

Introduction

This study will give a brief overview of the honey industry for the state of Ohio as well as the US as a whole. It will also evaluate the market and economic data for the production of honey in managed hives and give a synopsis of management costs associated with beekeeping.

Currently the United States is a net importer of honey. Approximately one third of the nation's honey supply comes from other countries including China, Argentina, Canada, India, Brazil and others. The US produces about 200,000,000 pounds and processes over 300,000,000 pounds annually. The US per capita consumption of honey is 1.3 pounds.

In 2004 Ohio had approximately 16,000 honey producing colonies averaging 58 pounds of honey each, ranking 27th in the nation for production. The top five producing states included ND, SD, FL, CA, and MT. Honey production is high in these states is due to the large amounts of open pasture/grazing land planted in clover and alfalfa. The other situation that allows for large honey production includes vast amounts of flowering vegetable and fruit plants. Honeybees are needed for the pollination of these commodities. Many beekeepers transport their hives to and from different areas to take advantage of nectar and pollen sources, thus giving them increased honey production.

With millions of fruit, vegetable, oilseed, and legume crops dependent on the honeybee for pollination, a 1999 Cornell University study concluded that the direct value of honeybee pollination to agricultural crops in the US is \$14.6 billion annually. The USDA estimates that the honeybee accounts for 80 percent of insect crop pollination. Approximately one-third of the total human diet is derived directly and indirectly from insect-pollinated plants. *Source: National Honey Board, June 2005.*

The honeybee industry in the state of Ohio has undergone dramatic changes over the course of the last two decades. In the mid 1980's two new species of predaceous mites found their way to and established themselves in the U.S. Due to these new species of mites approximately 90% of the honeybee colonies in the state were destroyed at this time. Ohio, as well as the rest of the nation, has lost nearly all of their wild honeybee colonies, leaving only managed colonies for the state's honey production and pollination services.

Bees and Hive Management

A strong colony of honeybees should contain 30,000-60,000 bees including one queen, 500-1,000 drone (male) bees for reproduction, and the rest worker (female) bees for foraging and raising young bees. The key to keeping a strong colony is being free of disease and mites, providing enough space for the queen to reproduce and workers to make honey, and finally an ample supply of pollen and nectar for manufacturing honey.

Bees need approximately two million flowers to produce a pound of honey. The honeybee will travel as far as 5 miles to forage for food. The main sources of nectar and pollen for honey production in the state of Ohio are clover, wildflowers, soybeans,

basswood trees, and alfalfa. Typically what you will find is that hobbyist beekeepers will market their honey as wildflower honey, and major honey packers will either call it blended or clover honey.

Bees produce honey by gathering the nectar from flowers near the hive. Worker bees deposit nectar into honeycomb cells while other workers evaporate excess water from the nectar by rapid wing movement to produce ventilation. Once the moisture becomes 18 percent or less in the nectar cells, it is called honey and cells are capped off with wax. Pollen is also transported back to the hive from floral sources and is used in the brood cells as a major source of protein and vitamins for the young bee larvae.

Bees do not produce honey during the winter months. The colony numbers die off significantly, but the queen continues to lay eggs (brood) and produce young bees. During the winter months the bees eat a supply of surplus honey within the hive to survive. Beehives should be left with approximately 60 pounds of honey over the winter to accommodate this hibernation. Otherwise sugar syrup feeding will be necessary.

Honeybee hive management issues include keeping them disease and mite free; guarding the hive from external predators; and maintaining or increasing bee population and honey production. Disease and predators can be managed with proper hive inspections and approved treatments. A few common practices for increasing population and honey production include:

1. Weekly or bi-weekly hive inspections during the spring, summer, and early fall.
2. Inspection on warm, sunny days above 50 degrees in the winter months. It is necessary to check them in the winter months, weather permitting, to be sure the bees have enough reserve food to stay alive until spring.
3. Place hives facing the front entrance in the southern direction three or more feet apart.
4. Be sure there is a water source nearby.
5. Prepare hives for wintering, i.e. feeding if necessary, entrance reducers, wind protection, ventilation, removing queen excluders.

