Chapter 10—Honey

Description of the Product and Its Uses

Honey is the sweet, viscous substance made by the common honeybee, *Apis mellifera*, from nectar gathered from flowers. Honey is used as a food product alone or as a sugar substitute in other food products. Honeybees in the United States produce about 250 million pounds of honey a year, a crop valued at $200 million.

In addition to the honey itself, honeybees also produce 4 million pounds of beeswax annually and other by-products such as bee pollen and royal jelly. Beeswax is sold as a by-product for candles, polishes, and as a component in cosmetics. Royal jelly—a secretion of the glands of the worker bee—is the queen bee's sole source of nourishment. It is promoted in retail sales as a nutrient and as a source of energy.

There are many valuable nectar and pollen sources for bees. Many bee flowers are blue, yellow, or purple—colors *Apis mellifera* can easily distinguish. The single most common nectar source in North America is probably white clover. Others (by season) include:

Early-Season Sources

Skunk cabbage (*Symplocarpus foetidus*)

Alders (*Alnus* spp.)

Buckbrush, snowberry (*S. albus*)

Willows (*Salix* spp.)

Maples (*Acer* spp.)

Serviceberry (*Amelanchier* spp.)

Pin cherry (*Prunus pensylvanica*)

Dandelion (*Taraxacum officinale*)

Plum (*Prunus domestica*)

Sour cherry (*Prunus cerasus*)

Apple (*Pyrus malus*)

Pear (*Pyrus communis*)

Cranberry (*Vaccinium macrocarpum*)

Main Nectar Flow

Black locust (*Robinia pseudoacacia*)

Raspberries (*Rubus* spp.)

Buckwheat (*Fagopyrum esculentum*)

White clover (*Trifolium repens*)

White sweet clover (*Melilotus alba*)

Anise hyssop (*Agastache* spp.)

Linden (*Tilia* spp.)

Bee bee tree (*Evodia danielli*)

Purple loosestrife (*Lythrum salicaria*)

Fall Nectar Flow

Goldenrod (*Solidago* spp.)

Asters (*Aster* spp.)

Still other important sources include asters, basswood, berries, chicory, cucurbits (cultivated cucumbers and their large-flowered relatives), fruit tree blossoms, mustards, ragweed, and vetch. Warm-climate plants include citrus, cotton, black mangrove, mesquite, palmetto, sourwood, and tupelo tree. A variety of wild and domesticated flowers, including those of sweet yellow clover, elm, alfalfa, wild rose, sunflower, prickly poppy, penstemon, cinquefoil, and thistle, are foraged by bees. Given a choice, the foraging honeybee will always choose the richest nectar available.

Bees need nectar and pollen over as long a period as possible to produce maximum honey crops. Therefore a polyculture of tree species with a succession of flowering periods is best for honey production. Willows and maples (February–March) are the most commonly exploited early-season species; basswood and sourwood (June–July) are among the latest; and most other species flower sometime between these.

Each floral source lends a slightly different flavor to the honey made from it, and each honey has its own bouquet. The experienced palate, like that of a good wine taster, can distinguish among 80 varieties of honey. Many regional "specialty" honeys have been developed, such as Texas mesquite honey and tupelo honey in Florida, and

honey from raspberries, cranberries, and blueberries along the east coast. Regulations of the Food and Drug Administration require that 51 percent of the nectar from a particular crop must be present in order to name-label honey, for example, raspberry honey.

California accounts for 70 percent of all hive rentals, with hives coming to that State from as far away as Florida. Ninety-five percent of all honeybees rented for crop pollination are used for apples, cherries, melons, almonds, alfalfa, plums, avocados, blueberries, cucumbers, pears, sunflowers, cranberries, vegetable seeds, and kiwi. Nut crops in particular depend on pollination. Bees also pollinate many wild plants that provide essential wildlife food and erosion control.

It takes about 50,000 bees to produce a pound of honey. One bee will only make about a tablespoon of honey in its lifetime. In a good year, the yield of honey per bee colony will be over 100 pounds.

Honey, the most popular beehive product, can be produced in many ways. The simplest is merely to cut out pieces of the comb containing honey. This “cut comb” may be wrapped with plastic or enclosed in a plastic sandwich box. Liquid honey is extracted from combs by centrifugal force with specially built extractors. Because of these equipment needs, a beginner should not try it.

