

Economic Contributions of the **FLORIDA BEEKEEPING INDUSTRY IN 2020**



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Photo credit: World Honey Market.

EXECUTIVE SUMMARY

This study was commissioned to assess the economic contributions of the beekeeping industry in Florida to increase public awareness of the industry and inform decision-making related to beekeeping in the state.

An internet survey of registered Florida beekeepers was conducted in the last quarter of 2021 with survey questionnaires distributed by email to 4,671 beekeepers. The Florida Department of Agriculture and Consumer Services-Apiary Inspection Service had 4,865 active registered beekeepers in the state in 2021, reporting an inventory of 677,000 honey bee colonies in all Florida counties and 32 other states. Valid survey responses received from 1,206 beekeepers represented a 25.8% response rate. The survey gathered information for the previous year (2020) on beekeeper experience, number of honey bee colonies managed, interstate movement of colonies, quantity produced and price received for honey bee products, quantity and price of pollination services for crops in Florida and other states, employment, annual revenues, operating expenditures, capital investments, bartering arrangements, colony losses, effects of the COVID-19 pandemic, and threats to the beekeeping industry. Data reported by survey respondents were used to extrapolate values for the full population of registered beekeepers across five operator size classes, referred to in the report as “expanded” or “estimated” results.

Surveyed Florida beekeepers reported a total of 173,000 honey bee colonies during peak season (warm months) and 97,000 colonies during non-peak season (cool months) in 2020. Over 59 percent of respondents reported having less than 10 colonies, 24 percent had 10 to 99 colonies, 4.9 percent had 100 to 999 colonies, 2.7 percent had 1,000 to 9,999 colonies, 0.2 percent had over 10,000 colonies, and 9.1 percent did not report the number of colonies. When expanded to the population of registered Florida beekeepers, it was estimated that there were over 650,000 colonies during peak season and nearly 400,000 colonies during non-peak season.

Surveyed beekeepers reported an average of 7.8 years of experience in beekeeping, with over 70 percent having less than ten years of experience, and 5 percent with 30 or more years of experience.

A small share (3.7%) of mainly large beekeepers reported moving colonies between Florida and other states for honey production or pollination services, including movements to and from California, Georgia, New York, Wisconsin, Alabama, and Michigan. An estimated 310,000 colonies, or 48 percent of all Florida colonies, were moved between Florida and other states. Migratory beekeeping operations, some based in other states, reported staying in Florida for an average of 24 weeks during the cooler months.

An estimated 92,000 honey bee colonies were used for crop pollination services in Florida on crops such as blueberry, watermelon, and specialty citrus, while 217,000 colonies were used for pollination in other states on crops including almond, blueberry, cranberry, and watermelon.

In 2020, Florida beekeepers produced an estimated 15.0 million pounds of honey, 102,000 pounds of comb honey, and 300,000 pounds of beeswax, as well as packaged bees, queens, complete hives and nucs, and various other minor products. Weighted average prices received for honey, comb honey, and beeswax products were \$2.58, \$11.11, and \$4.62 per pound, respectively, and average prices received were \$127 for packaged bees, \$24.61 for queens, and \$188 for complete hives and nucs.

About 56 percent of honey was marketed through wholesale honey packers, while 12 percent was marketed through roadside stands or farmers markets by small beekeepers, and the remaining one-third of products was marketed through other outlets. About 36 percent of honey bee products were sold to markets outside of Florida.

Employment in the Florida beekeeping industry in 2020 was estimated at 2,437 workers during peak season and 1,544 workers during non-peak season, or a simple average midpoint value of 1,990 workers.

Total revenues for Florida beekeeping operations in 2020 were estimated at \$93.36 million, including \$60.35 million for sales of honey bee products and \$33.29 million for crop pollination services. Some \$51.63 million in revenues was received for products and services produced in Florida, and \$42.01 million produced in other states.

Operating expenses were reported in 21 categories representing labor, materials, and overhead. The largest individual expense category was labor, representing 24.8 percent of total operating costs, followed by freight/shipping (10.7%), depreciation (9.8%), packaged bees and queens (9.7%), supplemental feed (8.2%), hive components, repairs and tools (7.8%), and repairs and maintenance of equipment (7.0%) and of buildings (7.0%). Because of the small sample size reporting detailed operating expenses, it was not possible to estimate total industry expenditures with this information alone; however, expenditure information was used to allocate annual revenues to various industry sectors for economic contribution analysis. Capital investments by Florida beekeepers in 2020 for hives and woodenware, equipment, buildings, and other assets were estimated at \$17.07 million.

Beekeepers reported significant losses of honey bee colonies in 2020, including 40 percent of respondents who lost at least 40 percent of colonies, and 10 percent who had complete losses (100%). The most commonly reported causes of colony loss were queen failure (26% of respondents), *Varroa destructor* (18%), and other pests and parasites (24%). Threats to the Florida beekeeping industry that were rated as “extremely important” to address included colony losses to pests and diseases (78% of respondents), pesticide exposure and honey contamination (65%), resistance to pesticides for mite control (55%), and adulteration of honey with other sweeteners (52%). Some commercial beekeepers reported various effects of the COVID-19 pandemic on their beekeeping operations during 2020-21, such as decreased revenues, increased costs,

illness, and difficulty finding employees; however, 44 percent of all respondents reported that their operations were not affected by the COVID-19 pandemic.

Besides commercial beekeepers, many small or hobbyist beekeepers who do not sell products or services keep bees purely for enjoyment or pollination of their own gardens. About 17 percent of all surveyed beekeepers reported engaging in bartering, i.e. trading of honey bee products or pollination services to others without monetary compensation.

The value of increased agricultural crop production attributed to honey bee pollination services was estimated based on the number of colonies used for each crop, together with information from other sources on average crop yields and prices, typical stocking rates (colonies per acre), and percent increase in yield attributable to pollination services. In Florida, pollination services on 36,000 acres of specialty crops generated increased production valued at \$237 million, and in other states pollination services by Florida beekeepers on 90,000 acres accounted for \$514 million in crop production value, notably for crops of almond, apple, cranberry, blueberry, and watermelon. Note that the increased crop production value attributed to honey bee pollination was not considered strictly part of the economic contributions of the beekeeping industry because these benefits accrue to crop producers.

The economic contributions of the beekeeping industry were evaluated using extrapolated estimates of in-state revenues, employment, and capital investment from the survey together with a regional economic model for Florida developed with the IMPLAN[®] software and associated model data for 2019. Such models account for activity generated in other sectors of the economy due to supply chain purchases and employee household spending, known as indirect and induced multiplier effects. The overall economic contributions of beekeeping operations and investment in Florida in 2020 were estimated at 2,303 fulltime and part-time jobs, \$24.11 million in labor income (employee wages, benefits and proprietor income), \$41.86 million in value added from total personal and business income (equivalent to Gross Domestic Product or Gross State Product), \$80.75 million in output or industry revenues, and \$8.53 million in local, state, and federal government taxes. These are independent measures and should not be added together.

Compared to a previous study for the Florida beekeeping industry in 1999, the current study for 2020 estimated significantly higher operating revenues (79%), and total economic contributions for output (49%), value added (53%), and employment (22%), in constant-dollar terms.

Keywords: beekeeping, honey, pollination services, economic contributions, Florida, IMPLAN.



INTRODUCTION

Management of honey bees (*Apis mellifera*) by beekeepers is an important industry in Florida because of the mild climate and abundant natural vegetation that provide an ideal environment for apiculture. The state is also the winter base for many migratory beekeepers who move colonies to Florida to work fruit and vegetable crops and forage on wild plants before moving to other states for the spring and summer months (Bustamante et al, 2019).

Trends in the Florida beekeeping industry are shown in the following charts based on information published by the United States Department of Agriculture - National Agricultural Statistics Service (USDA-NASS) in the Census of Agriculture and the Annual Honey and Annual Honey Bee Colony Surveys. Note that the Census of Agriculture, published every five years, only counts farms with at least \$1,000 in annual value of products, and the Honey Bee Colony Survey only counts operations with at least five colonies, so these statistics undercount the number of beekeepers and beekeeping revenues, but are nonetheless useful in describing trends over time. The number of beekeeping operations in Florida with inventory of colonies nearly tripled from 754 in 2002 to 2,124 in 2017, while the number of operations with production more than doubled from 683 to 1,513 (Figure 1-1). During this period, there was also a similar dramatic increase in the number of producing operations in the United States (U.S.), from 12,029 to 35,829. The number of honey bee colonies in Florida during the peak period of January-March varied from around 240,000 to 300,000 over the past six years (Figure 1-2). Honey production volume in Florida declined from 13.8 million pounds in 2010 to around 8.83 million pounds in 2020, representing a decrease of 36 percent (Figure 1-3). The value of honey production rose to a peak of \$30.6 million in 2014, then declined to around \$20 million in 2020 (Figure 1-4). Honey yields per colony have declined steadily from 69 pounds in 2010 to 46 pounds in 2020, a 33 percent decrease (Figure 1-5). Average prices received for honey by Florida producers reached \$2.28 per pound in 2020, an increase of 46 percent in nominal dollar terms, which partly offset the decrease in yields and production (Figure 1-6).

Florida is a leading honey producing state in the U.S., along with the states of California, North Dakota, and South Dakota. Honey production in Florida in 2020 represented 6.4 percent of total U.S. production (150 million pounds), and 7.0 percent of total value (\$320 million). Most honey produced in Florida is marketed through packing houses or cooperatives located outside the state or packaged on-farm and sold at local supermarkets, farmers' markets, and roadside stands. Other honey bee products that are marketed by producers include beeswax, propolis, royal jelly, pollen, packaged bees, queens, and complete colonies or small hives (nucs) shipped to other beekeepers.

In addition to honey bee products, the beekeeping industry in Florida provides the critical service of pollinating many important crops, including specialty citrus, blueberry, strawberry, cucumber, squash, watermelon, and avocado,



Beekeeper inspecting colonies at UF/IFAS Honey Bee Research and Extension Laboratory. Photo by: UF/IFAS.



Worker bee pollinating orange blossom. Photo by: UF/IFAS.



Historic photo of beekeeping in Florida. Photo by: UF/IFAS File Photo.



Retail store display of honey and other honey bee products. Photo by: Hani Honey Company.



Migratory beekeeping operation. Photo by: UF-HBREL.



Modern Honey Facility, UF/IFAS Honey Bee Research and Extension Laboratory. Photo by: Amy Vu, UF-HBREL.

and notably almonds in California (Bond et al, 2021). Beekeepers rent their honey bee colonies to growers for a period of several weeks or months, depending upon the time of year, the number of honey bee colonies required to pollinate the crop, and the amount of honey production expected from the crop and other nearby nectar sources. Honey bees are generalist pollinators, able to adapt to a wide variety of plant species. Honey bee pollination is responsible for increased yields of many dependent crops. Various researchers estimated the economic value of honey bee pollination services in the U.S. widely ranging from \$1.6-\$8.3 billion (Southwick and Southwick, 1992), \$14.6 billion (Morse and Calderone, 2020), \$17 billion (Calderone, 2012), and up to \$18 billion (Levin, 1983). The wide range of values estimated reflects uncertainties about yield effects for different crops, the degree of dependence on honey bee pollination, the decline in honey bee and other pollinator populations, and the degree to which other natural pollinators, such as wild bees, wasps, and bats, might act as alternative pollinators in the absence of honey bees. There is a need for better information about the broad economic contributions of the beekeeping industry to inform decision-making related to the support and regulation of the industry.

Numerous threats confront the continued economic viability of the Florida beekeeping industry. Costs of honey bee colony management and honey production continue to rise, reducing net returns to beekeepers. World honey prices grew dramatically during the 1970s, increasing foreign competition to U.S. beekeepers. The labor-intensive nature of honey production gives developing nations a comparative advantage in honey production, often resulting in lower prices for imported honey than for domestically produced honey. Adulteration of honey by cheaper sweeteners such as high fructose corn syrup erodes markets for honey and damages public perceptions of honey as a pure, natural, and healthful product.

Pesticide exposure in honey bees from commercial agriculture and urban landscape management impairs the reproductive success of honey bee colonies (Ingram et al., 1996). Urbanization has decreased the viability of locating bee colonies in Florida during the winter season as available sources of nectar are being lost (Ingram et al., 1996).

The parasite *Varroa destructor* has severely impacted the beekeeping industry, causing decline or death of infested colonies. There is concern that this could lead to a shortage of pollinators for crops. It is standard practice to treat infested colonies with miticides (amitraz, fluvalinate, formic acid, oxalic acid, etc.) to control *Varroa*, which increases management costs. Use of pesticides in honey bee colonies has raised concerns about possible contamination of honey bee products. Colony Collapse Disorder is a complex condition associated with unexplained decline and death of large numbers of honey bee colonies that emerged within the past 20 years, and has been linked to multiple possible causes (Ellis et al, 2010).