Equipment

Necessary hive equipment includes:

1. Cement Blocks: two each to elevate the hive
2. Bottom Board: protects the hive from external predators
3. Brood Chamber Box and Frames (Deep Super): two each where the queen lays eggs and workers rear the young
4. Queen Excluder: keeps the queen in the brood chambers and from entering the honey supers
5. Honey Super and Frames: contains cells where the bees deposit honey
6. Comb Honey Kit: place for the bees to construct comb honey that can be removed for sale
7. Inner Cover: protects the top cover from sticking to the boxes
8. Telescopic Top Cover: allows for ventilation so moisture can escape

9. Protective Clothing: gloves, hat and veil, jacket
10. Smoker: calms bees when inspecting hives
11. Hive Tool: used for scraping burr comb and excess honey that may stick boxes together, used to help remove frames for inspection
12. Bees: 2 pounds of Italian species is best for start-up hives

Necessary honey extraction equipment includes:

1. Uncapping Knife: heated knife for cutting off wax cappings on the comb of honey
2. Uncapping Tank: container for cappings to fall into, a screen catches the cappings and the residual honey drips down to the bottom
3. Extractor: drum containing a rotating wire basket where uncapped comb frames are placed and spun to remove the honey from the comb; honey is flung to the sides and then drains out the bottom
4. Strainer: attached to the bottom of the extractor to filter debris
5. Storage Tank: stores honey until it is ready for bottling

Honey Extraction

Honeybees generally produce more honey than the colony needs to survive. Average production of a good colony is 80 pounds of surplus each year. Strong hives with ample floral sources and good management can produce excess in the 150-pound range.

To harvest the honey, bees can be forced from the hive with a natural fumigant or you could wait until the bees are out foraging for the day. Frames are removed from the boxes and uncapped with the heated knife. Cappings are allowed to drip through a screen to catch wax while the residual honey collects in the bottom of the container.

Frames are then placed in an extractor (a centrifuge-type apparatus) and spun so the honey can drip to the bottom of the tank, pass through a filter and then collect into a storage tank. Honey can then be placed into 55-gallon drums and transported to a honey packer or kept to bottle for local retail sales.

Honey extraction usually begins at the end of July or beginning of August and goes on through October for large Ohio operations. There are first and second rounds of honey that can be taken off the hives. The main honey flow begins in June, which can be harvested at the end of July as previously stated. This main honey flow usually ends mid-August, which is when the peak extraction period begins. Honey is continually taken off in September and new boxes and frames can be added for the secondary honey flow of the season. This is due to a new round of forages coming into bloom throughout the state. The secondary honey flow is then harvested in October.

Market Analysis

Price and Economic Potential

At the forefront of this study the purpose of the investigation was to explore the possibility of increasing honey production in the state of Ohio in order to supply all or

part of the honey processed at an Ohio packing facility. The study found that a majority of their honey was coming from other countries, which has caused some problems for the company due to honey quality issues.

2004 USDA NASS indicates that there were 16,000 honeybee colonies in the state of Ohio with an average yield of 58 pounds of honey per colony. That brings the total honey production in the state to 928,000 pounds.

The price of honey has fallen from 2003 to 2004 by 22 percent. Prices are based on retail sales to cooperatives and private processors. State level honey prices reflect the portions of honey sold through retail, coop, and private channels. U.S. honey prices for each color class are derived by weighing quantities sold for each marketing channel at the U.S. level (Source: USDA National Agricultural Statistics Service).

Average price per pound of honey in Ohio was estimated at \$1.50. This brings the total economic value to \$1,392,000.

With honey termed as a “spot commodity” by the industry, larger packers have been purchasing honey steadily at \$0.80 per pound; 53 percent lower than the state average. Many hobbyist beekeepers are able to sell their raw, unprocessed honey for \$1.50-2.50 pound. This significantly adjusts the state average when looking at the price of honey as a commodity at \$0.80.

