

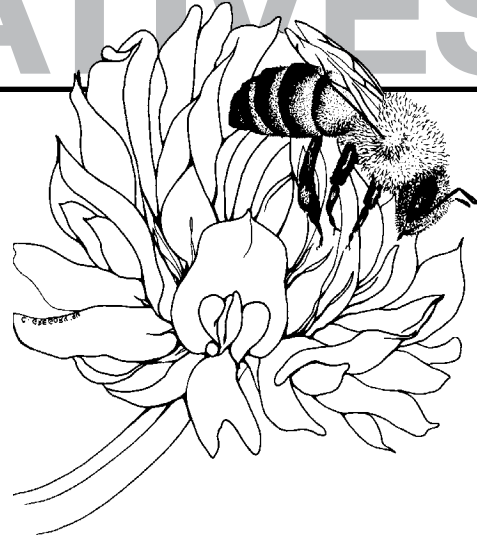
AGRICULTURAL ALTERNATIVES

Beekeeping

Honey bees produce or collect a variety of products that benefit people. These products include honey, beeswax, pollen, royal jelly, and propolis (a sticky resin collected from buds and used as a glue in the hive). Although honey bees can be managed to produce large quantities of these products, they are even more valued for the major role they play in pollination, especially of our agricultural crops. While other insects, birds, and bats also are pollinators, people have little control over the actions or numbers of these pollinators. Honey bee colonies, however, can be easily moved and placed wherever and whenever they are needed for pollination. Also, honey bees have additional advantages over other pollinators such as their availability in large numbers and their instinctive pollen-hoarding behavior. Without the pollinating service of honey bees, the cost of many fruits, vegetables, legumes, nuts, and seeds would be many times what it is today.

About 150,000 beekeepers manage approximately 2.5 million colonies of honey bees in the United States. Beekeepers derive income from their bees in a variety of ways. Some move their colonies several times during the season to produce a variety of honey crops and/or to pollinate various crops for a fee (apples, peaches, blueberries, or pumpkins, for instance). Some stationary beekeepers have apiaries in good honey-producing locations and make honey crops without moving their bees. Other beekeepers sell equipment, nucleus colonies, and/or package bees or rear and sell queens as a source of income. However, the majority of individuals keeping bees today maintain a small number of hives for enjoyment and/or the production of honey for home use and pollination of home gardens and orchards.

Around 175 million pounds of honey are produced annually in the United States. Honey is priced accord-



ing to its color (water white, extra white, white, extra light amber, light amber, and dark amber), with recent wholesale prices ranging from \$1.50 to \$2.00 per pound in the Northeast and Mid-Atlantic regions. About 3.9 million pounds of beeswax, worth about \$7 million, are also produced annually as a by-product of the honey harvest.

Planning Ahead

Good planning is an important part of successful beekeeping. New beekeepers need to consider the following before purchasing honey bees and the necessary equipment to keep them and produce honey:

- Number of colonies you will start with
- Location of your apiary and the amount of site preparation that will be necessary
- How and where you will purchase your bees (package bees and nucleus colonies should be ordered the fall prior to the spring they are needed)
- Equipment needed (such as hives for bees, protective equipment for the beekeeper, and honey-processing equipment) and where you will purchase it

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- Amount you can spend (your budget)
- Amount of time you have to devote to a beekeeping enterprise
- Local and state laws concerning the keeping of bees
- Potential markets for your honey, beeswax, or other products
- Registration of honey bee colonies with your state department of agriculture
- Registration of your honey-extracting facility (this is now required in some states like Pennsylvania, even if you extract in a kitchen or structure such as a garage)
- A plan for control of Varroa mites and other diseases

The number of colonies you start with will depend on whether you are planning to keep bees simply for your own enjoyment and use, as a sideline for generating additional income, or as a commercial venture. Many sideline and commercial beekeepers started out keeping bees as a hobby. If you are a beginning beekeeper, you should start small and let your operation grow with your enthusiasm and experience. New beekeepers often want to start with a single colony, but it is better to begin with at least two or three colonies. While the initial cost is higher, the time required to manage two colonies is no greater than the time required to care for one, and some of the management problems you may face can be corrected with the assistance of a second or third colony.