The beekeeping industry of Florida has suffered a high number of business shutdowns and beekeeper retirements over the years. In the past, beekeeping attracted

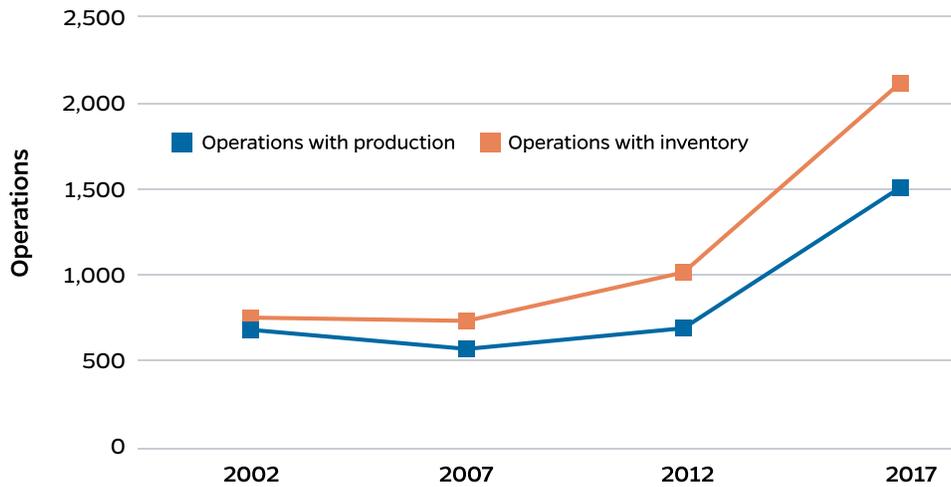


Figure 1-1. Trend in number of Florida honey bee operations, 2002-17.
Source: USDA-NASS, Census of Agriculture.

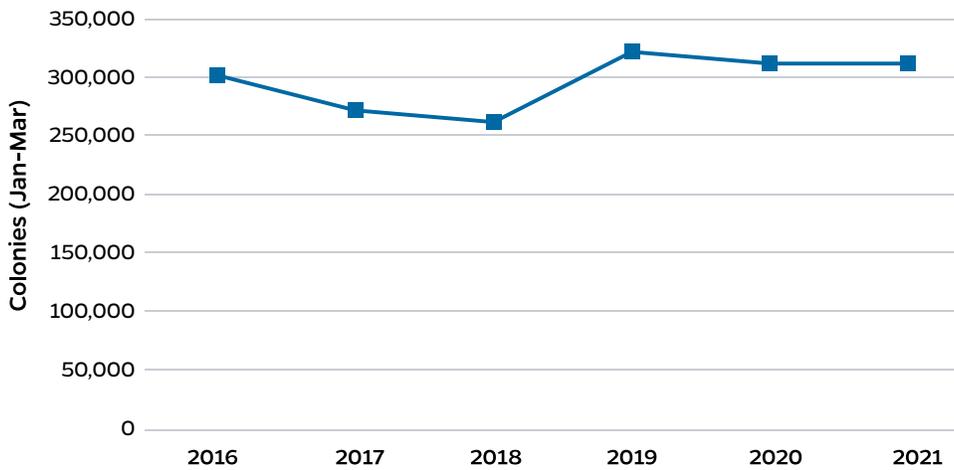


Figure 1-2. Trend in number of honey bee colonies in Florida, 2016-2021.
Source: USDA-NASS, Annual Honey Bee Colony Survey.

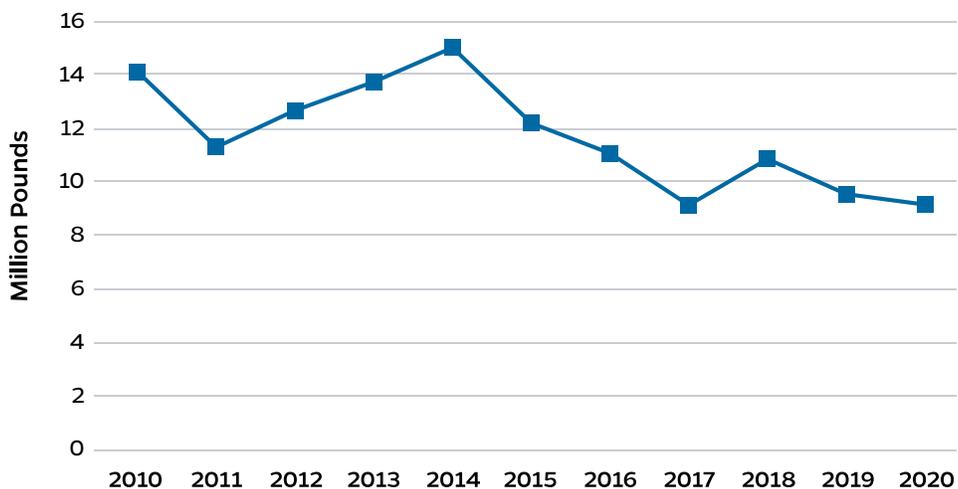


Figure 1-3. Trend in Florida honey production quantity, 2010-20.
Source: USDA-NASS, Annual Honey Survey.

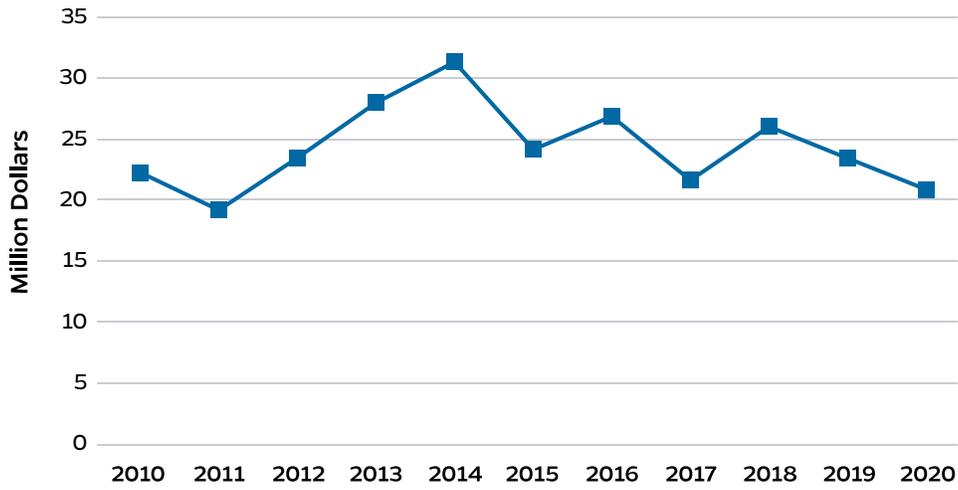


Figure 1-4. Trend in Florida honey production value, 2010-20.
 Source: USDA-NASS, Annual Honey Survey.

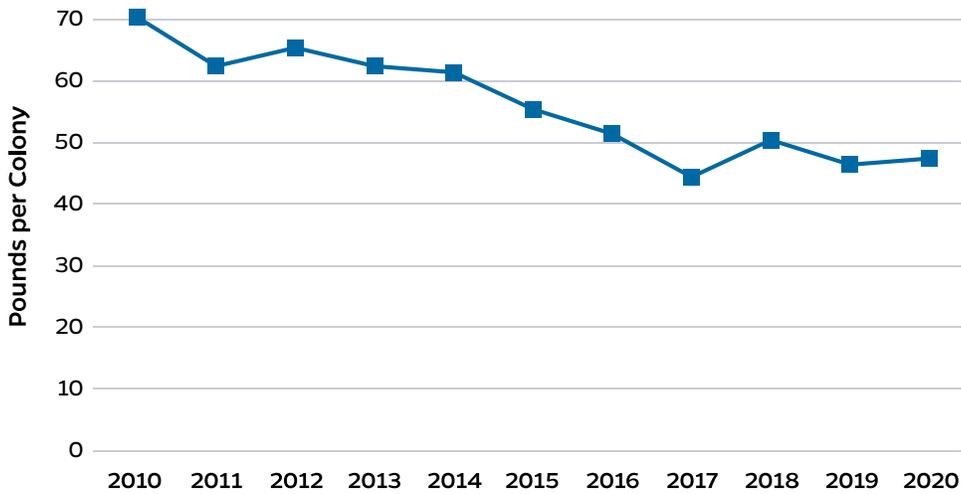


Figure 1-5. Trend in average Florida honey yield, 2010-20.
 Source: USDA-NASS, Annual Honey Survey.

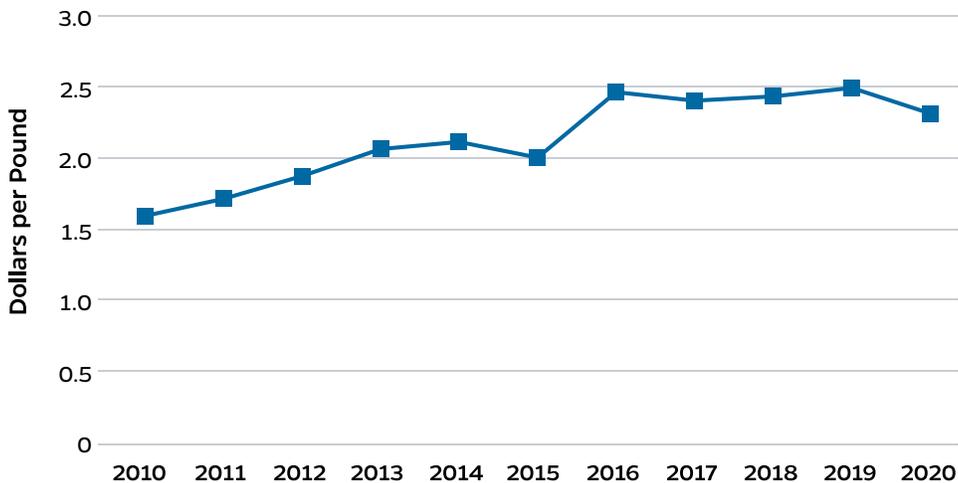


Figure 1-6. Trend in average price received for Florida honey, 2010-20.
 Source: USDA-NASS, Annual Honey Survey.



entrepreneurs because of its low entry costs relative to other agricultural operations. However, the low returns associated with beekeeping coupled with natural and market-related threats have limited the ability to recruit new beekeepers. The U.S. government eliminated honey loan programs beginning fiscal year 1994, which had been in existence since 1950 (Johnson and Ortego, 1996).

A previous economic study of the Florida beekeeping industry documented values in the year 1999, including total revenues of \$17.6 million for honey bee products and \$1.9 million for pollination services in the state, which had economic impacts of 806 jobs and \$30.5 million in output (Hodges et al, 2001). In addition, the study estimated that honey bee pollination of fruit and vegetable crops increased production value by \$26.4 million.

This project sought to provide an updated assessment of the economic contributions of the beekeeping industry to the State of Florida. Specifically, this project addresses the following objectives:

- Conduct a statewide survey of Florida beekeepers to document production of and revenues from the sale of honey bee products and pollination services as well as employment, production costs, and investment.

- Document characteristics of Florida beekeeping operations in terms of number of colonies managed and interstate movement of colonies.
- Document causes of honey bee colony loss in Florida and threats to the industry.
- Estimate the economic contributions of the beekeeping industry to the State of Florida in terms of employment, labor income, value added, output, and taxes, using a regional economic model that captures the multiplier effects of industry supply chain activity and employee household spending.
- Determine the marginal value of honey bee pollination services for major crops in Florida and other states where Florida beekeepers operate.

Photo credit: Bee Serious, LLC.



METHODOLOGY

Beekeeper Survey

Primary data for this project were gathered through a statewide survey of registered beekeepers conducted via the internet in the last quarter of 2021. The survey questionnaire was developed in consultation with industry experts. Information requested in the survey included the following: years of beekeeper experience, number of honey bee colonies managed during peak and non-peak seasons, other states operated in and interstate movement of colonies, production and prices of honey bee products (honey, wax, queens, packaged bees, complete hives), provision and prices of pollination services for specific specialty crops in Florida and other states, employment (peak and non-peak seasons), annual revenues, operating expenditures, capital investments, bartering arrangements (non-monetary trading), colony losses, threats to the beekeeping industry, and effects of the COVID-19 pandemic. All information collected was intended to represent beekeeping activities in the previous year, or calendar year 2020. A copy of the complete questionnaire is provided in Appendix A.

Florida had a total of 5,174 beekeepers registered with the Florida Department of Agricultural and Consumer Services-Apiary Inspection Service in August 2021, with 4,963 that were considered active, including 531 commercial operations, 186 sideline or part-time operations, and 4,215 backyard or hobbyist operations, as well as small numbers of delinquent or administrative registrants (Table 2-1). Florida beekeepers reported a total inventory of 677,431 colonies. The Florida county or other state home location of registered beekeepers is summarized in Appendix B.

The survey was distributed to 4,671 beekeepers for whom email addresses were available. Two attempts were made to contact beekeepers by email. Registered beekeepers who did not have email addresses on file with FDACS also had an opportunity to respond to the survey via anonymous links posted on UF Honey Bee Research and Extension Laboratory social media and e-mail listservs, and shared by the Florida State Beekeepers Association. The survey was administered through the *Qualtrics* software package licensed by the University of Florida. The software records responses to each question and controls the flow of survey questions, in some cases based upon previous responses, so that respondents only see questions that are pertinent to their situation. The survey protocol and questionnaire were approved by the University of Florida Institutional Review Board to assure protection of the rights of survey respondents. The survey was clearly described as voluntary and anonymous, with no compensation provided for participation. A cover letter accompanying the survey invitation emphasized the importance of the project for public understanding and support of beekeeping in Florida.

Valid responses to the survey were received from 1,206 beekeepers, with two-thirds of those fully completing the survey. The valid responses from the survey population of 4,671 represented a 25.8% response rate. About 73 percent responded to the email invitation, and 27 percent responded to an anonymous link sent out by the UF Honey Bee Research and Extension Laboratory (Table 2-2).