Pollen is a protein that is essential in the food of the bee larva. It is sometimes trapped and sold. Propolis—a resinous substance bees use to fill holes and gaps—is an additional source of income. However, small-scale entrepreneurs should make sure to have a market. Beeswax is a useful by-product but not for beekeepers with just a few colonies. The wax is sold as a by-product for candles and polishes, and as a component in cosmetics. Production of royal jelly is labor-intensive and markets are limited. Some honeys are sold unfiltered and uncooked.

Perhaps the most important role of the honeybee, however, is the pollination of virtually all plants, plants that not only provide fruits, nuts, and vegetables, but provide feed for beef and dairy cattle. Only in the last century have people begun to recognize the value of bees as pollinators, and this includes honeybees and over 3,500 species of wild bees in North America. The contribution of bees as pollinators of cultivated crops far outweighs the value of the hive products. Honeybee pollination affects about every third mouthful of food or drink consumed. Well-timed honeybee pollination gives farmers a way of ensuring uniformity of size and maturation date, which adds significantly to the yield and market value of a great many agricultural crops. As an example, without honeybees the average yield for an acre of almond trees would be about 500 pounds. Rental hives for pollination can boost the crop yield to 2,500 pounds.

Market and Competition Considerations

There are an estimated 250,000 beekeepers in the country. Of these, only about 2,000 are considered commercial beekeepers—beekeepers with 300 or more beehives. The rest are hobbyists. Florida led the Nation in 1990 in honey production volume, with nearly 21 million pounds and an estimated value of $9.8 million. Other major producing States are California, North Dakota, and South Dakota.

Most of the honey produced by the large commercial beekeepers is sold or put under loan to the Federal government through the honey price support program. Most of it ultimately goes into the bakery trade, with the Government absorbing the difference between the market price and the support price. Imported honey started entering the country in the early 1980's at prices well below what processors could offer. Key producers are China, Argentina, Mexico, and Canada.

Because of the national trend toward healthier, more natural foods, demand for honey is rising on a per capita basis. For the small rural entrepreneur looking for supplemental income from beekeeping, the most productive strategy might be to aim for a market niche with a high-quality regional or specialty flavor of honey. Producing a variety of both honey and other bee products is also a good strategy. Specialties such as whipped or blended honey, creamed or pure honey, flavored and unflavored honey, and fruit spreads mixed with honey are all being developed for gourmet markets. Propolis, sometimes called bee glue, and bee pollen can be packaged and sold by the pound to manufacturers of natural health foods. Bee pollen is said to be in demand in Japan as an aphrodisiac. Beeswax is sold for candlemaking and other products. Some in the bee business specialize in selling queen and worker bees to other apiaries, with honey and beeswax being by-products.

Beekeeping’s profitability depends on many factors, and the decision to enter this occupation should be made carefully. Beekeepers should know about bee biology, flora, and management, and possess business ability. They should understand they are subject to factors beyond their control—market prices and weather elements ranging from drought to floods and temperature extremes.

Entrepreneurs intent on commercializing should decide whether to be migratory or nonmigratory and select locations that offer opportunities for pollination rentals;

production of honey, beeswax, or pollen; and/or packaging queen bees.

Raising bees for honey extraction is most practical in areas with long growing seasons. For example, in North Dakota the bees can collect nectar from the alfalfa fields and sweet clover in the spring and later from the sunflower crops. An apiary in Tallahassee, Florida, has over 2,000 hives in the Apalachicola National Forest and is successful in producing high volumes of famous "tupelo honey," which has a unique flavor and is popular with honey enthusiasts. Bees will fly up to 7 miles to find food, though a 1-mile range is more common and certainly less taxing for the bees. Rural areas near enough to metropolitan areas to have regional markets might also be more competitive in the specialty markets.

There is also the potential for exports to Europe or to the Mideast. In some Arab countries, for example, people eat honey at least twice a day as a religious act. For this custom, the honey must be of the best quality. Tests for quality vary by custom, too. For instance, the three-part test for purity used by some Arabs involves the following: (1) a drop of honey in the eye should not sting (2) a drop of honey in the sand should not form a film and (3) pure honey should not soak through a piece of paper.