Requirements for successful honey production:

- Strong colonies
- Young queens (preferably selected for mite resistance)
- Minimal swarming
- Good locations with plentiful food resources and strong nectar flow

Marketing

Honey

Producing honey for profit is highly dependent on successful marketing. You should conduct market research to determine your competition, the amount of honey you can sell, and in what form(s) your customers prefer their honey.

Successful marketing of honey requires a well-organized marketing plan consisting of at least the following:

- Production of high-quality honey
- Attractive containers and labels
- An effective advertising program
- Dependable service for customers

Most honey in the United States is extracted and sold as liquid honey. However, honey can be prepared and marketed in five different ways:

1. Extracted honey
2. Section-comb honey
3. Cut-comb honey

4. Chunk honey
5. Finely crystallized or creamed honey

Equipment needs vary depending on the type and quantity of honey you wish to produce. Extracted liquid honey is the most profitable to produce under conditions where honey flows are generally light. Beekeepers who do not want to invest in extracting equipment can produce cut-comb honey, which is relatively easy to process. Section-comb honey, however, requires more equipment, close attention to colony management, and more frequent manipulation of bees than the production of extracted honey. In addition, beeswax—particularly crafted beeswax products (candles, ornaments, etc.)—is becoming an important source of income for some beekeepers.

Markets for honey and bee products are extensive. You should plan to start small and expand as market demand increases and you develop a better understanding of the markets for your products. For detailed marketing information and useful resources, contact the National Honey Board (see the “For More Information” section).

Pollination

Renting hives to growers for pollination services can be an important source of income for beekeepers. Contact fruit and vegetable grower organizations, your state or local beekeeping association, your local county extension educator, or university beekeeping specialist to inform them of your interest in renting your colonies for pollination. To avoid misunderstandings, it is important for beekeepers and growers to have a written agreement when honey bee colonies are being rented for pollination services. The following key points should be included in the contract:

- Approximate date to move bees into the crop, or the time relative to a certain condition of bloom, and the approximate date on which bees are to be removed
- Location of crop
- Pattern of colony placement
- Rental fee and the date(s) on which it is payable
- Beekeeper will provide a specified number of colonies of a minimum standard
- Grower will not apply bee-toxic pesticides while bees are in the crop; but, if necessary to do so, the beekeeper will be given a 48-hour notice
- Grower will warn the beekeeper of other spraying in the area
- Grower will reimburse the beekeeper for any additional movement of colonies in, out, or around the crop
- Grower will provide right of entry to the beekeeper for management of the bees while on the pollination site

Penn State Extension has a publication containing details of pollination contracts and a sample agreement located online at pubs.cas.psu.edu/FreePubs/pdfs/uf012.pdf or through the Publications Distribution Center.

Acquiring Bees

The best time to establish new colonies is in the spring. New honey bee colonies can be acquired in the following ways:

- Established colonies
- Nucleus colonies
- Package bees
- Swarms

Each of these options has distinct advantages and disadvantages. Your decision should be based on your particular production expectations and personal preference.

Established colonies

Overwintered or established colonies cost the most, but they can be a good buy. Before you can purchase the bees, they should be inspected by a state bee inspector to ensure that they are disease free. Avoid weak colonies and dilapidated equipment.

Advantages of purchasing established colonies:

- Equipment is already assembled
- Queen is present and laying (the quality of the queen can be evaluated by her brood pattern)
- A honey crop is possible the first season
- Information about the history of the colony may be available

Disadvantages of purchasing established colonies:

- Equipment or bees may be diseased (however, inspection by a knowledgeable individual, such as a state apiary inspector, should alleviate this concern)
- Strong colonies may be difficult for a beginner to handle
- Equipment may not be standard
- Combs and frames may be old and need to be replaced

Nucleus colonies (nucs)

Nucs consist of four or five frames of brood, honey and pollen, adult bees, and a laying queen. All frames should be covered with adult bees.