Data compiled from completed surveys was downloaded to spreadsheets for inspection, cleaning, and analysis. A small number of duplicate responses from the same computer IP address were discarded. Revenues for honey bee products and pollination services were taken as values reported directly by respondents, either as a specific value or the midpoint of a range, or calculated from quantities and prices reported for honey bee products and pollination services. Revenues in Florida for honey bee products and pollination services were adjusted for migratory beekeepers to account for the share of time their colonies spent in the state. Survey sample results were extrapolated to represent all active registered beekeepers in Florida, by operator size class for number of colonies, based on observed response rates, and the “expansion factors” shown in Table 2-3. For example, totals reported by large beekeepers (1,000 to 9,999 colonies) were multiplied by the expansion factor 4.727 to estimate totals for all large beekeepers.

Comments and descriptions of other items provided by survey respondents were tabulated and analyzed using a qualitative research methodology to develop key themes and subthemes (Thomas and Harden, 2008).

Table 2-1. Population of registered Florida beekeepers by business status and type, 2021.

Business Status/Type	Number Registered	Number for Survey via Email	Colony Inventory
Active	4,963	4,515	667,939
Commercial, fulltime	531	478	619,641
Sideline, part-time	186	158	14,170
Backyard	4,215	3,851	33,759
Exempt	31	28	369
Delinquent	76	65	3,533
Administrative	135	110	5,959
Total	5,174	4,690	677,431

Source: Florida registered beekeepers, Florida Department of Agriculture and Consumer Services, Apiary Inspection Service, Aug. 2021.

Table 2-2. Summary of beekeeper survey responses, 2021.

Survey Distribution Channel	Number Respondents	Percent of Respondents
Email	886	73.5%
Anonymous link	320	26.5%
Total	1,206	100%
Number contacted on email list	4,671	
Email survey response rate	25.8%	

Note that some duplicated beekeeper addresses were removed to give an effective survey population of 4,671.

Economic Contribution Analysis

Economic contributions of the beekeeping industry in Florida were evaluated with a regional economic model for the state constructed with the IMPLAN[®] Pro software and related regional data licensed from IMPLAN Group, LLC. IMPLAN[®] is an Input-Output/Social Accounting Matrix (IO/SAM) framework that enables estimation of multiplier effects for specified changes in industry output, employment, or labor income. The method accounts for the structure of a regional economy and tracks the flow of money between different industries, households, and government institutions (Miller and Blair, 2009). A premise of input-output analysis is that the structure of the economy is technologically fixed, such that a given change in the final demand, output, or employment for a particular industry or region will lead to predictable changes in other linked sectors of the economy.

The IMPLAN[®] system consists of software and database components. The database portion offers economic and sociodemographic descriptions for all U.S. counties, with 544 industry sectors, 10 household income groups, and local, state, and federal governments. In this study, 2019 data for the State of Florida was used in constructing the model. Industries are defined according to the North American Industry Classification System (NAICS) based upon the principal types of goods and services produced. Results are

available for the economic metrics of employment (fulltime and part-time jobs), output (business revenues), value added (equivalent to Gross Domestic Product), employee compensation (wages, salaries, benefits, business owner income), other property income (dividends, interest, rents, royalties, etc.), business taxes, and detailed local-state and federal government tax revenues. Results were estimated for direct, indirect, and induced multiplier effects. Direct effects represent the original activity in the sectors being analyzed, while indirect effects represent the supply chain activity of businesses providing input goods and services to production, and induced effects represent household income used for personal consumption spending by directly and indirectly supported employees.

Because beekeeping is a relatively small and specialized industry, it is not represented specifically in the economic model. Beekeeping is classified under the industry sector “Animal production except cattle, poultry and eggs”, which includes other livestock such as hogs, goats, and sheep as well as aquaculture and other various specialty animal production industries. To better fit the unique characteristics of beekeeping, the economic contribution analysis was structured as an “analysis by parts” with operating revenues and capital expenditures allocated to various IMPLAN[®] industry sectors based on a profile of operating and capital outlays reported by surveyed beekeepers as shown in Tables 2-4 and 2-5. Note that some expenditure categories were equally split into two or three industry sectors to reflect different items that were not homogeneous. The non-cash operating expenses for depreciation were not applicable for regional economic contribution analysis. Retail and wholesale trade sector expenditures were subject to margins that net out the value of intermediate commodity purchases to express values in producer price terms. Capital expenditures were discounted to account for the share of goods provided by producers in the state using local purchase coefficients (Table 2-5).

This analysis was intended to evaluate the ongoing economic activity associated with the beekeeping industry rather than treating it as a new industry, so the results are described as “economic contributions” rather than “economic impacts”, as explained by Watson et. al (2007). Following

Table 2-3. Survey respondents and population of registered Florida beekeepers by size class, 2021.

Size Class	Number of Colonies (Peak Season)	Survey Respondents	Percent of Respondents	Active Registered Beekeepers	Percent of Beekeepers	Expansion Factor
Very small	1-9	715	65.2%	3,397	69.8%	4.751
Small	10-99	286	26.1%	876	18.0%	3.063
Medium	100-999	59	5.4%	431	8.9%	7.305
Large	1,000-9,999	33	3.0%	156	3.2%	4.727
Very large	10,000+	3	0.3%	5	0.1%	1.667
Total		1,096	100%	4,865	100%	

Note that some survey respondents did not report the number of colonies.

best practice for economic contribution analysis, inputs to the economic model for operating revenues (expenses) and employment were discounted as described by Cheney

(2016); however, capital investments were treated as new final demand (economic impacts), as is customary for regional economic analysis.

Table 2-4. Correspondence of annual operating expense categories to IMPLAN® industry sectors for economic contribution analysis of the Florida beekeeping industry.

Survey Operating Expenditure Item	Percent of Total Expenditures Reported	IMPLAN® Industry Sector
Packaged bees, queens, queen cells	9.7%	14-Animal production, except cattle and poultry and eggs
Other items	0.1%	14-Animal production, except cattle and poultry and eggs
Utilities (electric, water, sewer)	0.8%	47-Electric power transmission and distribution
	0.8%	49-Water, sewage and other systems
Building repair & maintenance	7.0%	60-Maintenance and repair construction of nonresidential structures
Supplemental feed	8.2%	68-Wet corn milling
Hive components/repairs & small tools	7.8%	143-All other miscellaneous wood product manufacturing
Pesticides, antibiotics (to control pests/diseases)	2.3%	170-Pesticide and other agricultural chemical manufacturing
Product packaging & marketing	0.6%	192-Plastics bottle manufacturing
	0.6%	201-Glass container manufacturing
	0.6%	244-Metal barrels, drums and pails manufacturing
Equipment repair & maintenance	7.0%	402-Retail - motor vehicle and parts dealers
Fuel (gasoline, diesel, LPG)	1.7%	408-Retail - gasoline stores
Freight & shipping	10.7%	417-Truck transportation
Interest	0.1%	441-Monetary authorities and depository credit intermediation
Insurance (vehicle, property, liability)	3.2%	445-Insurance agencies, brokerages, and related activities
Rent for land & buildings	0.1%	447-Other real estate
Professional services (legal, accounting, brokerage)	0.2%	455-Legal services
	0.2%	456-Accounting, tax preparation, bookkeeping, and payroll services
Travel, entertainment, meetings, education	2.4%	469-Management of companies and enterprises
Office expense (telephone, computer, etc.)	0.4%	470-Office administrative services
Taxes	1.2%	531-Other state government enterprises
Labor (including payroll taxes and benefits)	12.4%	5001-Employee compensation
	12.4%	6001-Proprietor income
Depreciation	9.8%	Not applicable

Source: operating expenditure items from beekeeper survey; sector names from IMPLAN® (Implan Group, LLC).



Photo credit: Dadant and Sons Inc.

Table 2-5. Correspondence of capital investment categories to IMPLAN® industry sectors for economic contribution analysis of the Florida beekeeping industry.

Survey Capital Expenditure Item	Percent of Total Investment Reported	IMPLAN® Industry Sector	Local Purchase Percentage
Packaged bees, queens, queen cells	12.8%	14-Animal production, except cattle and poultry and eggs	58.12%
Complete colonies (hive bodies and bees)	1.8%	14-Animal production, except cattle and poultry and eggs	58.12%
Other items	3.3%	14-Animal production, except cattle and poultry and eggs	58.12%
Buildings (processing plant, warehouse, office)	14.8%	55-Construction of new commercial structures, including farm structures	100.00%
Tools and protective equipment	2.0%	128-Apparel accessories and other apparel manufacturing	3.26%
Hive bodies, components, pallets, other woodenware	18.0%	140-Wood container and pallet manufacturing	36.63%
	18.0%	143-All other miscellaneous wood product manufacturing	32.70%
Tools and protective equipment	2.0%	234-Handtool manufacturing	2.85%
Honey processing and other equipment	2.7%	269-All other industrial machinery manufacturing	4.74%
	2.7%	293-Packaging machinery manufacturing	10.19%
Trucks, trailers, loaders	6.6%	290-Industrial truck, trailer, and stacker manufacturing	3.13%
	6.6%	344-Truck trailer manufacturing	6.77%
	6.6%	402-Retail - motor vehicle and parts dealers	99.80%
Beeyard fencing	1.9%	405-Retail - building material and garden equipment and supplies stores	99.94%

Local purchase percentage represents share of goods or services purchased from in-state (Florida) businesses.

Source: Capital investment items from beekeeper survey; Sector names from IMPLAN® (Implan Group, LLC).

SURVEY RESULTS

Beekeeper Experience

The number of years of beekeeping experience reported by survey respondents is summarized in Table 3-1. Over 70 percent of respondents had less than ten years of experience, while 17 percent had 10 to 29 years of experience, 5 percent had 30 or more years of experience, and about 8 percent did not answer this question. The overall average years of experience was 7.8 years and the median was 4.0 years.

Table 3-1. Years of experience of Florida beekeepers in 2020.

Years of Experience	Respondents	Percent of Respondents
1-4	567	47.0%
5-9	285	23.6%
10-14	132	10.9%
15-19	32	2.7%
20-29	35	2.9%
30+	60	5.0%
No answer	95	7.9%
Total	1,206	100%

Honey Bee Colonies Managed

The number of survey respondents who reported the number of honey bee colonies owned or managed during peak season (warm months) and non-peak season (cool months) are summarized in Table 3-2. Very small hobbyist beekeepers (less than 10 colonies) represented 59 percent of all respondents, while small beekeepers (10 to 99 colonies) accounted for 24 percent of respondents. Among commercial or sideline beekeeping operators, 4.9 percent of respondents reported 100 to 999 colonies, 2.7 percent had 1,000 to 9,999 colonies, and 0.2 percent had over 10,000 colonies. About 9.1 percent of respondents did not report the number of colonies managed. These percentages closely match the distribution by colony inventory of Florida beekeepers registered with Florida Department of Agriculture-Apiary Inspection Service. About 9 percent of respondents did not report the number of colonies, possibly due to being out of business or retired. Survey respondents reported a total of 172,621 colonies at peak season and 96,864 colonies during non-peak season. When expanded to represent the entire population of active registered Florida beekeepers within each size class, the total number of colonies was estimated at 650,534 during peak season and 399,487 during non-peak season.

Table 3-2. Number of honey bee colonies by operation size in 2020.

Beekeeper Size Class (Number Colonies)	Survey Respondents	Percent of Respondents	Colonies Reported Peak Season	Colonies Reported Non-Peak Season	Estimated Total Colonies Peak Season	Estimated Total Colonies Non-Peak Season
Very small (1-9)	715	59.3%	2,505	1,850	11,901	8,789
Small (10-99)	286	23.7%	7,016	4,665	21,490	14,289
Medium (100-999)	59	4.9%	16,888	12,462	123,368	91,036
Large (1,000-9,999)	33	2.7%	81,712	51,377	386,275	242,873
Very large (10,000+)	3	0.2%	64,500	25,500	107,500	42,500
No answer	110	9.1%	0	1,010		
Total	1,206	100%	172,621	96,864	650,534	399,487

About 4.7 percent of respondents reported managing honey bee colonies in other states besides Florida in 2020, and 82 percent of those (3.7% of all respondents) moved some or all of their colonies between Florida and other states. The top six other states in which Florida beekeepers operated were California and Georgia, followed by New York, Wisconsin, Alabama, and Michigan (Table 3-3). A total of 77,329 colonies were reported as moved between Florida

and other states, including those for operations based in other states. When expanded to the population of Florida beekeepers, it was estimated that 310,439 colonies were moved between states, representing 48 percent of all colonies managed. Migratory honey bee colonies remained in the state of Florida an average of 24 weeks. Migratory beekeeping operations were primarily large or very large commercial firms.

Table 3-3. Other states in which honey bees are managed by Florida registered beekeepers in 2020.

State	Responses	Percent of Respondents
California	27	2.2%
Georgia	22	1.8%
New York	9	0.7%
Wisconsin	8	0.7%
Alabama	5	0.4%
Michigan	5	0.4%
Maine	3	0.2%
North Carolina	3	0.2%
South Carolina	3	0.2%
Indiana	2	0.2%
Kentucky	2	0.2%
Massachusetts	2	0.2%
Mississippi	2	0.2%
North Dakota	2	0.2%
South Dakota	2	0.2%
Illinois	1	0.1%
Nebraska	1	0.1%
Ohio	1	0.1%
Tennessee	1	0.1%
Virginia	1	0.1%

Employment

Employment reported by Florida beekeepers is summarized in Tables 3-4 and 3-5. These data represent beekeeper owner/operator and family members as well as hired employees. Nearly 84 percent of respondents reported no employed workers, presumably reflecting hobbyists who might have little or no commercial activity, while 14 percent had one to four workers, 1.5 percent had five to nine workers, and 0.66 percent had 10 or more workers (Table 3-3). Survey respondents reported a total of 545 workers during peak season and 351 workers during non-peak season. When expanded to represent the entire population of active registered beekeepers, it was estimated that there were 2,437 workers during peak season and 1,544 workers during non-peak season, or a simple average of 1,990 workers (Table 3-4).