However, it is important to note that the direct value to agriculture of honeybee pollination is much greater than the value of honey produced. (A 1989 study by Cornell University put the direct value of honeybee pollination at nearly $10 billion per year.) For every $1 paid beekeepers in pollination fees, the added value to the crop is more than $60.) So important is the pollination aspect of beekeeping that most commercial beekeepers could not survive if they did not make their bees migratory. The blooming season of any one plant in any single location is simply too short to produce enough honey to make the enterprise worthwhile. About 2 million rentals occur annually, involving 1 million hives. Any new entrepreneur in the beekeeping business should consider ways to rent out hives to orchards and farmers in the spring to pollinate their fruit, vegetable, legume, and oilseed crops. It should be kept in mind that pollination and honey production are separate enterprises of the beekeeper that seldom coexist on any one crop.

New beekeepers should be prepared to contract with area orchard growers to rent hives. In using the honeybees as pollinators, beekeepers often travel with their hives to various parts of the country to provide pollination services to orchards and other crop producers. "Migratory beekeepers" fall mainly into two geographic groups: those who travel extensively up and down the East Coast and those who move back and forth from the Plains and Mountain States to California's Sacramento and San Joaquin Valleys. For example, a large honey producer in Montana sends eight semiloads of bee colonies to California from October to March to pollinate the fruit crops and then returns them to Montana to produce Montana honey.

About 70 percent of all bee rentals go to California, the Nation's largest user of honeybee colonies for pollination. Nearly 700,000 colonies are rented in the spring by California almond growers alone. Some 200,000 of those colonies must come from outside the State to meet the demand.

On the East Coast, migratory beekeepers travel even more extensively. During the winter, the bees pollinate Florida's citrus groves. Then the beekeepers follow the spring north, with pollination stops that include New York State's apple orchards, Maine's blueberry barrens, and Massachusetts' cranberry bogs.

Packaging and Distribution

Most commercial honey producers are located in sparsely populated States and sell most of their production through wholesale channels like cooperative marketing programs. There are also "handlers," individuals (usually also beekeepers) who buy bulk honey from other producers. For example, the Silverbow Honey Company of Moses Lake, Washington, rents out as many as 20,000 bee colonies per year for pollination purposes. In addition, the company bottles honey purchased from all Pacific Northwest and most Mountain States as well as imports from Hawaii, China, Russia, Argentina, and Canada. The company is experimenting with new fruit-flavored honey syrups.

Equipment Needs, Costs, and Suppliers

A would-be beekeeper should learn as much as possible about beekeeping before purchasing bees and bee equipment. Observing honeybees close up with an experienced beekeeper is an excellent way to learn about beekeeping.

A beekeeper can get started by (1) purchasing an established beehive (2) buying new equipment and packaged bees with queens from bee supply companies or (3) obtaining bee equipment and capturing a swarm. Beekeepers can collect swarms by making their interest known to extension agents, police departments, beekeepers, and others who might receive swarm calls. Information on availability of bees also can be obtained from beekeeping groups and trade journals.

One new hive with bees and basic equipment costs about $150. Hive parts are cut to standard dimensions that mimic the space bees naturally leave between their combs. The following equipment is essential:

1. Beehive, including bottom board (wooden stand on which the hive rests); frames and foundation; hive body or brood chamber ("super"); queen excluder; honey supers; inner and outer covers.
2. Smoker, used to calm bees and reduce stinging.
3. Veil and gloves, for protection.
4. Feeders, which hold sugar syrup that is fed to bees in early spring and in the fall.

Honey-extracting equipment for the hobbyist is specialized and represents a one-time investment of about $500 for new equipment. The basic tools for extracting honey include:

1. Uncapping knife—a heated knife for slicing off the cappings from combs of honey.
2. Uncapping tank—a container for receiving the cappings.
3. Extractor—a drum containing a rotating wire basket. Honey is flung out of the combs onto the sides of the tank and drains through a spigot.
4. Strainer—a mesh of coarse screen or cloth directly under the extractor spigot to filter out large debris.
5. Storage tank—a large tank with a spigot, or honey gate, at the bottom.

The most obvious and essential "supply" in making honey is, quite naturally, the honeybee itself. An efficient hive houses 80,000 to 100,000 bees and in a good year produces anywhere from 50 to 100 pounds of honey, depending on the region of the country. A colony stays strongest when the queen is changed every year or two.