Advantages of nucleus colonies:

- Less expensive than established colonies
- Queens are usually new and can be evaluated by their brood pattern
- If there is a strong nectar flow, nucs usually can produce a honey crop the first year
- May be purchased locally
- Nucs are not as strong as established colonies, so they can be easier for beginners to handle

Disadvantages of nucleus colonies are similar to those of established colonies.

Package bees

Package bees are caged worker bees with a queen, produced mainly in the southern United States by beekeepers who specialize in producing package bees. They consist of 2, 3, or 5 pounds of bees, a queen (in a separate queen cage), and a canister of sugar syrup used for food by the bees during transport. The 3-pound package is often the best buy. Package bees should be ordered in the fall to ensure delivery by the desired early spring date. Packages are shipped in special screen mailing cages through the U.S. Postal Service or other package delivery services. Another option for beekeepers is to contact someone who will transport the bees for a fee. Beekeepers sometimes travel to bring package bees home for many beekeepers at once. Check newsletters to see if anyone is offering this service.

Advantages of package bees:

- Cheaper than established colonies or nucs
- Easy for beginners to handle
- Little possibility of the bees having a serious brood disease

Disadvantages of package bees:

- Little chance the bees will produce a honey crop the first year
- Because there is no brood, it is not possible to evaluate the queen
- Due to the stress of shipment, queens are often superseded, which can lead to queenlessness in the hive—a serious issue because it is necessary to have a productive queen to build the population and maintain a healthy hive
- Introducing package bees into hives may be difficult if the weather is poor
- Bees must be fed until the start of the nectar flow

Swarms

Swarms are another way to get started. Swarms can be easily collected and placed in prepared equipment. It is wise to requeen swarms as soon as possible since old queens head most swarms.

Advantages of swarms:

- Free
- Usually easy and fun to collect
- Although some swarms can be quite large, they are easy to handle

Disadvantages of swarms:

- Since there is no brood, the queen's brood pattern cannot be evaluated
- Depending on the size of the swarm, the bees are unlikely to produce a honey crop the first year
- Swarm availability is unpredictable

Diseases and Mites

Bees are subject to certain diseases, parasites, predators, and pests. Most pests and predators of bees are easy to control, but diseases and two recently introduced parasitic mites are a great threat to the industry. Diseases may be grouped into two categories: those affecting the brood, and those affecting the adult bees.

Brood diseases can be harmful and include American foulbrood (AFB), European foulbrood (EFB), sacbrood, and chalkbrood. The prevalence of American foulbrood makes it difficult to profitably keep bees unless this disease is monitored and controlled when identified. Adult diseases include virus and nosema. Most states have laws prohibiting the keeping of AFB-infected colonies or selling or removing infected bees or equipment. In most states, inspectors are authorized to enter any place where bees are kept to examine hives, bees, and equipment. Inspectors are authorized to prescribe treatment of diseased colonies and order the destruction of those in which the disease is too far advanced to warrant treatment.

Due to vigorous disease-control programs, beekeepers suffer few major problems with diseases. The biggest obstacle facing beekeepers today is the presence of two kinds of parasitic mites. Mites and the diseases associated with them were not found in the United States until the early 1980s. During the fall and winter, these mites can cause high mortality rates in bee colonies if not properly treated. Beekeeping, whether for fun or profit, is no longer possible without close attention to mite control.

The Varroa mite is considered by many to be the most serious honey bee pest. This mite is an external parasite that is visible to the naked eye. The brownish-red, oval (shaped like a tiny clamshell) mite feeds on the blood of both adult bees and the brood. Heavy parasitism by Varroa mites results in bee mortality, subsequent weakening of colonies, and often death.

The tracheal mite is an internal parasitic mite that lives and reproduces within the thoracic tracheae, or breathing tubes, of adult honey bees. These microscopic mites penetrate the tracheae of honey bees and feed on their blood. Feeding by the mites damages the tracheal walls, which blocks the bees' breathing passages. These breathing tubes supply the flight muscles with oxygen. As a result of mite feeding, the flight muscles may atrophy, and the bees may be unable to fly or control their body temperature. Pathogens also may be introduced into the bees' bloodstream by feeding mites.