Table 3-4. Employment distribution of Florida beekeepers at peak season in 2020.

Number of Workers	Respondents	Percent of Respondents
1	78	6.5%
2-4	91	7.5%
5-9	18	1.5%
10-14	4	0.3%
15-19	2	0.2%
20 or more	2	0.2%
No answer	1,011	83.8%
Total	1,206	100%

Table 3-5. Employment of Florida beekeepers by size class in 2020.

Beekeeper Size Class (Number Colonies)	Reported Workers Peak Season	Reported Workers Non-Peak Season	Estimated Total Employment Peak Season	Estimated Total Employment Non-Peak Season
Very small (1-9)	0	0	0	0
Small (10-99)	175	140	536	429
Medium (100-999)	137	81	1,001	588
Large (1,000-9,999)	172	104	813	492
Very large (10,000+)	52	21	87	35
No answer	9	5		
Total	545	351	2,437	1,544

Honey Bee Products

Primary honey bee products include honey, beeswax, pollen, propolis, packaged bees, queens, nucs (small hives), and complete hives. In addition, a variety of other derivative products were mentioned by respondents, such as candles, lip balms, creams, lotions, soaps, candies, and mead (honey wine). Information on quantity and price of honey bee products reported in the survey and calculated total value are summarized in Table 3-6. Among respondents

reporting products, over 80 percent reported bulk honey production, followed by beeswax (33%), comb honey (19%), complete hives and nucs (15%), queens (4.1%), packaged bees (1.3%), and other products (6.8%). About 34 percent of respondents did not report any information on product sales. When production quantities reported by respondents were expanded to represent the population of Florida beekeepers, the total quantities were estimated at 15.00 million pounds of bulk honey, over 100,000 pounds of comb honey, nearly



300,000 pounds of beeswax, 586 packages of bees, 353,000 queen bees, and 200,000 complete hives and nucs. The average price received per pound of product was \$2.58 for bulk honey, \$11.11 for comb honey, and \$4.62 for beeswax. Prices for packaged bees averaged \$127, prices for queens averaged \$24.61 and prices for complete hives and nucs averaged \$188. Note that prices for complete hives might be considerably higher than indicated by this combined average for hives and nucs.

The total value of each product was estimated by multiplying the quantity of production against the price reported by each surveyed beekeeper. When expanded to represent all registered Florida beekeepers, the total value

of production in 2020 was estimated at \$60.35 million. Bulk honey, comb honey, and beeswax were collectively valued at \$24.44 million, representing 41 percent of total value, while packaged bees and queens had a value of \$4.27 million (7%), complete hives and nucs had a value of \$25.56 million (42%), and miscellaneous other products were valued at \$6.07 million (10%). Honey bee product sales outside the State of Florida were estimated at \$21.64 million, or 36 percent of total product value. These results underscore the importance of honey bees themselves as an important market in the era of very high honey bee mortality and the ongoing need for replacement colonies.

Table 3-6. Honey bee products produced by Florida beekeepers in 2020.

Product	Responses	Percent of Respondents	Units	Quantity Reported	Estimated Total Quantity	Average Price Per Unit	Estimated Total Value (Million \$)	Percent Value
Honey	981	81.3%	pounds	3,770,624	15,001,632	\$2.58	\$23.28	38.6%
Comb honey	225	18.7%	pounds	22,275	102,383	\$11.11	\$0.46	0.8%
Beeswax	393	32.6%	pounds	69,576	299,126	\$4.62	\$0.70	1.2%
Packaged bees	16	1.3%	number	111	586	\$127.03	\$0.04	0.1%
Queens	49	4.1%	number	83,353	352,803	\$24.61	\$4.24	7.0%
Complete hives and nucs	176	14.6%	number	65,148	201,748	\$187.90	\$25.56	42.4%
Other products	102	8.5%					\$6.07	10.1%
Total							\$60.35	100%

Average prices received are weighted by production quantity, and do not include imputed values for missing data.

Market channels for Florida honey are summarized in Table 3-7. The total value of honey sales was normalized across market channels to match with the overall expanded value of honey sales. The largest market channel by far was wholesale honey packers, valued at \$12.9 million or 55.5 percent of total value, followed by roadside stands or farmers' markets (\$2.84 million, 12.2%), miscellaneous other

markets (\$2.22 million, 9.5%), friends and neighbors (\$1.82 million, 7.8%), commercial sweetener users (\$1.57 million, 6.8%), retail stores (\$1.10 million, 4.7%), and cooperatives (\$0.82 million, 3.5%). Note that the dominant market role of cooperatives documented in the previous study in 1999 (Hodges et al, 2001) has declined in recent years.

Table 3-7. Florida honey sales by market outlet in 2020.

Market Outlet	Value Reported	Estimated Total Value (Million \$)	Percent of Value
Wholesale honey packer	\$11,523,139	\$12.91	55.5%
Cooperative	\$419,190	\$0.82	3.5%
Commercial sweetener users	\$801,751	\$1.57	6.8%
Retail stores	\$476,288	\$1.10	4.7%
Roadside stands or farmers markets	\$1,184,320	\$2.84	12.2%
Friends and neighbors	\$1,195,781	\$1.82	7.8%
Other markets	\$942,363	\$2.22	9.5%
Total channel sales	\$16,542,831	\$23.28	100%

Honey Bee Pollination Services

Pollination of crops is an increasing source of income for beekeepers who typically contract with growers for a specified number of colonies to be located in or near crop fields for a specified time period. However, relatively few large beekeeping operations provide commercial pollination services because it involves frequent moving of colonies, which is labor-intensive and requires major investments in equipment.

Pollination services reported by survey respondents for 12 major Florida crops are summarized in Table 3-8. The most commonly pollinated crop in Florida was blueberry, served by 3.7 percent of surveyed beekeepers, followed by watermelon (1.9%), other crops (1.9%), squash (1.6%), and specialty citrus (1.1%). A total of 18,682 colonies were reportedly used for commercial pollination in Florida, including over 5,000 colonies for blueberry and watermelon and over 2,000 colonies for squash and specialty citrus. When expanded for the entire beekeeper population, an estimated 91,839 colonies were used for pollination in Florida, including

32,855 for blueberry, 27,072 for watermelon, and 10,736 for specialty citrus, as well as smaller numbers for cantaloupe, cucumber, pumpkin, strawberry, and miscellaneous other crops. Weighted average prices received by beekeepers for pollination services in Florida ranged widely from under \$22 to nearly \$126 per colony, depending upon the crop and other factors such as local demand and quality of forage. The average price for the major crops of blueberry and watermelon were \$68 and \$62, respectively. The total value of pollination services in Florida, calculated from reported quantity and price for each beekeeper, was \$971,790. When expanded to represent all beekeeping operations in Florida, the value of pollination services was estimated at \$8.15 million, with \$3.13 million for blueberry (38.4%), \$2.76 million for watermelon (33.9%), \$0.63 million for squash (7.7%), \$0.57 million for specialty citrus (7.0%), and \$0.37 million for cucumber (4.5%). Other Florida crops mentioned for pollination services were orange, blackberry, basil, carambola, citrus, coconut, eggplant, fig, mango, roselle, sorrel, soursop, and tomato.

Table 3-8. Pollination services by beekeepers to Florida crops in 2020.

Crop	Responses	Percent of Respondents	Quantity Colonies Reported	Estimated Total Quantity Colonies	Average Price Per Colony	Expanded Value (Million \$)	Percent Value
Avocado	8	0.7%	289	1,543	\$38.93	\$0.09	1.2%
Blueberry	45	3.7%	5,677	32,855	\$65.67	\$3.13	38.4%
Cantaloupe	6	0.5%	480	1,436	\$28.33	\$0.11	1.4%
Cucumber	8	0.7%	694	3,264	\$63.69	\$0.37	4.5%
Peach	7	0.6%	78	352	\$50.00	\$0.03	0.4%
Pear	2	0.2%	5	15		NA	
Pumpkin	5	0.4%	356	937	\$5.62	\$0.02	0.2%
Raspberry	3	0.2%	5	15		NA	
Specialty citrus	13	1.1%	2,160	10,736	\$31.39	\$0.57	7.0%
Squash	19	1.6%	2,045	7,583	\$36.65	\$0.63	7.7%
Strawberry	8	0.7%	275	1,389	\$33.64	\$0.08	1.0%
Watermelon	23	1.9%	5,673	27,072	\$58.06	\$2.76	33.9%
Other crop 1	23	1.9%	929	4,581	\$44.31	\$0.35	4.2%
Other crop 2	4	0.3%	16	59	\$93.75	\$0.01	0.2%
Total	174		18,682	91,839		\$8.15	100%

Average prices per colony are weighted by quantity of colonies, with no imputed value for missing observations.

Honey bee pollination services by migratory registered Florida beekeepers to crops in other states are summarized in Table 3-9. By far, the most commonly pollinated crop in other states was almonds in California, served by 2.1 percent of surveyed beekeepers. A total of 57,216 colonies were reported as used for commercial pollination in other states, including over 35,000 colonies for almond, along with blueberry (8,740 colonies), cranberry (4,996 colonies), apple

(3,742 colonies), and watermelon (1,650 colonies), as well as smaller numbers for cucumber, pumpkin, strawberry, cherry, and squash. When expanded for the Florida beekeeper population, an estimated total of 216,801 colonies were used for pollination services outside of the State of Florida. Prices received per colony for pollination services in other states were highest for the most pollinated crops of almond (\$188), cranberry (\$85), and blueberry (\$80), and were generally in



the range of \$50-\$60 per colony for most other crops. Total value of pollination services in other states reported by survey respondents was estimated at \$6.35 million. When expanded for the beekeeper population, total value of out-of-

state pollination services was estimated at \$25.14 million, dominated by \$19.50 million for almond, followed by blueberry (\$2.72 million), and cranberry (\$1.67 million).

Table 3-9. Pollination services by beekeepers to crops in other states in 2020.

Crop	Responses	Percent of Respondents	Quantity Colonies Reported	Estimated Total Quantity Colonies	Average Price Per Colony	Estimated Total Value (Million \$)
Almond	25	2.1%	35,812	117,387	\$188.39	\$19.50
Apple	7	0.6%	3,742	14,172	\$56.41	\$0.48
Avocado	0	0.0%	0	0		\$0.00
Blueberry	10	0.8%	8,740	46,074	\$79.65	\$2.72
Canola	0	0.0%	0			
Cantaloupe	1	0.1%	50	236		
Cherry	4	0.3%	490	2,472	\$61.90	\$0.12
Cranberry	4	0.3%	4,996	19,836	\$84.69	\$1.67
Cucumber	2	0.2%	600	1,857	\$52.53	\$0.12
Peach	1	0.1%	24	175	\$55.00	\$0.01
Pear	1	0.1%	32	234	\$60.00	\$0.01
Pumpkin	2	0.2%	200	945		\$0.00
Raspberry	1	0.1%	32	234	\$60.00	\$0.01
Specialty citrus	2	0.2%	110	761	\$30.00	\$0.00
Squash	2	0.2%	450	3,287	\$60.00	\$0.11
Strawberry	2	0.2%	240	1,238	\$55.00	\$0.01
Tomato	0	0.0%	0	0		\$0.00
Watermelon	5	0.4%	1,650	7,543	\$56.52	\$0.37
Other crops	2	0.2%	48	351	\$60.00	\$0.01
Total	71		57,216	216,801		\$25.14

Average prices per colony are weighted by quantity of colonies, with no imputed value for missing observations.

Beekeeper Revenues

Annual revenues for 2020 reported by surveyed Florida beekeepers are summarized in Tables 3-10, 3-11, and 3-12. Survey respondents were asked to report point values separately for revenues from honey bee product sales and pollination services, or alternatively to indicate the range of revenues that represents their overall operating revenues from all sources. In some cases, when respondents did not provide revenue information, revenues were imputed based on reported quantities and average prices received for various products or pollination services to different crops. Total revenues specifically reported were \$9.92 million, including \$4.07 million for honey bee products and \$5.70 million for pollination services, plus a small amount for other services such as tours, education, swarm removal, etc. (Table 3-10). For respondents who reported only a range for total annual revenues, the vast majority had revenues of less than \$1,000 or less than \$10,000 (Table 3-11). For these respondents, the annual revenues were imputed at the midpoint of the range, with estimated total revenues of \$18.51 million. Beekeeper annual revenues, whether reported as a specific value, imputed or calculated, are summarized by range in Table 3-12. Some 43.5 percent of respondents had

annual revenues of less than \$1,000, another 15.0 percent had revenues of \$1,000 to \$9,999, 7.1 percent had revenues of \$10,000 or more, and 34.3 percent did not provide any revenue information. These results confirm that beekeeping operations are typically small enterprises. Total revenues reported, imputed, or calculated averaged \$199 per peak season colony.

Table 3-10. Florida beekeeper revenues for honey bee products and pollination services reported as specific values in 2020.

