, is the liquid portion once it has been separated from the comb. Specialty products such as honey butter and creamed whipped honey are made from extracted honey. **CHUNK HONEY** is a combination of comb honey and extracted honey bottled together. Like comb honey, chunk honey is very popular; the presence of the beeswax comb guarantees authenticity. Other products include soap and lip balm, which are easy to produce and very popular at markets. Beeswax soap, generally made with lye, does not need to be regulated by the state, so many people can make it in their home.

The U.S. imports a substantial amount of **BEESWAX**, a secondary product of bee activity. Market potential persists for quality, domestic beeswax. The beekeeping industry, which uses beeswax to form the wax foundation for the frames in the hive, is one of the largest users of this byproduct. Beeswax candles are also popular home and gift items.

**ROYAL JELLY**, a substance secreted by worker bees to feed the queen, and **BEE POLLEN** (more accurately, “bee-collected pollen”), are being promoted as dietary supplements. Royal jelly production can be expensive and labor-intensive with limited markets. Collecting pollen, protein made by flowers and gathered by honeybees, is simple using a pollen trap on the front of the hive. With a little knowledge about collection and marketing, bee-collected pollen may bring a premium price, as it is quite popular and supply does not keep up with demand.



Comb honey (above and directly below) is often preferred by older adults.



Chunk honey includes both comb and extracted honey.

Hive rentals to orchardists and farmers for pollination purposes can provide another source of income. According to the 2018 California study, revenue from pollination services is at least as important as the value of honey production for beekeepers nationally. In addition, experienced beekeepers could consider selling bees to other beekeepers. These are sold as a small nucleus hive, or “nuc,” that is easily transported and later expanded to a full-size hive. Selling queens is another way experienced beekeepers may profit from their enterprise. The technique for rearing queens is taught in workshops at Kentucky State University. The Kentucky Queen Bee Breeders Association has done a lot of work with Purdue University and the USDA Baton Rouge Bee Lab to diversify queen stock while also collecting feral genetics from colonies in abandoned houses, etc.

## Production Considerations

### *Site selection and obtaining bees*

Ideally, hives should be located within 1 to 2 miles of a succession of spring, summer, and fall nectar and pollen sources. While previous guidelines indicated that hives need to be in a shaded area, the latest information suggests that it is best to place them in full sunlight to help combat the small hive beetle. A source of water, such as a bird bath, should be located nearby. Avoid locations near large rivers, highways, public areas,

or on hilltops. Do not place hives on highway or utility rights of way. Energy companies are responsible to the Public Service Commission and face steep fines if those areas become overgrown and impact energy to homes. Hives should be protected against cold winter winds. Hives located near cultivated crops are potentially in danger of exposure from insecticides. Obtaining the cooperation of the grower and/or pesticide applicator will be essential to avoid bee losses. The Kentucky Department of Agriculture (KDA) has a Pollinator Protection app, which beekeepers, landowners, and applicators can use to communicate the time, date, and product to beekeepers within a 5-mile range. The app is free, anonymous, and easy to use. It is available at [https://www.kyagr.com/statevet/documents/OSV\\_Bee\\_Pollinator-Handout.pdf](https://www.kyagr.com/statevet/documents/OSV_Bee_Pollinator-Handout.pdf).

Bees can be captured from a swarm, obtained from an established beekeeper, or purchased from a commercial bee supply company. Along with the hive and hive parts, other necessary equipment includes a smoker, hive tool, and protective gear for the beekeeper.

#### *Sources of honey*

Honey color and flavor are determined by the various plant species visited by the bees. It is not economically practical to produce a crop solely for honey production; however, cultivated plants grown for other purposes can provide an important source of nectar. Common nectar sources include agricultural crops, tree fruits, small fruits, ornamentals, and wildflowers.

#### *Management*

The beekeeper will need to regularly inspect each hive to examine the condition of the brood, check



Swarming can be a source of free bees.

food stores, look for signs of disease and pests, and to perform various hive maintenance tasks. With erratic springs impacting mating yards, it is not unusual to have to replace queens every year. While some inspections can be brief, it is important that the hive be examined in a timely manner throughout the year.

Swarming, which greatly reduces hive strength, is most often associated with overcrowding in the hive. It can be avoided with proper management practices. However, swarming can be a source of free bees for beginning beekeepers, or a great way to expand an apiary.

#### *Pest management*

The most common brood diseases in Kentucky are chalk brood, American foulbrood, European foulbrood, and a varroa-mite-vector disease known as snotty brood. Other diseases include nosema and several viruses strongly correlated with the presence of varroa mites. Because mites vector viruses, both varroa and tracheal mites can result in high beehive mortality. Recent successes in bee breeding have provided strains of bees that are mite-resistant and disease-resistant. Obtaining bees and queens from a reputable source, frequent inspections, and proper management helps prevent bee losses. The Kentucky Queen Bee Breeders Association works throughout the year to educate Kentucky beekeepers about queen bee selection, grafting techniques, management strategies for mating yards, etc. The small hive beetle is a widespread pest in Kentucky.



Beekeepers need to inspect hives regularly.