Efforts to stop the spread of these two mites have been largely unsuccessful, but research into various chemical controls and alternative control techniques, such as the use of resistant stocks, look promising. For more information on parasitic mite control, contact your county extension office or your university beekeep-

ing specialist or visit the MAAREC website, <https://agdev.anr.udel.edu/maarec/>.

According to a 2007 report by the National Academies of Science, most North American pollinators, including honey bees, are in decline. Colony Collapse Disorder (CCD) is the most recent manifestation of an overall long-term decline in the managed honey bee population. CCD is characterized by the demise of honey bee colonies as a result of the rapid loss of the adult bee population. Typically, these colonies have healthy-looking brood and adequate food stores. Multiple possible causes of CCD are being studied. A combination of factors including mites, diseases, use of pesticides, environmental stresses, and migratory beekeeping may also be the cause.

Depending on where bees are kept, bears can be a serious hindrance to successful beekeeping. In areas where bears are known to be present, the construction of an electric fence enclosing the apiary is highly recommended before the bees are acquired. Additional pests that may need to be addressed include hive beetles, mice, skunks, opossums, and wax moths. For more information on these pests and their control, visit the MAAREC website, <https://agdev.anr.udel.edu/maarec/>.

Risk Management

You may now insure your honey, pollen collection, wax, and breeding stock through a crop insurance program for apiculture. The new grid-based rainfall index apiculture group-risk policy is available in selected states and counties (including all counties in Pennsylvania). Advantages of this coverage include flexibility of when to insure during the year and how much to insure (you are not required to insure all your colonies). This allows you to adjust coverage to better match the value of your beekeeping enterprise. Payments for losses under this program are based on lack of rainfall as measured by a rainfall index within a geographic grid (approximately 12 by 12 miles in area).

You can also insure your income from beekeeping and any other agricultural enterprises you may have using AGR-Lite. AGR-Lite is a whole-farm policy that covers all your crops and is based on your farm's gross revenue as reported on your federal taxes. To use AGR-Lite you must have five years of Internal Revenue Service (IRS) Schedule F forms. If your business structure is either a C or an S corporation, the necessary information can be entered into a Schedule F for crop insurance purposes.

For more information on these risk management options contact your local crop insurance agent, or visit www.rma.usda.gov/pubs/rme/apiculture.pdf.

Sample Budget

Included in this publication is an annual beekeeping budget that summarizes the receipts, costs, and net returns for ten mature honey bee colonies. It should be noted, however, that successful part-time operations aiming to generate income typically maintain fifty or more colonies. The initial resource requirements explain the startup costs. There will be no receipts from an operation until the second year. This sample budget should help ensure that all costs and receipts are included in your calculations.

Costs and returns are often difficult to estimate in budget preparation because they are numerous and variable. Therefore, you should think of this budget as an approximation and make appropriate adjustments in the “Your Estimate” column (on right) to reflect your specific production and resource situation. For example, you may decide not to rent your colonies for pollination. More information on the use of budgets can be found in *Agricultural Alternatives: Enterprise Budget Analysis*.

Initial Resource Requirements

(first-year establishment based on a 10-hive unit in a 50-hive production system).