Revenue Source	Number Respondents	Average Amount Reported	Total Amount Reported
Honey bee products	441	\$9,238	\$4,073,903
Pollination services	322	\$17,694	\$5,697,539
Other services	295	\$494	\$145,631
Total			\$9,917,073

Table 3-11. Florida beekeeper revenues reported by revenue range for 2020

Annual Revenue Range	Number Respondents	Midpoint Value Imputed	Estimated Total Revenues At Midpoint Value (Million \$)
Less than \$1,000	401	\$500	\$0.20
\$1,000 to \$9,999	96	\$5,500	\$0.53
\$10,000 to \$49,999	17	\$30,000	\$0.51
\$50,000 to \$99,999	5	\$75,000	\$0.38
\$100,000 to \$299,999	11	\$200,000	\$2.20
\$300,000 to \$499,999	3	\$400,000	\$1.20
\$500,000 to \$999,999	3	\$750,000	\$2.25
\$1.00 to \$2.49 million	0		
\$2.50 to \$4.99 million	3	\$3,750,000	\$11.25
Don't know or prefer not to answer	115		
Total	654		\$18.51

Photo credit: Hani Honey Company.



Table 3-12. Florida beekeeper annual revenues reported, imputed, or calculated by revenue range for 2020.

Annual Revenue Range	Number	Percent
Less than \$1,000	525	43.5%
\$1,000--\$9,999	181	15.0%
\$10,000--\$49,999	37	3.1%
\$50,000--\$99,999	13	1.1%
\$100,000--\$249,999	15	1.2%
\$250,000--\$499,999	11	0.9%
\$500,000--\$999,999	6	0.5%
\$1,000,000+	4	0.3%
Not available	414	34.3%
Total	1,206	100%

Annual revenue estimates expanded for the entire Florida beekeeper population, by operator size class, are provided in Table 3-13. Total annual revenues were estimated at \$93.36 million, including revenues for honey bee products (\$60.35 million) and pollination services (\$33.29 million). Nearly three-quarters (72%) of revenues were received by large or very large beekeepers, i.e. operators with 1,000 or more colonies. Honey bee products produced in Florida were valued at \$43.48 million, and pollination services for crops in Florida were valued at \$8.15 million, giving a total value of \$51.63 for all products sold and services provided in Florida, while \$33.29 million in pollination services and \$16.86 million in products were produced in other states by migratory beekeepers who operate in Florida for part of the year.

Table 3-13. Summary of expanded Florida beekeeper revenues by operator size class in 2020.

Operator Size Class (Number Colonies)	Total Revenues	Honey Bee Products	Honey Bee Products Produced in Florida	Pollination Services in Florida	Pollination Services in Other States	Pollination Services all States	Total Product and Services Revenues in Florida
-----Million Dollars-----							
Very small (1-9)	\$1.00	\$0.77	\$0.77	\$0.00	\$0.00	\$0.00	\$0.77
Small (10-99)	\$4.11	\$3.68	\$3.47	\$0.05	\$0.01	\$0.06	\$3.52
Medium (100-999)	\$21.07	\$14.90	\$12.43	\$2.64	\$5.05	\$7.69	\$15.06
Large (1,000-9,999)	\$45.55	\$27.10	\$15.49	\$3.84	\$16.85	\$20.69	\$19.33
Very large (10,000+)	\$21.63	\$13.89	\$11.32	\$1.62	\$3.23	\$4.86	\$12.95
Total	\$93.36	\$60.35	\$43.48	\$8.15	\$25.14	\$33.29	\$51.63

Note that revenues for products and pollination services may not sum to total due to rounding.

Operating Expenses

Operating expenses reported by surveyed beekeepers are summarized in Table 3-14. Expenses were itemized in 21 categories covering labor, materials and supplies, and various overhead expenses. Total operating costs of \$1.54 million were reported. The largest expense item was labor, averaging \$76,493 or about 25 percent of total costs, followed by freight and shipping (10.7%), depreciation (9.8%), packaged bees and queens (9.7%), supplemental feed (8.2%), hive components, repairs and small tools (7.8%), and repair

and maintenance to equipment (7.0%) and buildings (7.0%). Some beekeepers commented that pesticides used to control honey bee pests/pathogens are a major operating expense. Total operating expenses reported averaged \$159 per peak season colony. It was not possible to reliably estimate expanded operating costs for the entire population of beekeepers due to insufficient survey sample size. A number of small beekeepers commented that beekeeping is a hobby for them and they do not keep expense records.



Photo credit: Dadant and Sons Inc.

Table 3-14. Operating expenses for Florida beekeepers in 2020.

Expense Item	Respondents Reporting	Average Amount Reported	Average Per Colony	Total Amount Reported	Percent of Total
Labor (including payroll taxes and benefits)	5	\$76,493	\$39.43	\$382,463	24.8%
H2A program costs (visa, travel, housing)	0		\$0.00		0.0%
Packaged bees, queens, queen cells	28	\$5,329	\$15.38	\$149,225	9.7%
Supplemental feed	38	\$3,313	\$12.98	\$125,904	8.2%
Pesticides, antibiotics (to control pests/diseases)	29	\$1,216	\$3.63	\$35,256	2.3%
Hive components/repairs & small tools	42	\$2,868	\$12.42	\$120,435	7.8%
Fuel (gasoline, diesel, LPG)	12	\$2,125	\$2.63	\$25,502	1.7%
Utilities (electric, water, sewer)	10	\$2,363	\$2.44	\$23,629	1.5%
Equipment repair & maintenance	21	\$5,128	\$11.10	\$107,692	7.0%
Freight & shipping	12	\$13,716	\$16.97	\$164,592	10.7%
Product packaging & marketing	19	\$1,361	\$2.67	\$25,851	1.7%
Building repair & maintenance	9	\$11,973	\$11.11	\$107,755	7.0%
Office expense (telephone, computer, etc.)	8	\$867	\$0.71	\$6,934	0.4%
Rent for land & buildings	2	\$1,100	\$0.23	\$2,200	0.1%
Professional services (legal, accounting, brokerage)	6	\$1,258	\$0.78	\$7,550	0.5%
Insurance (vehicle, property, liability)	8	\$6,178	\$5.10	\$49,425	3.2%
Taxes	7	\$2,548	\$1.84	\$17,836	1.2%
Travel, entertainment, meetings, education	9	\$4,027	\$3.74	\$36,243	2.4%
Interest	3	\$402	\$0.12	\$1,205	0.1%
Depreciation	4	\$37,650	\$15.53	\$150,600	9.8%
Other items	2	\$950	\$0.20	\$1,900	0.1%
Total			\$158.99	\$1,542,197	100%

Capital Investment

In addition to annual operating costs, capital investments made by Florida beekeepers in 2020 were documented in the survey, as summarized in Table 3-15. Total investments reported by survey respondents were \$4.08 million, and estimated investments expanded to the population of beekeepers totaled \$17.07 million. The largest category of capital investments was hives, component parts, and other woodenware, which accounted for 36.0 percent of

investments, followed by trucks, trailers, loaders (19.9%), buildings (14.8%), and packaged bees and queens (12.8%). Total capital investment in 2020 represented 18.3 percent of annual revenues and averaged \$47 per peak season colony. Note that some beekeepers considered packaged bees and queens to be a capital expense that is depreciated over several years, while others assumed that this is an annual operating cost due to high rates of colony loss.

Table 3-15. Capital investments by Florida beekeepers in 2020.

Asset Type	Respondents Reporting	Average Amount	Average Per Colony	Total Value Reported	Percent of Total	Estimated Total Value (Million \$)
Hive bodies, components, pallets, other woodenware	524	\$2,808	\$16.95	\$1,471,278	36.0%	\$6.15
Packaged bees, queens, queen cells	400	\$1,303	\$6.00	\$521,025	12.8%	\$2.18
Complete colonies (hive bodies and bees)	221	\$332	\$0.85	\$73,441	1.8%	\$0.31
Tools and protective equipment	428	\$390	\$1.92	\$167,031	4.1%	\$0.70
Bee yard fencing	204	\$377	\$0.89	\$76,990	1.9%	\$0.32
Trucks, trailers, loaders	163	\$4,979	\$9.35	\$811,630	19.9%	\$3.39
Honey processing and other equipment	339	\$653	\$2.55	\$221,235	5.4%	\$0.93
Buildings (processing plant, warehouse, office)	153	\$3,950	\$6.96	\$604,301	14.8%	\$2.53
Other items	148	\$913	\$1.56	\$135,108	3.3%	\$0.57
Total			\$47.02	\$4,082,039	100%	\$17.07



Colony Losses

Honey bee colony losses have become a very serious issue for beekeepers in recent years. Responses by surveyed Florida beekeepers about causes of honey bee colony losses in the previous year are summarized in Table 3-16. The most common cause of colony loss was queen failure, reported by 25.8 percent of respondents, followed by other pests and parasites (23.7%), *Varroa destructor* (17.9%), pesticides (7.7%), starvation/lack of forage (7.6%), weather (7.5%), and Colony Collapse Disorder (6.3%). In addition, 11.7 percent of respondents suffered colony losses that were unknown (“don’t know”), while only 12.2 percent of respondents reported no colony losses (“none”). A number of beekeepers (n=78) commented that “poor management” is a cause of colony loss, including “inexperience”, “lack of time” and “lack of knowledge”, and “swarming and robbing behavior due to inattention”.

Table 3-16. Causes of Florida honey bee colony losses in 2020.

Cause of Loss	Percent of Respondents
Queen failure (premature death, improper mating, drone layer, etc.)	25.8%
Other pests and parasites (tracheal mites, Nosema, small hive beetle, wax moth, etc.)	23.7%
<i>Varroa destructor</i>	17.9%
Pesticides	7.7%
Starvation, lack of forage	7.6%
Weather	7.5%
Colony collapse disorder	6.3%
Predators (bears, skunks, etc.)	4.6%
Viral diseases (Kashmir Bee Virus, Deformed Wing Virus, Israeli Acute Bee Paralysis Virus, etc.)	2.8%
Hive destruction	1.6%
Theft	1.4%
Brood diseases (American or European foulbrood, stonebrood, sacbrood)	1.1%
Other causes	5.2%
None	12.2%
Don't know	11.7%

To quantify the magnitude of honey bee colony losses, the reported share of colonies lost in 2020 is summarized in Table 3-17. Losses of 40 percent or higher were reported by 40 percent of beekeepers, including 10 percent of beekeepers with complete losses (100%), while one third of beekeepers had losses of zero or less than 20 percent. Based on the reported loss rates and number of colonies,

it was estimated that a total of 221,527 colonies were lost in 2020, which represented 34.1 percent of all colonies at peak season. Loss rates were higher for very small beekeepers (45%) compared to small and medium sized beekeepers (26%) or large and very large operators (36%). By comparison, surveys by the Bee Informed Partnership reported an average of 38.2 percent of colonies lost in Florida during the 2020-21 winter season, and 32.2 percent more broadly throughout the U.S. (Steinhauer et al, 2021). Industry experts indicated that the rate of colony losses due to pests and diseases in recent years is significantly greater than was experienced historically, well beyond the normal 10 to 20 percent of colonies that are lost during overwintering.

Table 3-17. Share of Florida honey bee colonies lost in 2020

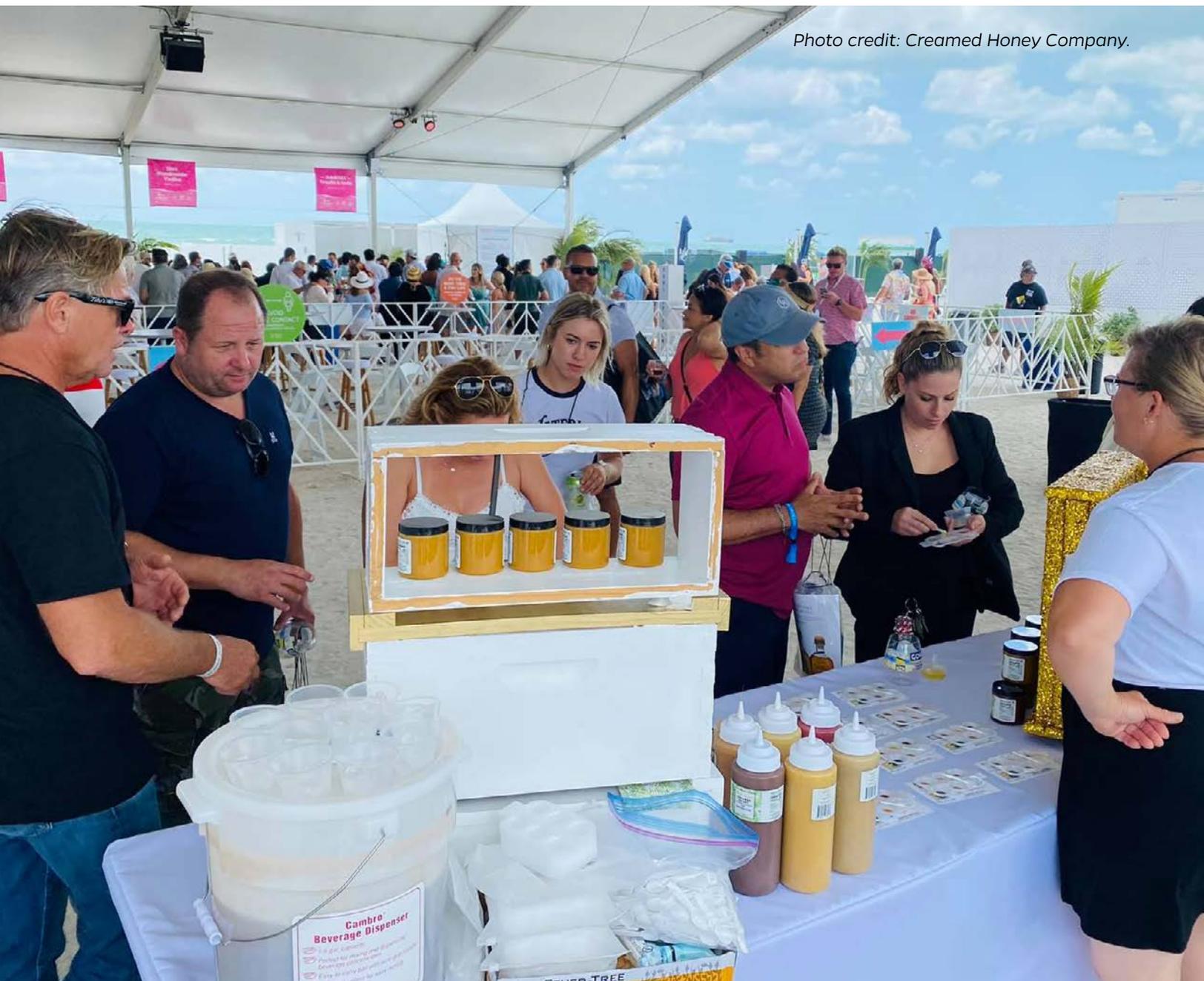
Share of Colonies Lost	Percent of Respondents
Zero	6.1%
1% to 19%	27.3%
20% to 39%	27.0%
40% to 59%	21.3%
60% to 79%	6.3%
80% to 99%	1.9%
100%	10.0%