For those who want to package the honey themselves for the retail market, supplies include jars or plastic containers, lids, and paper labels. These costs range roughly from 10 to 30 cents per container.

Migratory beekeepers who operate on a large scale usually move their hives on long flatbed trucks, expensive pieces of equipment to own and operate, slightly less so if rented. Those who rent bees on a smaller scale can ship bees, but the containment and climate control concerns make this an expensive proposition as well.

Bee Management

To survive, bees need honey as a carbohydrate source, pollen or pollen substitutes for protein, and water as the universal solvent. A colony also needs lots of comb space for storing the food and rearing brood. Lack of adequate space can lead to swarming, which cuts honey production.

Setting equipment for beehive in place. Courtesy of USDA Forest Service. (USDA/0185 x 0032.17)

For successful wintering, a colony should have a young queen, a large cluster of adult bees, 40 to 60 pounds of honey, and several combs of pollen. Each colony should have a two-story standard hive, one brood chamber, and one honey super—the removable section where the bees store their honey.

Starvation is a principal cause of colony losses. Bees die in cold climates not from freezing but from starving to death. If the temperature is extremely cold, they cluster and starve because they do not move around to eat the honey that they have stored. If bees are short of honey, they should be fed a syrup of two parts granulated sugar to one part water. Lack of pollen can be compensated for by purchasing pollen substitutes from bee supply dealers.

The occasional pesticide spraying of isolated plants or gardens may kill only a few bees, but when entire fields and orchards are sprayed or dusted, the resultant bee loss can be devastating. In such cases, beekeepers will usually see a large accumulation of dead and dying bees at hive entrances.

To find out about spraying in advance, beekeepers should keep a sign on each beehive with their name, address, and telephone number. Given a few days' warning, there are several things that can be done to minimize the effects of a harmful spray:

1. The beehive may be moved to a temporary location at least 2 miles from the spray area.
2. The hive entrance can be draped with a damp burlap. This protects the beehive from effects of a direct "hit." The burlap cover should stay only for the duration of the application.
3. The hive may be left in place and some loss of bees accepted.

The best way is to work with the farmer and the pesticide applicator in developing programs that safeguard pollinating insects. Some general guidelines are:

1. Insecticides should not be applied to open blossoms. Honeybees visit not only blossoms on cultivated crops but also those of orchard ground cover and noncultivated plants.
2. The safest time to apply insecticides is late afternoon after bees stop foraging. Early morning applications are also less dangerous to bees than those in midday.
3. An insecticide may be selected that has the least impact on nontargeted insects and animals.

Honeybees, like all creatures, are subject to infectious diseases. To lessen their spread and minimize harm, beekeepers should learn as much as possible about healthy, normal colonies so that they can recognize signs of diseases. Most common brood diseases are American foulbrood, European foulbrood, and chalk brood. Among adult bees, Nosema disease is one of the most serious. Two parasitic mites, *Acarapis woodi* and *Varroa jacobsoni*, recently replaced more traditional adult and brood diseases as the most serious ailments. These mites can shorten the already brief (about 40 days) life span of the honeybee. Many States now require certification that bees entering their borders are mite-free. The Varroa mite feeds off the blood of adult bees and larvae, either killing them or causing defects. The mite was first discovered in Wisconsin in 1987 following a routine inspection of hives and is assumed to have spread from Asia through Europe. It has since spread to over 40 States. The State of Florida has taken the lead in using the pesticide Fluvalinate to treat mite-infested hives.

If disease is suspected, the county extension agent or State apiary inspector can help. *Who's Who in Apiculture* lists State apiary inspectors.

Here are a few simple rules for avoiding diseases in honeybees:

1. Do not buy honey for feed from an unknown source; such honey may carry organisms that cause American foulbrood disease.
2. Buy package bees and queens only from reputable dealers.
3. Buy used bee equipment only after consulting with the State apiary inspector.
4. Look for signs of diseases each time the beehive is opened. Early detection can avoid costly replacements.

Besides watching for parasitic mites, beekeepers have been keeping an eye on the range expansion of Africanized honeybees. Subject of many scary media stories, these bees are more likely to sting in defense of their nests than the domestic European honeybees. However, a chance encounter with an Africanized bee foraging on blossoms is no more likely to result in a sting than with a domestic honeybee.