Apiary sites

10 package bees (3 lb each) plus shipping \$ 500.00

Capital investment

Brood boxes, frames, and foundation \$ 335.00

Top, bottom, and inner covers \$ 400.00

Supers with frames and foundation \$ 810.00

Protective clothing \$ 90.00

Hive and tool/smoker \$ 45.00

Feeder \$ 55.00

Queen excluders \$ 15.50

Fumeboard \$ 12.00

Extractor \$1,600.00

Bottling tank (300 lb) with cover & strainer \$1,000.00

Uncapping tank \$ 135.00

Uncapping knife \$ 100.00

• *Total equipment investment* \$5,097.50

Building

Adapting and upgrading existing facility \$2,000.00

Total start-up cost \$7,097.50

For more information

Associations

National

American Beekeeping Federation

3525 Piedmont Road

Building 5, Suite 300

Atlanta, GA 30305

Phone: 404-760-2875

Fax: 404-240-0998

Email: info@abfnet.org

www.abfnet.org

American Honey Producers Association

www.americanhoneyproducers.org

The National Honey Board

11409 Business Park Circle, Suite #210

Firestone, CO 80504-9200

Phone: 303-776-2337

www.honey.com

Regional

Eastern Apiculture Society

www.easternapiculture.org

State

Most states and many counties have beekeepers' associations. Information about these associations may be obtained by contacting county agricultural extension educators or state apiculturists.

Books

Beekeeping Resource Manual. 2001. Available from the Department of Entomology and Applied Ecology, University of Delaware, Newark, DE 19713, for \$10.00 or on the MAAREC website.

Caron, D. M. *Honey Bee Biology and Beekeeping*. Cheshire, Conn.: Wicwas Press, 2000.

Collison, Clarence H., Maryann Frazier, and Dewey Caron. *Beekeeping Basics*. University Park: Penn State Cooperative Extension, 2004. pubs.cas.psu.edu/freepubs/pdfs/agrs093.pdf.

Flottum, Kim. *The Backyard Beekeeper*. Rev. ed. Quarry Books, 2010.

Frazier, Maryann. *A Field Guide to Honey Bee and Their Maladies*. University Park: Penn State Cooperative Extension, 2011. pubs.cas.psu.edu/FreePubs/PDFs/AGRS116.pdf.

Grout, Roy A. *The Hive and the Honey Bee*. Hamilton, Ill.: Dadant and Sons, 1992.

Kelley, Walter T. *How to Keep Bees and Sell Honey*. Clarkson, Kent.: W. T. Kelley, Co. 1991.

Root, Amos Ives, Ann Harman, Hachiro Shimanuki, and Kim Flottum *The ABC & XYZ of Bee Culture: An Encyclopedia Pertaining to the Scientific and Practical Culture of Honey Bees*. 41st ed. A I Root Co., 2007.

Sammataro, D., and A. Avitabile. *The Beekeepers Handbook*. Ithaca: Cornell University Press, 2011.

Winston, M. L. *The Biology of the Honey Bee*. Cambridge: Harvard University Press, 1991.

MAAREC Resources

The following information is available on the MAAREC website, <https://agdev.anr.udel.edu/maarec>.

1 General

- 1.1 Bees Are Beneficial
- 1.2 Information for Bee-Ginners
- 1.3 What Is the Africanized Honey Bee

2 Starting with Bees

- 2.1 Tips on How to Handle Bees
- 2.2 Beekeeping Equipment & Supplies
- 2.3 Queen & Package Bee Suppliers (not included—under revision)
- 2.4 Sources of Information/Assistance for Beekeepers
- 2.5 Agricultural Alternatives—Beekeeping
- 2.6 Beekeeping for Beginners
- 2.7 Keeping Bees in Populated Areas/Tips for Suburban Beekeepers

3 Bee Management

- 3.1 Early Spring Management
- 3.2 Fall Management
- 3.3 Dividing Honey Bee Colonies
- 3.4 Swarming—Its Prevention & Control
- 3.5 Transferring Bees
- 3.6 Removing Bees
- 3.7 Bait Hives
- 3.8 Honey

4 Diseases/Pests

- 4.1 Chemicals Approved for Legal Use in Honey Bee Colonies for the Control of Parasites and Pests of Honey Bees
- 4.2 Tracheal Mites
- 4.3 Pests of Honey Bees
- 4.4 Stinging Insect Control
- 4.5 Wax Moth
- 4.6 Small Hive Beetle
- 4.7 Varroa Mite
- 4.8 Integrated Pest Management (IPM) for Beekeepers
- 4.9 Bee Diseases & Their Control

5 Pollination

- 5.1 Hives for Hire
- 5.2 Pollination
- 5.3 Moving Bees
- 5.4 Pollination Contracts

Websites

Bee Informed Partnership: beeinformed.org

Beekeeping 101 (an online course from Penn State designed to help you keep your own bees): beekeeping101.psu.edu

The Center for Pollinator Research: ento.psu.edu/pollinators

The Pollinator Partnership: www.pollinator.org

For information on these and other extension materials, visit the MAAREC (Mid-Atlantic Apiculture Research and Extension Consortium) website, <https://agdev.anr.udel.edu/maarec>.