Threats to Florida Beekeeping

Surveyed respondents were asked to rate the potential threats confronting Florida beekeepers as either “extremely important”, “somewhat important” or “not important”, with results as shown in Table 3.18. The threats that were rated as extremely important by the highest percentage of beekeepers were “colony losses to *Varroa*, other pests, and diseases”, reported by 78 percent of respondents, followed by “pesticide exposure and honey contamination” (65%), “resistance to pesticides for control of mites” (55%), “adulteration of honey with other sweeteners” (52%) and “low prices and competition from imported honey” (46%). Other threats that were strongly rated as somewhat important by at least 40 percent of respondents included “lack of education available for beekeepers” (45%), “low recruitment of new beekeepers to the industry” (43%), and high costs of operation (42%). Threats that were perceived to be not important included “difficulties using foreign H2A workers” (75%), “lack of domestic employees” (62%), however, these labor-related issues are likely only relevant to the relatively small number of large or very large operators that depend on hired labor. Miscellaneous “other threats” to beekeeping mentioned by survey respondents included various regulations such as restrictions by homeowner associations and programs to eliminate invasive species such as Brazilian Pepper and Chinese tallow that are important nectar plants, as well as decreased acreage of citrus, competition for colony sites from out-of-state beekeepers, lack of enforcement of laws for food processing, climate change, and hurricanes.

Table 3-18. Rated importance of threats to Florida beekeepers.

Threat	Extremely Important	Somewhat Important	Not Important
	Percent of Respondents		
Colony losses to varroa, other pests, and diseases	77.8%	18.5%	3.8%
Pesticide exposure and honey contamination	64.6%	24.6%	10.8%
Resistance to pesticides for control of mites	54.7%	35.8%	9.5%
Adulteration of honey with other sweeteners	52.0%	22.0%	25.9%
Low prices/competition from imported honey	45.9%	31.8%	22.4%
High costs of operation	41.7%	42.3%	16.0%
Lack of suitable honey bee colony sites	32.4%	35.5%	32.1%
Low recruitment of new beekeepers to the industry	29.4%	42.8%	27.9%
Lack of education available for beekeepers	29.4%	45.4%	25.2%
Other threats	20.0%	33.3%	46.6%
Lack of domestic employees	13.2%	25.1%	61.7%
Difficulties of using foreign (H2A) workers	6.7%	18.0%	75.3%



In addition to the many threats to Florida beekeeping discussed above, another unprecedented threat in 2020-21 was the COVID-19 pandemic. Beekeeper survey responses about possible effects of COVID-19 are summarized in Table 3-19. In general, it appears that Florida beekeepers were not extensively affected, with nearly half of respondents (44%) reporting “was not affected”, while 8.6 percent experienced decreased revenues due to loss of market, and less than 5 percent reported other effects such as increased costs for safety protocols, difficulty finding employees, or worker illness. Other negative effects of COVID-19 on beekeepers mentioned were increased input costs, slowed supply chain, and reduced education and mentorship opportunities. Some respondents also noted that there were positive effects such as more starting hobbyist beekeepers and increased honey sales.

Table 3-19. Effects of COVID-19 on Florida beekeepers.

Effect	Responses	Percent of Respondents
Increased costs for safety protocols	46	3.8%
Decreased revenues due to loss of market	104	8.6%
Difficulty finding employees	28	2.3%
Operator, family or employee illness	52	4.3%
Other	53	4.4%
Was not affected by Covid-19	535	44.4%
Don't know	65	5.4%
Total	883	

Note: Respondents could choose any of the effects listed.

Bartering for Honey Bee Products or Services

Survey respondents were asked whether they had engaged in bartering of honey bee products, pollination, or other services, i.e. exchanging for other goods or services without monetary compensation. About 17 percent of respondents who answered this question (11% of all respondents) reported that they had engaged in bartering, including small, medium and large beekeepers. The most common type of bartering was sharing honey bee products

with friends or family, practiced by about one third of respondents (36.6%), followed by providing tours or public education about honey bees (18.2%), providing hives, honey bees or queens to beginning beekeepers (17.5%), sharing honey bee products with landowners of colony sites (16.2%), providing crop pollination (6.6%), as well as miscellaneous other bartering (5.0%), as summarized in Table 3-20. A few respondents also noted that they provided bee removal services (n=9). Bartering exchanges described by respondents included the following comments that illustrate the nature of these informal arrangements:

- “Swapped a quart of honey for eggs with a neighbor”
- “A handy man laid my flooring in my bee room for honey”
- “All revenue and products are used to support a food pantry garden”
- “Provided honey for sale at the Northeast Florida Fair, contributing 50% of revenue to my local beekeepers association”
- “Watched/maintained neighbor’s hives in exchange for assistance, education, and hive supplies and extractor when needed”

Motivations for beekeeping and subsequent management decisions for hobbyist beekeepers might differ dramatically from commercial beekeepers. Hobbyist beekeepers generally foster a more personal connection with their colonies and become involved in beekeeping with environmental or social concerns in mind rather than being profit driven (Velardi et al. 2021). Furthermore, beekeeping becomes a core pillar of identity and brings opportunities to be involved in community outreach and education as well as benefits to social capital (Andrews, 2019). Insight into the attitudes and motivations for hobbyist beekeeping is still limited, particularly in Florida, and further research on this topic is needed to provide a more thorough understanding of this segment of the industry to develop policies supporting small scale beekeeping.

Bartering is not new to beekeeping. In the early twentieth century, bartering honey for pollination services was a common exchange between beekeepers and growers, however, with increasing acreage of specialty crops, the exchange between growers and beekeepers shifted to cash payments for pollination services because the honey produced from these crops was not readily marketable (Baylis et al. 2021).



Photo credit: Hani Honey Company.

Table 3-20. Bartering practiced by Florida beekeepers in 2020.

Type of Bartering Activity	Responses	Percent of Responses
Shared honey bee products with friends or family	111	36.6%
Shared honey bee products with landowner of colony site(s)	49	16.2%
Provided hives, honey bees or queens to beginning beekeepers	53	17.5%
Provided crop pollination services	20	6.6%
Provided tours or public education about honey bees	55	18.2%
Other	15	5.0%
Total	303	100%

General Comments

General comments about beekeeping and its economic contributions in Florida were received from over 200 respondents. Some common themes of these comments included hobbyist beekeeping (n=85), the need for education (n=27), market and regulation barriers (n=21), and colony loss due to pest and diseases (n=14). Under hobbyist beekeeping, 41 percent of respondents noted they “simply keep bees as a hobby” in which they either “give honey away to friends and family” or “have no honey sales at all”. Many beekeepers reported a need for honey bee education and awareness aimed towards government officials and legislators. In addition, consumer education is needed to create more informed consumers and neighbors of apiaries who appreciate local honey production. Under market and regulation barriers, there is a need for better marketing of Florida honey and for regulations to register bee yards and avoid competition for resources from migratory beekeepers overwintering colonies in Florida. Also, there was a need expressed for more formal management of honey bee swarms. Many beekeepers identified a need for more education and training.

BENEFITS OF HONEY BEE POLLINATION SERVICES FOR CROP PRODUCTION

Data from the survey on number of honey bee colonies used for crop pollination services was compiled together with information on average crop yields and prices, number of colonies per acre, and typical increase in yield attributed to honey bee pollination to estimate the marginal benefit of honey bee pollination services for crop production value, i.e. the difference in value of crops with and without honey bee pollination. The marginal benefit was calculated as the percent yield increase multiplied by average crop value per acre and number of acres pollinated for each crop. The typical increase in crop yields from pollination services was taken from published values (Delaplane et al, 2000; Mallinger et al, 2021). These results assume that there are no market supply or price adjustments associated with marginal changes in crop yields due to pollination.

Results for the value of Florida crops are summarized in Table 4-1. The total benefit for all Florida crops was estimated

at \$237.3 million, including \$112.1 million for blueberry, \$94.1 million for watermelon, \$18.7 million for squash, \$4.2 million for cucumber, and \$3.4 million for peach. Blueberry had the largest number of colonies, with over 10,000 acres pollinated, an average value per acre of \$12,262, and an average share of yield attributed to pollination of 84 percent. Watermelon had over 15,000 acres pollinated, with an average value of \$6,256 per acre, and the crop is considered to be 100 percent dependent on pollination. Squash had over 5,000 acres pollinated, with a value of \$5,698 per acre, and a 65 percent increase in yields under pollination. Cucumber had 1,484 acres pollinated, with a value of \$3,779 per acre, and a 75 percent increase in yields under pollination. Peach had fewer acres pollinated (440), but a higher value per acre, and the average yield increase from pollination was reported as 286 percent, however, this was truncated to 100 percent.

Table 4-1. Value of honey bee pollination services for crop production in Florida in 2020.

Crop	Estimated Total Number Colonies	Average Colonies Per Acre	Number Acres	Average Yield Per Acre	Units	Average Price Per Unit	Average Value Per Acre	Average Percent Yield Increase	Marginal Benefit (Million \$)
Avocado	1,543	1.8	857	3.80	Tons	\$799.00	\$3,036	34	\$0.88
Blueberry	32,855	3	10,952	4790	Pounds	\$2.56	\$12,262	84	\$112.13
Cantaloupe	1,436	1.8	798	240	Hundredweight	\$30.20	\$7,248		NA
Cucumber	3,264	2.2	1,484	165	Hundredweight	\$22.90	\$3,779	75	\$4.20
Peach	352	0.8	440	8.46	Tons	\$914.67	\$7,738	100	\$3.41
Pear	15	1.5	10	15.40	Tons	\$476.67	\$7,341	40	\$0.30
Pumpkin	937	1.5	625	208	Hundredweight	\$18.15	\$3,770	50	\$1.18
Raspberry	15	0.8	19	13100	Pounds	\$1.95	\$25,549	45	\$0.22
Specialty citrus (tangerine)	10,736			129	Boxes	\$25.07	\$3,235		NA
Squash	7,583	1.5	5,056	156	Hundredweight	\$36.50	\$5,698	65	\$18.72
Strawberry	1,389	3.5	397	180	Hundredweight	\$137.00	\$24,660	25	\$2.41
Watermelon	27,072	1.8	15,040	340	Hundredweight	\$18.40	\$6,256	100	\$94.09
Total	87,199		35,667						\$237.28

U.S. price and yield data were used where not available for Florida.

Sources: USDA-NASS for yield and price information; literature for number colonies per acre and percent yield increase.

Results for crops in other states are summarized in Table 4-2. The total benefit for all crops in other states was estimated at \$513.7 million. By far the most important crop for pollination was almonds grown in California, with 46,955 acres pollinated, an average value of \$4,557 per acre, and 100 percent dependent on pollination services, giving a value of \$214.0 million. Apples also had a large benefit from pollination, valued at \$114.6 million, reflecting 9,448 acres pollinated, an average value of \$14,886 per acre, and an 82 percent increase in yields. Blueberry had a benefit of \$100.8

million for over 15,000 acres in other states. Cranberry, grown in the New England states, had a benefit of \$31.0 million from pollination on 6,612 acres, with an average value of \$10,202 per acre and 46 percent increase in yield. Watermelon had a value of pollination of \$25.0 million in other states, again reflecting the 100 percent dependence on pollination. Squash and tart cherry grown in other states had \$8.1 million and \$7.6 million in pollination benefits, respectively.

Table 4-2. Value of honey bee pollination services for crop production in other states in 2020.