Based on experience in South and Central America, honey production in the United States is likely to show a temporary decline after the arrival of the interlopers. Beekeepers may experience more difficulty in transporting pollinator colonies because of these bees' sensitive nature. Also, hobby and sideline beekeepers may find it more difficult to obtain apiary locations in nonrural areas.

From a biological viewpoint, one defense would be to increase the numbers of European honeybee colonies to compete with the other. State and Federal researchers are working with beekeepers to develop methods to minimize the impact of the Africanized bees.

Potential entrepreneurs may need to plan for more intensive management practices to maintain desirable bees.

Other Factors

Taking advantage of their special skills, many beekeepers "moonlight" as swarming-pest control specialists (bees, wasps, and hornets) to augment the income earned from their hives. Sometimes the swarms can be taken and resold to other beekeepers.

Beekeeping has become a much more sophisticated and technical business in the last few years. The unwary entrepreneur must be prepared to contend not only with the obvious and omnipresent dangers of bee stings but also with various pest and disease problems, crop failures because of weather, low prices because of imports, and even marauding bears. And much has also been made in recent years about the northward migration of so-called Africanized "killer" bees.

These bees have been migrating northward since 1956 when they were accidentally released in Brazil. However, these tropical strains are ill-suited to cold weather and are probably incapable of sustaining life in at least the northern two-thirds of the United States. Wild honeybee colonies become easy targets for swarms of Africanized bees, which kill the queen and replace her with their own queen, gradually taking over the hive. But beekeepers are able to control the stock of their colonies by regularly "requeening," or replacing one domestic queen with another.

Profile

Dean Gary of Biz-zz Bee Farms in San Antonio, Texas, began as a beekeeper in 1982. At one point, he was running 400 hives and packaging honey for resale to grocery stores, produce markets, health food stores, and other customers. Gradually, however, he came to the realization that it was not practical or efficient to try to "do it all;" that is, to produce, package, and sell the honey. As his business grew, he recognized that his real niche was in selling rather than in producing. Most farmers and ranchers are not salespeople, but this was a skill at which he excelled.

In 1986, Mr. Gary began to gradually shift his business away from the bee business and into honey buying and reselling. By 1991, he was almost exclusively wholesaling uncooked mesquite honey. He pays other producers between 50 and 55 cents a pound for their honey, which includes picking up the honey at the beekeeper's facility and saving their drums. He can sell it in bulk for between 80 and 85 cents a pound. Currently he sells 40 to 50 drums a year.

Mr. Gary buys honey from about 30 producers who produce anywhere from 5 gallons to 100 barrels of honey. The market for unfiltered, uncooked raw honey and also specialty honey (such as mesquite honey) has been increasing. The rising interest in raw honey has been partly a result of marketing work his company accomplished in the past few years. Mr. Gary also continues to bottle and sell to several small health food stores and grocery stores.

While a very small producer might find it efficient to package and distribute his or her own honey locally, anyone wanting to grow will likely need to make connections with an end packager or someone like himself who buys bulk honey. Direct store delivery is a great amount of effort. The exception is someone who has two or three established outlets—stores that will buy all the producer wishes to package and sell, and a big enough family to help with the business so that additional labor does not have to be hired.

Honey is stored and sold in specially lined 55-gallon drums, or 5-gallon pails approved for food containment. Around San Antonio, the competition among buyers for raw honey is quite intense, and there are many buyers for as little as a pail or as much as 10 barrels.

It is very important for a new producer to know and remember that honey production, like any farming venture, is strictly dependent on the weather. In the semiarid Southwest, this is especially true. Someone running about 60 hives might produce 11 barrels of honey in an excellent year. The same 60 hives in 1991 would have produced no more than 2 barrels of honey. The rain must not only come, but also come at the right time to produce the blooms. If there is only enough honey to keep the bees alive, there will be none to sell. However, with proper care there is no reason to expect that the hives and bees will be lost, even in a bad year. It is very difficult to forecast in the business, and it is not a good opportunity for someone who has to recover a part of his or her investment in a certain year.

A newcomer to the honey business who chooses to sell honey to a buyer should also know that a reputable buyer will (1) pay on the spot (2) pick up the honey and (3) return the drums or leave drums of equal value. In particular, producers should be aware that some buyers offer to pay in 30 to 45 days, which they claim is the length of time required to bottle and sell the honey. A producer should look for a buyer within 150 miles of the operation.