Fifteen million pounds of honey are purchased annually for processing at an Ohio facility. The honey is sourced from all over the world, however some is domestic and even local. A large beekeeper in NW Ohio produces 120,000 pounds of honey from 800 hives to supply the facility. The hives in their operation generally do better than the state average, producing about 150 pounds of honey per hive. This production has been steady over the past five to seven years.

In order to meet the demand for 15 million pounds or more, the state would need 100,000 hives producing 150+ pounds of honey to accommodate the packing and processing at the Ohio facility. This would best be done in rural areas with about 25 hives per location for a total of 4,000 bee yards. Thus bringing \$12 million in economic value ($\$0.80 \times 15,000,000$ pounds) back to the state of Ohio.

Another option of economic potential is renting honeybee hives for pollination purposes. Locally fruit and vegetable producers may need bees for pollination services in their crop fields. While this can be a source of supplemental income during the honey-producing season, another option would be to send hives to California for the almond crop pollination.

Almond pollination is late January through mid March. There are several ways you can do this. Most beekeepers located long distances from California have managers in California run their bees in the Almond groves. Beekeepers can either ship their bees to California in the fall (October or November) or send them out when pollination starts in

late January, early February. If bees are sent in the fall, the handler gets 30% of the pollination fee, if they are sent in January or February the handler gets 15% of the pollination fee. Historically when it was not difficult for almond growers to get the number of needed colonies for pollination the fee has been around \$40.00 to \$50.00 per hive. With the increased demand, the fees have ballooned to around \$100.00 to \$150.00 per hive. With a 1000 colony operation and sending half for pollination, that gives an additional \$50-75,000 in gross annual income. The cost to ship a semi-load (approximately 500 hives) is about \$12,000; cost for shipping pallets is estimated at \$3,500, resulting in a net of \$34,500-\$59,500.

An example of pollination service practices used by an Ohio beekeeper: *“What we are doing to have bees for pollination is this: We have been running 800 hives in Ohio for honey production. We are still running our hives for honey production and doing all the necessary work in preparation for production, but then after the production year is finished, we do our feeding and medicating like normal as though we would be overwintering. Then we make sure the hives are on moving pallets, congregate them into a few locations and load them up on a semi for California. Some beekeepers have made divides for pollination, but I believe the best way to benefit from these pollination prices is to continue to produce a good crop of honey and then supplement your income with Almond pollination. When Almond pollination is over they will come back to us, unless we had another beekeeper run them for us on shares in their part of the country.”*

Costs

Investment Needed for 1,000 Colony Operation (taken from UC Davis Small Farm Center)

1. Hive equipment - \$113,655 (with optional equipment) - \$95,330 (without optional equipment)

- 1,000 bottom boards @ \$8 each = \$8,000
- 1,000 covers @ \$8 each = \$8,000
- 2,000 deep boxes @ \$12 each = \$24,000
- 20,000 deep frames @ \$0.35-0.65 each = \$10,000
- 20,000 deep foundations @ \$0.06 each = \$1,200
- 1,000 medium depth boxes @ \$8 each = \$8,000
- 10,000 medium depth frames @ \$0.40 each = \$4,000
- 10,000 medium depth foundation @ \$0.40 each = \$4,000
- 100,000 frame eyelets @ \$2/1,000 = \$200
- 2,000 queen excluders (optional) \$9 each = \$18,000
- 6,000 metal rabbets @ \$0.08 each = \$480
- 50 fumes boards @ \$9 each = \$450
- 1 bee blower (optional) @ \$325 each = \$325
- 75 gallons of paint @ \$16-21/gal = \$1,500
- staple gun and compressor = \$500
- 1,000 packages of bees @ \$25 each = \$25,000

2. Honey Handling Equipment - \$36,505 (high end with optional and bottling equipment) - \$7,200 (low end without optional or bottling equipment)