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Sample Honey Production and Pollination Budget (Established Operation)

Summary of Estimated Costs and Returns for 10 Established Colonies

Item	Unit	Amount	Receipts or costs per unit	Total receipts or costs (one crop)	Your estimate
Receipts					
Honey (extracted) ¹	pounds	600	\$5.00	\$3,000.00	_____
Pollination fee ²					_____
Spring	hives	10	\$85.00	\$850.00	_____
Summer	hives	10	\$100.00	\$1,000.00	_____
Wax	pounds	5	\$4.00	\$20.00	_____
<i>Total receipts</i>				\$4,870.00	_____
Variable costs					
Bees (replacement bees) ³					
Package (3 lb)	hive	2	\$100.00	\$200.00	_____
Queens (replacement)	queen	2	\$18.00	\$36.00	_____
Parasite and disease control					
Varroa chemical control	pkg of 10	4	\$33.00	\$132.00	_____
Fumidil-B	2-gm bottle	1	\$44.00	\$44.00	_____
Sugar	pounds	50	\$0.40	\$20.00	_____
Jars	cases of 24	21	\$15.50	\$325.50	_____
Labels (supplier and quality id)		500	\$0.15	\$75.00	_____
Paint	gallon	2	\$40.00	\$80.00	_____
Buckets	5 gallons	5	\$7.80	\$39.00	_____
Vehicle (fuel, maint., depreciation)	miles	150	\$0.55	\$82.50	_____
Marketing (advertisement) plus bee management and production information	one year	1	\$150.00	\$150.00	_____
Registration fee	year	1	\$5.00	\$5.00	_____
<i>Total variable costs</i>				\$1,189.00	_____
Fixed costs					
Brood boxes with frames and foundation ⁴	10 colonies	20	\$3.35	\$67.00	_____
Top, bottoms, and inner covers ⁴	10 colonies	10	\$4.00	\$40.00	_____
Honey supers with frames and foundation ⁴	10 colonies	30	\$2.70	\$81.00	_____
Protective clothing ⁴	10 colonies	1	\$9.00	\$9.00	_____
Hive tool/smoker ⁴	10 colonies	1	\$4.50	\$4.50	_____
Feeder ⁴	10 colonies	1	\$5.50	\$5.50	_____
Queen excluder ⁴	10 colonies	1	\$1.55	\$1.55	_____
Bee escape ⁴	10 colonies	10	\$1.05	\$10.50	_____
Extracting equipment (based on 50 hives)					
Extractor (\$1,600) ⁴	year	1	\$160.00	\$160.00	_____
Bottling tank (300 lb with covered strainer) (\$1,000) ⁴	year	1	\$100.00	\$100.00	_____
Uncapping tank (\$135) ⁴	year	1	\$13.50	\$13.50	_____
Uncapping knife (\$100) ⁴	year	1	\$10.00	\$10.00	_____
Upgrading existing facilities (\$2,000) ⁵	year	0.5	\$200.00	\$100.00	_____
<i>Total fixed costs</i>				\$602.55	_____
Total costs				\$1,791.55	_____
Returns					
Returns over variable costs				\$3,681.00	_____
Net returns				\$3,078.45	_____

1. Retail price.

2. Rental fee may vary depending on the crop.

3. Estimated 20 percent loss each year.

4. Depreciated over 10 years.

5. Depreciated over 20 years. Building may not be necessary. Sideline beekeepers often convert a garage, basement, or other outbuilding into a honey house.