Although almost anyone can be a beekeeper, it does take hard work. About 400 hives are the maximum for a couple to undertake unless additional part-time help can be found. Someone aiming for $1,200 to $1,500 a year supplemental income might keep under 100 hives. A small to medium investment in the bee industry might be $3,000 to $5,000, which would be enough in the Texas area to start out with about 100 hives.

Ground cover and blooming trees that produce pollen and nectar are, of course, critical to the honey business. Most hives in the San Antonio area are located where the bees have access to the mesquite tree, mostly growing on privately owned lands. The mesquite tree is the largest producer of honey in Texas as well as in several southwestern States. There is also a large market for pollen, beeswax, and royal jelly. However, someone must know the basics of beekeeping before undertaking development of any of these other products. Pollen is particularly difficult to produce because it must be collected so quickly after the bees bring it into the hive. It is also easy to take the pollen at the wrong time for the bees. A pollen cleaner mechanism is now available. Royal jelly is currently selling for over $200 a kilo.

New equipment is not necessary or even desirable. From a cost-effectiveness point of view, it is far smarter to visit many financial institutions and find out who is in the bee business, who wants to get out of it, and buy good used equipment from someone willing to talk about the bee business. Local bee organizations, unfortunately, are not always willing to talk to anyone they perceive as an outsider.

In another part of the country, Bill Merritt of Merritt Apiaries has been a full-time, commercial beekeeper for nearly 20 years. His beeyard is located along the Ochlockonee River in Wakulla County, Florida. But much of the time, his 2,000 hives are located in the Apalachicola National Forest, where the bees have access to tupelo trees. The resulting "tupelo honey" has become famous among honey enthusiasts for its unique flavor. Gallberry, palmetto, and other plants are also good sources of pollen in the region.

Considerations for a Rural Development Strategy

Many of the most desirable forage trees of bees have higher value for other uses so that honey production is simply a secondary product of their growth. For example, tulip poplar is both an important timber species and one of the most important honey trees in much of the Eastern United States. Timber production can also be combined with grazing as in the use of honey locust in pastures. Many tree species such as tulip poplar, sourwood, basswood, and tupelo produce high-quality honey that fetches a premium price. These and other valuable honey species are also grown as ornamental shade trees which could be marketed to the landscaping industry.

Contributors

Laurence P. Cutts, Chief, Division of Plant Industry, Florida Department of Agriculture and Consumer Services, P.O. Box 147100, Gainesville, FL 32614-7100. 904-372-3505.

Dean Gary, Biz-zz Bee Farms, 11693 Southeast Loop 1604, San Antonio, TX 78263. 512-655-6028.

Bill Rogers, Florida Department of Agriculture and Consumer Services, Division of Marketing, Mayo Building, Room 413A, Tallahassee, FL 32399-0800. 904-488-4366.

Bibliography

The ABC and XYZ of Bee Culture. 1990. Medina, OH: A.I. Root and Company. First published in 1897, this encyclopedia includes history, anatomy, hive styles, and glossary for large-scale bee cultivation. $25. 703 p.

Attfield, Harlan. 1990. A beekeeping guide. 40th ed. VITA Tech. Bull. No. 9, 1815 North Lynn Street, Suite 200, Arlington, VA 22209. 703–276–1800. Includes construction details for small-scale equipment, and discusses site selection, hive care, and clothing.

Coggeshall, William L.; Morse, Roger A. 1984. Beeswax: Production, harvesting, processing, and products. Ithaca, New York: Wicwas Press, 25 Hanshaw Road, Ithaca, NY 14850. This publication discusses chemistry and mechanics of beeswax production; utilization of beeswax; and other information.

Cooperative Extension Service. 1983. Beginning beekeeping for Kentuckians. Extension publication ENT–41. Lexington, KY: University of Kentucky. 26 p.

Delaplane, Keith S. 1991. Honey bees and beekeeping. Bull. 1045. Athens, GA: University of Georgia, College of Agriculture, Cooperative Extension Service. 23 p.

Donovan, Robert E. 1980. Hunting wild bees. Tulsa, Oklahoma: Winchester Press. Distributed by Roots Windmill Press, Box 1151, Medina, OH 44258. Discusses bee hunting, harvesting wild honey, beekeeping fundamentals, and making/using beehives.