- automatic uncapper = \$1,700-3,000

- frame conveyor = \$600
 - conveyor drip pan = \$250
 - cappings melter = \$1,000-2,000
 - extractor = \$1,900-7,800
 - settling tanks = \$170-250 each
 - spin float (replaces melter) = \$3,300
 - honey sump = \$325-800
 - honey pump = \$170-190
 - flash heater (optional) = \$1,000
 - barrels (each) = \$16 new/\$8 used
 - barrel truck = \$160-250
 - hand truck = \$125-525
 - glass jars (if not selling bulk) = \$17,300
 - bottling equipment (if not selling bulk) = \$940
- 3. Vehicles - \$38,000 – 28,600**
- flat bed trucks = \$1,600-1,800
 - bee booms (each) = \$2,500
 - forklifts = \$16,000-18,000 (new); \$8,000-10,000 (used)
 - pickups = \$14,000
- 4. Warehouse - \$6,000**
- 5. Land @ \$3,000/ac = \$20,000**
- 6. Labor - \$43,040** (1 full and 8 part time based on Ohio beekeeper operation mentioned above)
- self = \$30,000
 - help (full time) = \$20,000 each
 - help (part time) = \$1,630 each
 - See *Appendix A* for a comprehensive list of hours and tasks
- 7. Overhead - \$15,400**
- utilities = \$2,400
 - insurance = variable
 - workman's compensation, health insurance = \$13,000

Totals: **1)** \$139,530 (low end without land, labor or insurance costs)
 2) \$215,570 (low end with land, labor and insurance costs)

1,000 hives averaging 150 pounds of honey per hive
@ approximately \$0.80 per pound = \$120,000 gross

Year 1	Low1	Low2
	-\$139,530	-\$215,570
	+\$120,000	+\$120,000
	- \$ 19,530	-\$ 95,570

Year 2 -\$ 64,440 (warehouse, labor, and overhead costs)
 +\$120,000

+\$ 55,560 (taking into consideration that there is no need to purchase
equipment, vehicles, or land)

Gives you a two year NET of \$36,030

Potential and Conclusion

The costs associated with starting honeybee colonies for wholesale honey production are not economically feasible to the average farmer looking to diversify his operation. There is a significant amount of economic investment that would require funding sources of some type. A small hobby beekeeper start-up would be significantly less at approximately \$1,200 for three hives.

If a cooperative were formed to help absorb some of the equipment and overhead costs, and a guaranteed market were available, a smaller operation could be manageable. Factoring in only hive and equipment costs, you are looking at a total investment of approximately \$103,000. Assuming 1,000 hives produce 150 pounds of honey to be sold at \$0.80 per pound, this gives a net profit of \$17,000. Having to split that amount between multiple individuals is not economically appealing.

Appendix A: Beekeeping Operation Labor Estimate

1000 hives - an estimate to the amount of time for manual labor. This is a best estimate of work. Behind the scenes there is a lot of planning, honey marketing (August – November), legal and book work.

January: 1 employee ~ 160 hours

Repair boxes: 2 weeks – carpentry work
Check hives: 4 days – pick up dead hives, feed hives (dry sugar) - field work
Misc repairs: 2 days – maintenance work

February: 1.5 employees ~ 225 hours

Clean equipment: 2 weeks – clean up dead hives, sort combs, paint boxes and prepare for new hives – inside field work
Check hives: 3 days – pick up new dead, feed hives (dry sugar) - field work
Misc. repairs: 2 days – maintenance work

March: 2 employees ~ 200 hours

Clean equipment: 1 week – clean up dead hives, sort, prepare - inside field work
Check hives: 1 week – feed hives (syrup, dry sugar, medicate) equalize brood

April: 2 employees ~ 400 hours

Beework: 3 weeks – feed hives (syrup, medication), make divides (new hives), put on first round of honey supers
Clean up: 1 week – support work for beehive activity