Crop	Estimated Total Number Colonies	Average Colonies Per Acre	Number Acres	Average Yield Per Acre	Units	Average Price Per Unit	Average Value Per Acre	Average Percent Yield Increase	Marginal Benefit (Million \$)
Almond	117,387	2.5	46,955	2,490	Pounds	\$1.83	\$4,557	100	\$213.96
Apple	14,172	1.5	9,448	34,700	Pounds	\$0.43	\$14,886	82	\$114.62
Blueberry	46,074	3	15,358	7,090	Pounds	\$1.11	\$7,860	84	\$100.80
Cantaloupe	236	1.8	131	280	Hundredweight	\$26.10	\$7,295		NA
Cherry (tart)	2,472	1	2,472	4,410	Pounds	\$0.78	\$3,419	90	\$7.61
Cranberry	19,836	3	6,612	199	Barrels	\$51.27	\$10,202	46	\$31.03
Cucumber	1,857	2.2	844	138	Hundredweight	\$23.95	\$3,298	75	\$2.09
Peach	175	0.8	219	8.46	Tons	\$914.67	\$7,738	100	\$1.70
Pear	234	1.5	156	15.40	Tons	\$476.67	\$7,341	40	\$0.46
Pumpkin	945	1.5	630	208	Hundredweight	\$18.15	\$3,770	50	\$1.19
Raspberry	234	0.8	292	13,100	Pounds	\$1.95	\$25,549	45	\$3.36
Specialty citrus (tangerine)	761			317	Boxes	\$29.24	\$9,268		NA
Squash	3,287	1.5	2,192	156	Hundredweight	\$36.50	\$5,698	65	\$8.12
Strawberry	1,238	3.5	354	541	Hundredweight	\$81.40	\$44,037	25	\$3.83
Watermelon	7,543	1.8	4,190	355	Hundredweight	\$16.80	\$5,956	100	\$24.96
Total	216,450		89,852						\$513.70

Sources: USDA-NASS for yield and price information; Literature for number colonies per acre and percent yield increase.

REGIONAL ECONOMIC CONTRIBUTIONS OF THE FLORIDA BEEKEEPING INDUSTRY

The economic contributions of the Florida beekeeping industry were evaluated with a regional economic model that captures the multiplier effects of industry activity on other sectors of the regional economy. Values for the industry in 2020 that were estimated from the survey included \$51.63 million in operating revenues in Florida, capital investment of \$17.07 million, and employment of 1,990 fulltime and part-time jobs as an average of peak and non-peak season workers. These values were entered into a model for the State of Florida constructed with the IMPLAN® software and associated database for Florida in 2019 (Implan Group, LLC), as described in the methods section of this report. Note that the marginal benefits of pollination services for increased crop production were not evaluated with the regional economic model because these benefits accrue to other industries rather than to beekeepers.

Economic contributions of Florida beekeeping operations and capital investment in 2020 are summarized in Table

5-1. Total economic contributions of all activities included employment of 2,303 fulltime and part-time jobs, \$24.11 million in labor income (employee wages, salaries, benefits, proprietor income), \$41.86 million in value added contributions to Gross State Product (GSP), and \$80.75 million in output or business revenues. Operating revenues and employment accounted for 2,215 jobs, or 96% of total employment contributions and \$34.56 million value added contributions (83% of total), while investment accounted for 88 jobs (3.8%) and \$7.30 million in value added contributions (17.4%). The value added and employment results are perhaps the most meaningful results because jobs and GSP are readily understood by the public. Although output contributions are larger values, they include the value of input goods and services. Note that labor income is a subset of value added, which is a subset of output, so these measures should not be added together.

Table 5-1. Summary of economic contributions of the beekeeping industry in Florida in 2020.

Activity	Impact Type	Employment (Jobs)	Labor Income (million \$)	Value Added (million \$)	Output (million \$)
Operations revenues and employment	Direct Effect	1,981	\$7.88	\$13.70	\$29.34
	Indirect Effect	74	\$4.11	\$6.76	\$13.36
	Induced Effect	160	\$7.55	\$14.10	\$24.90
	Total Effect	2,215	\$19.55	\$34.56	\$67.60
Investment	Direct Effect	52	\$2.71	\$4.03	\$7.05
	Indirect Effect	13	\$0.79	\$1.28	\$2.59
	Induced Effect	23	\$1.07	\$1.99	\$3.52
	Total Effect	88	\$4.57	\$7.30	\$13.16
Total all activities	Direct Effect	2,033	\$10.60	\$17.72	\$36.39
	Indirect Effect	88	\$4.90	\$8.04	\$15.95
	Induced Effect	183	\$8.62	\$16.10	\$28.42
	Total Effect	2,303	\$24.11	\$41.86	\$80.75

Values in million 2020 dollars. Employment represents fulltime and part-time jobs.
Source: IMPLAN® model for State of Florida, 2019 (IMPLAN Group, LLC).

These economic contribution estimates include the direct, indirect, and induced multiplier effects estimated in the regional economic model, as discussed in the methods section. Direct effects represent the original revenues, employment, and capital spending by beekeepers, while indirect effects capture input supply chain activity and induced effects represent spending of household income by employees of directly and indirectly supported industries. In terms of employment, direct jobs represented 88 percent of all jobs created, while indirect effects were 3.8 percent and induced effects were 7.9 percent, but in terms of value

added, direct effects represented a lower share (42.3%) of total contributions, compared to indirect effects (19.2%) and induced effects (38.5%).

Economic contributions of the beekeeping industry in Florida in 2020 by major industry group are shown in Table 5-2. Naturally, the largest contributions occurred in the agriculture industry sector which includes “Other animal production”, the primary sector in which beekeeping is classified, with 1,998 jobs and \$6.63 million in value added. Significant contributions also occurred in other sectors of the Florida economy arising from indirect and induced

multiplier effects, such as retail trade (36 jobs, \$2.96 million value added), health/social services (34 jobs, \$2.42 million), accommodation/food services (26 jobs, \$1.06 million), real estate/rentals (18 jobs, \$4.56 million), transportation/warehousing (30 jobs, \$4.11 million) and construction (27 jobs, \$3.21 million), as well as other sectors with smaller contributions.

Government tax contributions of the beekeeping industry in Florida in 2020 are shown in Table 5-3. Total tax contributions of \$8.53 million included state and local tax contributions of \$2.94 million and federal tax contributions of \$5.60 million. The largest individual state-local tax items were sales tax (\$1.43 million) and property tax (\$0.98 million), and the largest federal tax items were the employee contributions (\$1.42 million) and employer contributions (\$1.14 million) to social insurance taxes as well as personal income taxes (\$2.34 million). These tax contribution results reflect prevailing industry-specific tax rates for all levels of government and households.

The economic contribution results for the Florida beekeeping industry from this study for 2020 were compared to previous study results for 1999 (Hodges et al, 2001), as shown in Table 5-4, with dollar values for the 1999 study results adjusted for inflation to 2020 dollars using the GDP Implicit Price Deflator (USDOC-BEA). Note that the methodologies used in the two studies were different, so a strict comparison is not possible. Total operating revenues in Florida in 2020 were 79 percent higher than in 1999, both for honey bee products (67%) and pollination services (191%). Total economic contributions in 2020 were also significantly higher than in 1999 for output (49%), value added (53%), and employment (22%). The significantly greater revenues and economic contributions from pollination services reflects the growth and development of this part of the beekeeping industry.

Table 5-2. Economic contributions of the beekeeping industry in Florida in 2020 by major industry group.

NAICS Industry	Employment (Jobs)	Labor Income (Million \$)	Value Added (Million \$)	Output (Million \$)
11 Agriculture, forestry, fishing & hunting	1,998	\$2.70	\$6.63	\$7.25
21 Mining	0	\$0.01	\$0.06	\$0.15
22 Utilities	1	\$0.32	\$1.18	\$2.18
23 Construction	27	\$2.28	\$3.21	\$6.63
31-33 Manufacturing	18	\$2.39	\$3.54	\$14.81
42 Wholesale trade	10	\$0.92	\$2.12	\$3.43
44-45 Retail trade	36	\$1.77	\$2.96	\$4.70
48-49 Transportation & warehousing	30	\$3.12	\$4.11	\$8.98
51 Information	4	\$0.42	\$0.98	\$2.12
52 Finance & insurance	23	\$1.78	\$2.60	\$6.71
53 Real estate & rental	18	\$0.46	\$4.56	\$7.12
54 Professional- scientific & tech services	17	\$1.39	\$1.83	\$2.93
55 Management of companies	4	\$1.07	\$1.24	\$2.15
56 Administrative & waste services	24	\$1.13	\$1.21	\$2.23
61 Educational services	4	\$0.18	\$0.21	\$0.31
62 Health & social services	34	\$2.11	\$2.42	\$4.06
71 Arts- entertainment & recreation	6	\$0.19	\$0.30	\$0.49
72 Accommodation & food services	26	\$0.67	\$1.06	\$1.90
81 Other services	20	\$0.83	\$1.01	\$1.57
93 Non NAICS	0	\$0.00	\$0.00	\$0.00
92 Government	1	\$0.37	\$0.64	\$1.05
Total all industries	2,303	\$24.11	\$41.86	\$80.75

Values in million 2020 dollars. Employment represents fulltime and part-time jobs. Industries classified according to the North American Industry Classification System (NAICS).

Source: IMPLAN® model for State of Florida, 2019 (IMPLAN Group, LLC).



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Table 5-3. Government tax contributions of the beekeeping industry in Florida in 2020.

Tax Item	Amount (\$1000)
Dividends	\$12
Social ins tax- employee contribution	\$2
Social ins tax- employer contribution	\$3
TOPI: sales tax	\$1,431
TOPI: property tax	\$975
TOPI: motor vehicle licenses	\$20
TOPI: severance tax	\$1
TOPI: other taxes	\$190
TOPI: S/L non-taxes	\$106
Corporate profits tax	\$95
Personal tax: income tax	\$0
Personal tax: non-taxes (fines- fees)	\$77
Personal tax: motor vehicle license	\$19
Personal tax: property taxes	\$5
Personal tax: other tax (fish/hunt)	\$1
Total state and local tax	\$2,937
Social ins tax- employee contribution	\$1,422
Social ins tax- employer contribution	\$1,136
TOPI: excise taxes	\$198
TOPI: custom duty	\$160
TOPI: fed non-taxes	\$17
Corporate profits tax	\$323
Personal tax: income tax	\$2,337
Total federal tax	\$5,595
Total all taxes	\$8,532

Values in thousand 2020 dollars.

Source: IMPLAN® model for State of Florida, 2019 (IMPLAN Group, LLC).

Table 5-4. Economic contributions of the beekeeping industry in Florida, 1999 and 2020.

Metric	2020	1999	Percent Change
Revenues in Florida (million \$)	\$51.63	\$28.90	78.6%
Honey bee products (million \$)	\$43.48	\$26.10	66.6%
Pollination services (million \$)	\$8.15	\$2.80	190.7%
Output contribution (million \$)	\$67.60	\$45.26	49.3%
Value added contribution (million \$)	\$34.56	\$22.63	52.7%
Employment contribution (jobs)	2,215	806	174.8%

Values in million 2020 dollars; 1999 values inflation-adjusted using GDP Implicit Price Deflator (USDOC-BEA).

Source for 1999 study: Hodges et al, 2001.

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MEDICATION

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APPENDIX A: FLORIDA BEEKEEPER SURVEY 2021

This survey is being conducted by the **University of Florida-IFAS, Food and Resource Economics Department**, in collaboration with the **UF Honey Bee Research and Extension Laboratory**, and sponsored by the **Florida State Beekeepers Association**. The survey is part of a project to assess the economic contributions of the beekeeping industry in Florida. This information will be used by industry leaders, researchers, extension professionals, regulatory agencies, and policy makers in support of the beekeeping industry and Florida agriculture.

You are invited to fill-out this survey questionnaire to the best of your ability. All questions pertain to your beekeeping activities in 2020. The survey is voluntary, and you do not have to answer any questions that you do not wish to

answer. Your responses will remain strictly confidential. Information gathered in the survey will be released only as industry-wide totals or averages. There is no potential risk to you for participating in the survey. No direct compensation is provided to you for participation, however, your valuable time is duly acknowledged. The beekeeping industry at large will benefit from increased public awareness of its importance. Thank you for your consideration in this matter.

If you have questions about the survey, please contact the principal investigator: Dr. Christa D. Court, University of Florida, PO Box 110240, Gainesville, FL 32611, telephone 352-294-7675, email ccourt@ufl.edu; or contact the *University of Florida Institutional Review Board* at 352-392-0433 or ufirb2@ufl.edu.

1. Do you agree to take this survey? ____ Yes ____ No
If answered “No”, skip to end.

Beekeeping Operation Characteristics

2. How many years have you been a beekeeper? (enter number in blank)
Number years ____
3. Is beekeeping your main business activity? ____ Yes ____ No
4. What was the maximum number of honey bee colonies you owned or managed in Florida last year (2020) during peak and non-peak seasons, including production hives and nucs?
(enter numbers in blanks)
During peak season ____ colonies
During non-peak season ____ colonies
If answered question 4 with less than 20 hives during peak season, skip to question 11.
5. What was the number of people who worked for your operation last year (2020), including all fulltime and part-time employees, yourself and other family members, during peak and non-peak seasons? (enter numbers in boxes)
During peak season ____ employees
During non-peak season ____ employees
6. Did you own or manage honey bee colonies in any other state besides Florida last year?
____ Yes ____ No
If answered “No”, skip to question 11.
7. In which other states besides Florida did you own or manage honey bees last year?
(check any that apply)

List of States

____ Alabama	____ Idaho	____ Michigan	____ New York	____ Tennessee
____ Alaska	____ Illinois	____ Minnesota	____ North Carolina	____ Texas
____ Arizona	____ Indiana	____ Mississippi	____ North Dakota	____ Utah
____ Arkansas	____ Iowa	____ Missouri	____ Ohio	____ Vermont
____ California	____ Kansas	____ Montana	____ Oklahoma	____ Virginia
____ Colorado	____ Kentucky	____ Nebraska	____ Oregon	____ Washington
____ Connecticut	____ Louisiana	____ Nevada	____ Pennsylvania	____ West Virginia
____ Delaware	____ Maine	____ New Hampshire	____ Rhode Island	____ Wisconsin
____ Georgia	____ Maryland	____ New Jersey	____ South Carolina	____ Wyoming
____ Hawaii	____ Massachusetts	____ New Mexico	____ South Dakota	

8. Did you move any of your colonies between Florida and other states last year? ____ Yes ____ No
If answered “No”, skip to question 11.