Gentry, Curtis. [Publication year unknown] Small scale beekeeping. Peace Corps AT Dev. Series: Manual M–17. Washington, DC: Peace Corps Information Collection and Exchange, 806 Connecticut Avenue NW., Room 701. Covers basics of beekeeping; project planning, honeybee characteristics, hive products, disease and pest control, and plans for building equipment.

The Hive and the Honey Bee. 1975. Hamilton, IL: Dadant & Sons, Inc., 51 South Second Street. Technical compendium includes history, equipment, management, anatomy, behavior, pollination, disease, honey processing and plants, and pesticide poisoning. $16.25, 700 p. Also available from agAccess Book Catalog, P.O. Box 2008, Davis, CA 95617. 916–756–7177.

Kelley, Walter T. 1985. How to keep bees and sell honey. Clarkson, KY: Walter Kelley Company. A good and entertaining primer for the beginning beekeeper.

Miller, Dr. C.C. 1980. Fifty years among the bees. New Berlin, NY: Molly Yes Press. The book provides practical tips, gadgets, and gimmicks.

Morse, Roger A.; Hooper, Ted (ed.). 1985. Illustrated encyclopedia of beekeeping. Available through agAccess, P.O. Box 2008, Davis, CA 95617. 916–756–7177. Discusses recreational and commercial beekeeping management, biology, history, and includes a list of foraging plants. Includes regional discussions also. $35. 432 p.

Sammataro, D.; Avitabile, Alphonse. 1985. The beekeepers handbook. Charlevoix, MI: Peach Mountain Press.

Stelley, D.G. 1983. Beekeeping: an illustrated handbook. Davis, CA: agAccess Book Catalog, P.O. Box 2008. This publication includes products, pesticides, diseases, common nectar plants, equipment, and marketing. $12.95. 244 p.

Tompkins, Enoch; Griffith, Roger M. 1977. Practical beekeeping. Pownal, Vermont: Garden Way Publishing, Department 8600, Schoolhouse Road. Good coverage of different topics related to beekeeping. 214 p. $8.95 plus $2 for postage and handling.

Vivian, John. 1986. Keeping bees. Charlotte, VT: Williamson Publishing, P.O. Box 185. Good coverage of most beekeeping topics including planning, management, equipment, diseases, national and international sources of information, and suppliers. 238 p. $10.95 plus $1.25 for postage and handling.

Periodicals

American Bee Journal, Dadant & Sons, Inc., 51 South Second Street, Hamilton, IL 62341. 217–847–3324. Monthly magazine for hobbyists and professional beekeepers. Subscription, $14.

Bee Science Review, Wicwas Press, P.O. Box 817, Cheshire, CT 06410, $20/year.

Gleanings in Bee Culture, A. I. Root Company, 623 West Liberty Street, P.O. Box 706, Medina, OH 44256. 216–725–6677. Monthly apiculture magazine. Subscription, $14.

Honey Market News, Market News Branch, F&V Div., AMS, USDA, Room 2503, South Building, 14th and Independence Avenue, SW, Washington, DC 20250.

The Speedy Bee, P.O. Box 998, Jesup, GA 31545. 912–427–4018. Monthly newspaper for the beekeeping and honey industry. Subscription, $12.50.

Associations

American Bee Breeders Associations, P.O. Box 12, Claxton, GA 30417. 205–548–2313. Mrs. R. V. Harrel, Secretary. Fifty members include commercial beekeepers, researchers, hobbyists. Encourages development of better bees through better queens. Seeks to maintain uniform trade practices and principles in production/sale of package bees and queens. Annual meeting.

American Beekeeping Federation, 13637 Northwest 39th Avenue, Gainesville, FL 32606. 904–322–0012. Frank Robinson, Secretary/Treasurer. Eighteen hundred members include commercial/avocational beekeepers, suppliers, bottlers, and packers. Sponsors educational services, workshops, conferences, and contests. Provides bimonthly newsletter, membership directory, and classifieds. Ladies' Auxiliary has annual meeting.

American Honey Producers Association, Box 368, Minco, OK 73059. 405–352–4126. Glenn Gibson, President. Six hundred members include commercial/avocational beekeepers. Lobby to represent beekeepers in agricultural research or Federal programs.