Skunks and mice are common in rural areas but can be excluded with screens or other barriers at the front of the hive. Bears have also caused damage in Kentucky



Bees capping honey.

but can be kept away with electric fences. Fences should be built before bears locate hives. It is very difficult to build any type of fence to keep bears out after they have located a hive.

### *Harvesting and processing honey*

Honey is considered ripe when the bees cap the honey (bees dehydrate the nectar before sealing the cell with a beeswax cap for future use by the honeybees). Supers, the chambers used to store surplus honey in the hive, can be removed from the hive once they are completely capped over. Frames are completely capped. The average yield in Kentucky is about 50 pounds of honey per hive per year. The honey should be processed soon after harvesting and then stored in sealed containers in a warm, dry place or freezer until marketed.

Pieces of sealed and undamaged honeycomb can be cut into neat pieces, packaged in plastic wrap or boxes, and sold as comb honey. Liquid honey may be separated from the combs using professional extracting equipment. Small-scale beekeepers should check with their county extension office or a local beekeeping club about the availability of an extractor. Extracted honey is packaged in clear glass or plastic containers. Chunk honey is prepared by placing a portion of honeycomb in a jar and filling up the rest of the jar with the extracted liquid honey. Kentucky now has more than 60 local bee associations, many of which are glad to let members borrow extraction equipment.

Beeswax foundation is usually left in the frame after harvest. It needs to be properly stored with Paramoth to prevent wax moth from destroying combs. Certan is another, newer product on the market to help beekeepers prevent wax moth damage. Beeswax can be

collected after all honey has been removed from the combs and then it should be cleaned, melted down, and strained. It stores well at room temperature in the form of large chunks or can be sold to bee supply companies or candle makers.

### *Labor requirements*

Labor needs for beekeeping and honey production are quite variable. For example, the time spent establishing new hives will depend on materials used. In addition, considerable time can be spent simply driving between hive locations. While it is difficult to estimate exact labor times, beginning honey producers should expect to spend at least 28 hours per year managing two hives. This includes time caring for bees and harvesting. Labor time per hive should decline somewhat with experience and as more hives are added.

Honeycomb processing times will vary depending on the type of honey produced. Producers should expect to spend about an hour per hive processing comb honey. Additional time will be required for further production.

### **Economic Considerations**

Initial investments include education and association/conference fees. Anyone interested in beekeeping and honey production should attend one year's worth of meetings before investing in bees or equipment. The purchase of hives, beekeeping equipment, bees, and queen are necessary to get started. Estimates for honey costs and returns, informed by the KDA, suggest budgeting a startup cost of at least \$500 for two hives, and \$175 for each additional complete hive. Producers should be aware that first-year hives are not honey production hives, as no surplus honey is produced



Honey extractors may be purchased or they might be available through beekeeping associations or county extension offices.

in Year 1. First-year hives need all honey produced for winter consumption. A honey crop will not be available until Year 2. Beekeepers might want to consider buying polystyrene equipment, given the current high cost of lumber.

Pressing or extracting equipment will represent an additional investment for producers of chunk and extracted honey. The least expensive honey extractors with associated equipment cost about \$500. However, extractors can be borrowed from other beekeepers and some local beekeeping associations make them available to members. A grant from the Kentucky Agricultural Development Board to Kentucky State University has allowed the construction of a number of large-capacity honey extraction units. These units have been established at selected county extension offices around the state. Contact your local county extension office or beekeepers association to learn if an extractor is available. There are other funding opportunities through the County Agricultural Investment Program (CAIP) and the Kentucky Department of Agriculture Kentucky Proud Promotional Grant. Please see Selected Resources below for links to these programs, extension offices, and beekeepers associations.

Producers wishing to purchase their own extraction equipment typically need at least 40 hives to recoup the typical costs of extraction equipment in three years or less. For producers wanting to invest in extraction equipment but wishing to keep fewer hives, a 10-hive production and extraction system would require an



The 2021 Kentucky State Beekeepers Association Board at the honey booth at the Kentucky State Fair.

initial investment in the \$5,000 range; a 50-hive system would require an investment approaching \$6,500. There are definite economies of scale and cost savings realized by keeping more hives for the purpose of extraction. Based on a price of \$2 per pound, extracted honey producers using this complete system could realize returns to land, labor, and management exceeding \$100 per hive, provided hives are rented for pollination at an annual rate of at least \$60 per hive. Recent retail honey prices up to \$14 per pound in Kentucky could create significantly greater returns for well-managed honey operations. The Kentucky State Beekeepers Association sold honey for \$15 per pound at the Kentucky State Fair in 2022, with 70% going back to the beekeeper.



Hives should be placed in full sunlight to help combat the small hive beetle.

Producers of comb honey will need at least one year of production to cover the cost of hive materials. This will be realized in the second year of keeping hives since the first year is devoted to building up hives for winter survival and producing a honey crop on the following year's nectar flow. At a price of about \$2 per pound of comb honey, a 10-hive comb honey system can yield returns to land, labor, and management exceeding \$50 per hive for honey production and returns exceeding \$125 per hive when hives are also rented out for pollination. Direct marketing of honey and related products can substantially increase price per pound and profitability per hive.