9. What was the number of colonies or the percentage of peak number of colonies that were moved between Florida and other states last year? (enter number in one blank)
 Number of colonies _____
 Percentage of peak colonies _____ %
10. How many weeks did your colonies that were moved to other states remain in Florida last year?
 (enter number in blank) _____ weeks

Honey Bee Products and Markets

11. What was the quantity produced and average price received for the following honey bee products last year? (enter numbers in blanks)

Item	Production	Average Price
Honey	_____ lbs.	_____ \$/lb.
Comb honey	_____ lbs.	_____ \$/lb.
Beeswax	_____ lbs.	_____ \$/lb.
Packaged bees	_____ lbs.	_____ \$/lb.
Queens	_____ units	_____ \$/unit
Complete hives	_____ units	_____ \$/unit
Nucs (young colonies)	_____ units	_____ \$/unit
Other product(s)	_____ units	_____ \$/unit

Describe other product(s)

12. What percentage of your honey sales last year were to each of the following market outlets?
 (enter numbers in blanks; answers should sum to 100%; may estimate percentages)

Market Outlet	Percentage
Wholesale honey packer	_____ %
Cooperative	_____ %
Commercial sweetener users	_____ %
Retail stores	_____ %
Roadside stands/farmers markets	_____ %
Friends and neighbors	_____ %
Other markets	_____ %

Describe other markets

Don't know

If answered question 4 with less than 20 hives during peak season, skip to question 21.

13. What percentage of your honey bee product sales last year were to customers outside Florida?
(check appropriate range)

- 0%
- 1% to 19%
- 20% to 39%
- 40% to 59%
- 60% to 79%
- 80% to 99%
- 100%
- Don't know

Honey Bee Pollination Services

14. Did you provide honey bee crop pollination services last year? Yes No

If answered "No" skip to question 16.

15. How many honey bee colonies were contracted for pollination services and what was the average price received last year for each of the following crops in Florida? (enter numbers in blanks)

Crop Pollinated	Number Colonies	Average Price (\$/Colony)
Avocado	_____	_____
Blueberry	_____	_____
Cantaloupe	_____	_____
Cucumber	_____	_____
Peach	_____	_____
Pear	_____	_____
Pumpkin	_____	_____
Raspberry	_____	_____
Specialty citrus	_____	_____
Squash	_____	_____
Strawberry	_____	_____
Watermelon	_____	_____
Other crops	_____	_____
List other crops		

If question #8 answered "No", skip to question 17.

16. How many honey bee colonies were contracted for pollination services and what was the average price received last year for each of the following crops in other states? (enter numbers in blanks)

Crop Pollinated	Number Colonies	Average Price (\$/Colony)
Almond	_____	_____
Apple	_____	_____
Avocado	_____	_____
Blueberry	_____	_____
Canola	_____	_____
Cantaloupe	_____	_____
Cherry	_____	_____
Cranberry	_____	_____
Cucumber	_____	_____
Peach	_____	_____
Pear	_____	_____
Pumpkin	_____	_____
Raspberry	_____	_____
Specialty citrus	_____	_____
Squash	_____	_____
Strawberry	_____	_____
Tomato	_____	_____
Watermelon	_____	_____
Other crops	_____	_____
List other crops		

Operating Expenses and Capital Investment

17. Do you have detailed records available on operating expenses last year that you would be willing to share? ____ Yes ____ No

If answered “No”, skip to question 19.

18. What were your annual operating expenses for honey bee colonies last year in the following detailed cost categories? (enter dollar values in blanks)

Expense Catagories	Price
Labor (including payroll taxes and benefits)	\$ _____
H2A program costs (visa, travel, housing)	\$ _____
Packaged bees, queens, queen cells	\$ _____
Supplemental feed	\$ _____
Pesticides, antibiotics (to control pests/diseases)	\$ _____
Hive components/repairs & small tools	\$ _____
Fuel (gasoline, diesel, LPG)	\$ _____
Utilities (electric, water, sewer)	\$ _____
Equipment repair & maintenance	\$ _____
Freight & shipping	\$ _____
Product packaging & marketing	\$ _____
Building repair & maintenance	\$ _____
Office expense (telephone, computer, etc.)	\$ _____
Rent for land & buildings	\$ _____
Professional services (legal, accounting, brokers)	\$ _____
Insurance	\$ _____
Taxes	\$ _____
Travel, entertainment, meetings, education	\$ _____
Interest	\$ _____
Depreciation	\$ _____
Other item(s)	\$ _____
List other item(s)	

If answered question 18, skip to question 20.

19. If you did not have detailed information to share on operating expenses, please consider this more simple question: what was the share of total operating expenses for your beekeeping operation last year in the following cost categories? (enter percentages in blanks; answers should sum to 100%; may estimate)

Expense Catagories	Percentage
Labor: wages, payroll taxes, benefits	_____ %
Materials & Supplies: packaged bees, queens, feed, pesticides, antibiotics, fuel, packaging	_____ %
Overhead: utilities, repair & maintenance, shipping, of- fice, rent, professional services, insurance, taxes, travel, meetings, education, interest, depreciation	_____ %
Other items	_____ %
List other items	

20. What was the value of purchases made last year for the following types of beekeeping assets?
(enter dollar values in blanks)

List of purchases	Price
Hive bodies, components, pallets, other woodenware	\$ _____
Packaged bees, queens, queen cells	\$ _____
Complete colonies (hive bodies and bees)	\$ _____
Tools and protective equipment	\$ _____
Beeyard fencing	\$ _____
Trucks, trailers, loaders	\$ _____
Honey processing and other equipment	\$ _____
Buildings (processing plant, warehouse, office)	\$ _____
Other item(s)	\$ _____
Describe other	
Don't know	

Honey Bee Colony Losses and Threats to the Industry

21. Which of the following were causes of honey bee colony losses in your operation last year?
(check any that apply)

- Queen failure (premature death, improper mating, drone layer, etc.)
- Varroa destructor
- Other pests and parasites (tracheal mites, Nosema, small hive beetle, wax moth, etc.)
- Brood Diseases (American or European foulbrood, stonebrood, sacbrood)
- Viral Diseases (Kashmir Bee Virus, Deformed Wing Virus, Israeli Acute Bee Paralysis Virus, etc.)
- Pesticides
- Predators (bears, skunks, etc.)
- Weather
- Starvation, lack of forage
- Hive destruction
- Colony Collapse Disorder
- Theft
- Other stressors-describe _____
- None
- Don't know

If "none" selected, skip to question 23.

22. What percentage of your honey bee colonies were lost last year? (check appropriate range)

- 0%
- 1% to 19%
- 20% to 39%
- 40% to 59%
- 60% to 79%
- 80% to 100%
- Don't know

23. Rate the importance of the following possible threats facing the beekeeping industry in Florida (check appropriate column).

Threat	Extremely Important	Somewhat Important	Not Important
Low prices/competition from imported honey			
High costs of operation			
Lack of domestic employees			
Difficulties of using foreign (H2A) workers			
Lack of suitable honey bee colony sites			
Adulteration of honey with other sweeteners			
Pesticide exposure and honey contamination			
Colony losses to Varroa, other pests, and diseases			
Resistance to pesticides for control of mites			
Low recruitment of new beekeepers to the industry			
Lack of education available for beekeepers			
Other threats			
Describe other threat(s)			

24. How did the Covid-19 pandemic affect your beekeeping operation during 2020-21? (check any that apply)

- Increased costs for safety protocols
- Decreased revenues due to loss of market
- Difficulty finding employees
- Operator, family or employee illness
- Other-describe _____
- Did not affect
- Don't know

Income from Beekeeping Operations

25. What were your total revenues last year (2020) from honey bee products, crop pollination services or other services? (enter dollar values in blanks)

- Honey bee products (including packaged bees/queens, crop insurance) \$ _____
- Crop pollination services \$ _____
- Other services such as education or tours \$ _____
- Don't know
- Prefer not to answer

If answered with dollar values or "don't know", skip to question 27.

26. If you did not answer the previous question on specific values for annual income, please check the appropriate range below representing your beekeeping revenues from all sources last year.

- Less than \$1,000
- \$1,000 to \$9,999
- \$10,000 to \$49,999
- \$50,000 to \$99,999
- \$100,000 to \$299,999
- \$300,000 to \$499,999
- \$500,000 to \$999,999
- \$1.00 to \$2.49 million
- \$2.50 to \$4.99 million
- \$5.00 to \$9.99 million
- \$10 million or more
- Prefer not to answer

27. Did you engage in any bartering without monetary compensation last year for honey bee products, pollination or other services such as tours or education? Yes No

If answered "No", skip to question 29.

28. Which of the following types of bartering or exchanges without compensation did you engage in last year? (check any that apply)

- Shared honey bee products with friends or family
- Shared honey bee products with landowner of colony sites
- Provided hives, honey bees or queens to beginning beekeepers
- Provided crop pollination services
- Provided tours or public education about honey bees
- Other-describe _____

29. Please provide any comments you wish to share about the Florida beekeeping industry and its economic impacts in your community in the space below.

End of survey. Thank you for you participation!

APPENDIX B: SUMMARY OF REGISTERED FLORIDA BEEKEEPERS BY LOCATION

Number of registered Florida beekeepers, number with email addresses for survey, and number of colonies in inventory, by county and other states, 2021.

Florida County/Other State	Number Registered	Number for Survey via Email	Colony Inventory
Alachua	162	159	19,542
Baker	17	15	6,163
Bay	74	69	1,068
Bradford	19	17	2,086
Brevard	173	162	52,900
Broward	212	189	6,134
Calhoun	18	13	939
Charlotte	46	42	9,583
Citrus	50	47	3,868
Clay	83	77	494
Collier	55	47	4,526
Columbia	34	29	3,097
Desoto	12	10	8,180
Dixie	11	7	4,570
Duval	209	184	3,513
Escambia	127	108	2,024
Flagler	27	25	485
Franklin	9	8	94
Gadsden	25	22	1,168
Gilchrist	28	26	533
Glades	9	7	3,157
Gulf	23	19	5,399
Hamilton	10	9	251
Hardee	9	8	5,076
Hendry	22	20	11,912
Hernando	46	41	4,343
Highlands	45	40	8,280
Hillsborough	264	247	9,112
Holmes	28	20	4,045
Indian River	56	53	12,671
Jackson	41	35	1,481
Jefferson	22	20	439
Lafayette	6	4	98
Lake	141	130	33,994
Lee	181	170	23,683
Leon	130	121	1,850
Levy	32	28	1,615
Liberty	35	26	20,574

Florida County/Other State	Number Registered	Number for Survey via Email	Colony Inventory
Madison	17	16	140
Manatee	87	83	25,439
Marion	101	82	4,884
Martin	55	50	10,468
Miami-Dade	250	222	20,085
Monroe	29	26	449
Nassau	64	58	1,532
Okaloosa	101	85	3,633
Okeechobee	11	9	2,876
Orange	148	142	4,010
Osceola	46	46	2,215
Out of State	13	12	152
Palm Beach	261	240	31,210
Pasco	110	108	4,148
Pinellas	275	265	2,261
Polk	128	117	26,805
Putnam	53	46	1,175
Santa Rosa	80	68	570
Sarasota	84	80	3,623
Seminole	92	84	719
St. Johns	109	100	1,276
St. Lucie	48	46	13,594
Sumter	20	19	4,129
Suwannee	41	37	4,257
Taylor	15	11	444
Union	9	8	67
Volusia	112	105	13,672
Wakulla	47	33	8,524
Walton	48	33	2,170
Washington	17	10	1,773
Total Florida Counties	4,962	4,495	475,247
Other States			
Alabama	3	2	90
California	7	7	36,618
Connecticut	2	2	193
Georgia	56	50	31,093
Iowa	1	1	600
Idaho	1	1	3
Illinois	3	3	2,380
Indiana	8	7	2,892
Kansas	1	1	9,000
Kentucky	7	7	2,834
Massachusetts	3	3	811
Maine	7	5	1,763

Florida County/Other State	Number Registered	Number for Survey via Email	Colony Inventory
Michigan	30	30	43,103
Minnesota	1		300
Missouri	2	2	400
Mississippi	2	2	850
North Carolina	10	9	8,432
North Dakota	1	1	3,600
New Jersey	4	4	9,396
New York	12	10	4,850
Ohio	7	6	2,309
Pennsylvania	11	10	16,351
South Carolina	3	3	560
South Dakota	2	1	1,100
Tennessee	8	8	3,840
Texas	3	3	3,510
Utah	1	1	1
Virginia	3	3	3,550
Vermont	1	1	500
Washington	2	2	5,300
Wisconsin	8	8	4,830
West Virginia	2	2	1,125
Total other states	212	195	202,184
Total all U.S. regions	5,174	4,690	677,431

Source: Florida Department of Agriculture and Consumer Services, Apiary Inspection Service, list of registered beekeepers, August 2021.





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On the cover: Bee keeper attending to bees. Photo credit World Honey Market.

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