Apiary Inspectors of America. Eighty-five members include State/provincial apiarists, researchers, and individuals. Active in research meetings and publishes newsletter. Contact Mr. I. Barton Smith Jr., Maryland Department of Agriculture, Plant Protection Section, 50 Harry S. Truman Parkway, Annapolis, MD 21401. 401–841–5920.

Bee Industries Association, 102 Broadway, Hamilton, IL 62341. 217–847–3324. C.C. Dadant, Secretary. Twenty members are manufacturers of wooden beehives and supplies. Sponsors annual convention.

Eastern Apicultural Society of North America, c/o Liz Rodrigues, 157 Five Point Road, Colt Neck, NJ 07722. 201–462–4591. EASNA has 1,600 members including hobbyists, honey producers, honey packers, and equipment manufacturers. Provides educational services, conferences, and a quarterly journal.

North American Apiotherapy Society, 15621 Aitcheson Lane, Laurel, MD 20707. 301–253–5313. Members include beekeepers, scientists, physicians, and others interested in therapeutic use of honeybee products. Information dissemination, quarterly newsletter, and annual symposium.

Western Apicultural Society of North America, 13 Alder Street, Apt. B, P.O. Box 681, Woodland, CA 95695. 916–666–4053. Ron Neese, Treasurer. WASNA has 225 members including hobbyists, honey producers, honey packers, and equipment manufacturers. Provides educational services, convention, and Western Apicultural Society Journal 4 to 5/year.

Resources

Thomas Donnelly, Delaware County Extension Service, New York State Route 10, P.O. Box 184, Hamden, NY 13782. 607–865–6531.

Dr. Malcolm T. Sanford, University of Florida, 0740 IFAS, Building 970, Gainesville, FL 32611-0740. 904–392–1801, Ext. 143.

Dr. Thomas Webster, Atwood Research Facility, Kentucky State University, Frankfort, KY 40601.

Alan White, Sullivan County Extension Service, 59 North Main Street, P.O. Box 670, Liberty, NY 12754. 914–292–6180.

USDA Research Facilities

Five USDA laboratories are studying breeding, behavior, and benefits of wild and domesticated bees.

Carl Hayden Bee Research Center, Dr. Eric H. Erickson, Entomologist, Director, 2000 East Allen Road, Tucson, AZ 85719. 602–629–6380. Studying life-style of the honeybee, how bees communicate with pheromones, visual cues and vibration, honeybee nutrition, and the effect of toxins on bees.

Bee Breeding and Stock Center Laboratory, Dr. Thomas E. Rinderer, Geneticist, Research Leader, Rural Route 3, Box 82–B, Ben Hur Road, Baton Rouge, LA 70808. 504–766–6064. Research on breeding honeybees that tolerate harsh climate, disease, insects, and other hazards.

Beneficial Insects Laboratory, Dr. Hachiro Shimanuki, Microbiologist, Chief, BARC-East, Building 476, Room 200, Beltsville, MD 20705. 301–504–9100. Studies bee diseases, pests, and nutritional needs. Provides bee diagnostic services.

Bee Biology and Systematics Laboratory, Dr. Franklin D. Parker, Entomologist, Research Leader, Utah State University, UMC53, Logan, UT 84322. 801–750–2525. Research involves alternatives to honeybees as pollinators, and wild bees.

Honey Bee Research, Dr. William T. Wilson, Entomologist, Research Leader, P.O. Box 267, Weslaco, TX 78596. 512–968–3159. Studies mites that infest breathing tubes of honeybees. Designs mite control measures and tracks spread of mites.

Sources of Bee Supplies

The A. I. Root Company, P.O. Box 706, Medina, OH 44258–0706. 800–289–7668.

Brushy Mountain Bee Farm, Inc., Route 1, Box 135, Moravian Falls, NC 28654. 800–233–7929.

Dadant & Sons, Inc., 161 Tillman Street, P.O. Box 397, Hahira, GA, 31632–0397. 912–794–2785.

Dadant & Sons, Inc., 190 Mary Street, Umatilla, FL 32784. 904–669–2622.

Rossman Apiaries, Inc., P.O. Box 905, Moultrie, GA 31776. 800–333–7677.

The Walter T. Kelley Company, Clarkson, KY 42726. 502–242–2012.