May:	2 employees ~ 400 hours
Beework:	3 weeks – feed hives (syrup), make divides, continue to add honey supers – bees are covered a couple of times
Clean up:	1 week – support work for beehive activity
June:	2 employees ~ 400 hours
Beework:	3 weeks – transfer divides, finish filling locations, continue to add honey supers as needed (start of primary honey flow) – bees are covered a couple of times
Extract preparation:	3 days – final preparation of extract equipment, make repairs, clean equipment, grease equipment
Maintenance:	2 days – maintenance work as needed
July:	3.5 employees ~ 660 hours
Beework:	4 weeks – Add honey supers as needed (center of primary honey flow, bees are very strong), go over all hives a couple of times, at end of month begin to take off first round of honey
Maintenance:	2 days – Maintenance work as needed
August:	7 employees ~ 1200 hours
Beework:	4 weeks – Take off honey, add honey supers (bees are at peak strength, main honey flow usually ends mid August) – this is peak harvest season
Extraction:	4 weeks – Honey extraction nearly every day (must extract to keep ahead of honey pulling, combs must be extracted quickly to avoid hive beetle larvae from inhabiting honey combs)
September:	5 employees ~ 800 hours
Beework:	4 weeks – Take off honey, add honey supers for secondary honey flow, begin medication, may need to start feeding
Extraction:	2 weeks – Honey extraction will continue, but slow down
October:	2.5 employees ~ 500 hours
Beework:	4 weeks – take off last of honey, heavy feeding month (syrup, medication, dry sugar)
Clean up:	1 week – Clean up in building after extracting
November:	2 employees ~ 400 hours
Beework:	3 weeks – Finish feeding (syrup, dry sugar, medication), prepare hives for winter (put on insulation pads, wraps where necessary, mouse guards, pass out beeyard rent)
Clean up:	1 week – Clean up extracting equipment, building, organize equipment
December:	2 employees ~ 375 hours

Melt Wax: 1 week – Melt wax from honey production, clean up melting equipment
Repair boxes: 2 weeks – Sort and repair hive boxes, put together new equipment
Clean building: 3 days – Continue to do miscellaneous cleaning

References:

Mussen, Eric. (1994). Starting a Small Beekeeping Operation. Small Farm News [On-line]. Available: <http://www.sfc.ucdavis.edu/pubs/SFNews/archive/94032.htm>

Wenning, Carl, J. (2001). Profitable Beekeeping. American Bee Journal, 141(3), 167-170 [On-line]. Available: <http://www.nhb.org/articles/profbk.html>

Tew, James, E. Some Ohio Nectar and Pollen Producing Plants: Both Major and Minor Sources [On-line]. Available: <http://beelab.osu.edu/factsheets/sheets/2168.html>

Ohio Department of Agriculture Division of Plant Industry – Apiary Section
<http://www.ohioagriculture.gov/plant/curr/ap/plnt-ap-index.stm>

The Ohio State University OARDC Honeybee Lab
www.beelab.osu.edu

USDA Agricultural Marketing Service National Honey Report
<http://marketnews.usda.gov/portal/fv/honey>

USDA National Statistics Service
<http://www.nass.usda.gov/oh/sm0405.txt>

National Honey Board
www.honey.com
www.nhb.org

American Beekeeping Federation
www.abfnet.org

American Honey Producers Association
www.americanhoneyproducers.org

Ohio State Beekeepers Association
<http://www.osba.us/>

Bee Culture Magazine
www.beeculture.com

American Bee Journal
www.dadant.com/journal/

Dadant & Son's, Inc.
www.dadant.com

Walter T. Kelley
<http://www.kelleybees.com/>

Mann Lake Ltd.
www.mannlakeltd.com

Simpson's Bee Supply
<http://www.simpsonsbeesupply.com/>

eBeeHoney.com
www.ebeehoney.com

Buckeye Bee Basic Beekeeping Course
www.buckeyebee.com

GoBeeKeeping.com
www.gobeekeeping.com