Beekeepers selling honey in bulk to a honey packer can avoid the cost of bottling and marketing the honey in jars but will obtain only \$2.18 (amber) to \$2.22 (light honey) per pound for 55-gallon drums of honey in the Kentucky region, according to Bee Culture magazine. Other regions such as the Midwest sell the same drums for \$7.48 (amber) to \$9.32 (light). If local markets are available for bulk honey, savings on packaging and direct marketing costs can make bulk production attractive. There may be a local market for selling honey to other producers who have established accounts and need more honey.

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<sup>1,3,4</sup>Honey, National Agricultural Statistics Service (NASS), Agricultural Statistics Board, United States Department of Agriculture, March 18, 2022. <https://downloads.usda.library.cornell.edu/usda-esmis/files/hd76s004z/7m01cp956/df65wc389/hony0322.pdf>

<sup>2</sup>Sugar and Sweeteners Outlook, Honey Update, United States Department of Agriculture, June 2022. <https://www.ers.usda.gov/webdocs/outlooks/104129/sss-m-406.pdf?v=3296.2>

## Selected Resources

- Beginning Beekeeping for Kentuckians (University of Kentucky, 1996) <http://www.ca.uky.edu/agc/pubs/ent/ent41/ent41.pdf>
- Honey Bee Program and Kentucky State Apiarist (KDA) <http://www.kyagr.com/statevet/honeybees.html>
- Kentucky Beekeeping—A Guide for Beginners (Kentucky State University, 2013) 4.9 MB file [https://www.kyagr.com/statevet/documents/OSV\\_Bee\\_Beginning-Beekeeping.pdf](https://www.kyagr.com/statevet/documents/OSV_Bee_Beginning-Beekeeping.pdf)
- Kentucky State Beekeepers Association <https://kybees.org/>
- Local Beekeeping Associations in Kentucky <https://kybees.org/local-beekeeping-organizations/>
- Kentucky County Extension Offices <http://extension.ca.uky.edu/county>
- Kentucky Department of Agriculture Kentucky Proud Program <http://www.kyproud.com/>

- Kentucky Agricultural Development Fund County Agricultural Investment Program (CAIP) [https://www.kyagr.com/agpolicy/documents/2022-Program-Guidelines-Applications/ADF\\_APP\\_animal-small.pdf](https://www.kyagr.com/agpolicy/documents/2022-Program-Guidelines-Applications/ADF_APP_animal-small.pdf) (see Page 4)
- Pollinator Protection App (see Page 3) [https://www.kyagr.com/statevet/documents/OSV\\_Bee\\_Pollinator-Handout.pdf](https://www.kyagr.com/statevet/documents/OSV_Bee_Pollinator-Handout.pdf)
- Agricultural Alternatives: Beekeeping (Pennsylvania State Extension, 2013) <https://extension.psu.edu/beekeeping-honey-bees>
- American Beekeeping Federation <http://www.abfnet.org>
- Bees (Agricultural Marketing Resource Center, 2021) <http://www.agmrc.org/commodities-products/livestock/bees-profile/>
- Beekeeping Enterprise Budget (Iowa State University Leopold Center, 2010) 1.3 MB file [http://lib.dr.iastate.edu/extension\\_pubs/41/](http://lib.dr.iastate.edu/extension_pubs/41/)
- Best Management Practices for Hive Health (Honey Bee Health Coalition, 2019) [https://honey-beehealthcoalition.org/wp-content/uploads/2019/01/HBHC\\_Hive\\_BMPs\\_v1.0\\_reduced.pdf](https://honey-beehealthcoalition.org/wp-content/uploads/2019/01/HBHC_Hive_BMPs_v1.0_reduced.pdf)
- Contributions of the U.S. Honey Industry to the U.S. Economy (University of California, 2018) [https://aic.ucdavis.edu/wp-content/uploads/2019/02/HONEY-COMPLETE-DRAFT\\_FEBRUARY-11-2019.pdf](https://aic.ucdavis.edu/wp-content/uploads/2019/02/HONEY-COMPLETE-DRAFT_FEBRUARY-11-2019.pdf)
- Honey Bee Program (University of Georgia) <http://www.ent.uga.edu/bees/>
- Honey Bees and Beekeeping (University of Georgia, 2010) [https://extension.uga.edu/publications/detail.html?number=B1045&title=Honey Bees and Beekeeping](https://extension.uga.edu/publications/detail.html?number=B1045&title=Honey%20Bees%20and%20Beekeeping)

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*Reviewed by Dr. Tammy Horn Potter, State Apiarist, Kentucky Department of Agriculture, and Shawn Wright, UK Horticulture Specialist*

*Photos courtesy of [Pixabay.com](http://Pixabay.com) (Pgs. 1 and 4; beekeeper, Pg. 3, and hives, Pg. 5); Dr. Leonard Davis (comb honey and chunk honey, Pg. 2); Dr. Tammy Horn Potter (swarm, Pg. 3); and William Jagers, Kentucky Exposition Center staff (KSBA Booth, KY State Fair, Pg. 5)*

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