July 20, 2018

NYS Beekeeper Tech Team

2017 Beekeeping Business Benchmark

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Acknowledgements

We gratefully acknowledge the beekeepers who shared their financial records to support this project. Special thanks to Mark Cannella with UVM Extension, Dan Welch with NY FarmNet, and Jason Karszes with PRO-DAIRY for sharing their knowledge on developing financial benchmarks for farm businesses. This project was funded by the New York State Environmental Protection Fund in support of the statewide Pollinator Protection Plan.

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Introduction

New York State's agricultural economy is critically dependent on insect pollination, which is valued at $500 million annually. Concerns about pollinator health and honey bee colony declines have stimulated a growing interest in the economic health and sustainability of the state's beekeeping industry. In 2017 the NYS Beekeeper Tech Team launched its Financial Analysis and Business Benchmarking (FABB) program for beekeepers, with the goal of evaluating and enhancing the financial health and viability of individual beekeeping businesses.

The 2017 Beekeeping Business Benchmark is the result of the first year of data collection and analysis completed through the FABB program. The NYS Beekeeper Tech Team worked with nine honey producers to complete financial analyses of their operations. Participants each received a detailed financial summary of their business, including a beginning and ending balance sheet, an income statement, and a summary of key performance indicators.

A benchmark is defined as a standard, or point of reference, against which individual outcomes may be compared and evaluated. This report presents benchmarks for the economic performance of beekeeping businesses, developed by aggregating and analyzing financial data from the nine participating beekeepers. The original FABB participants represent a small sample of New York State beekeepers. In 2017 the FABB program recruited participants operating as sideliner beekeepers, managing fewer than 500 colonies. One future goal is to expand the program to include larger commercial operations.

Terms and Definitions

Accrued expenses. Expenses that the business incurs during the current production year but does not pay until the following year.

Accrued income. Revenue that the business earns during the current production year, but does not receive until the following year.

Average. The central or typical value in a set of numbers. This report uses both the mean and the median (defined below) to represent average values.

Cost of production (COP). The total value of all production inputs used in the course of normal business operations to generate goods and services. This report uses three different COP measurements:

1. *COP from Operations*. Equal to the sum of variable costs, fixed costs, and accrued expenses.
2. *COP with Depreciation*. Equal to the sum of variable costs, fixed costs, accrued expenses, and annual depreciation.
3. *Full Economic COP*. Equal to the sum of variable costs, fixed costs, accrued expenses, annual depreciation, and unpaid operator and family labor.

Depreciation. The annual depreciation expense is obtained by dividing the purchase price of capital assets (assets with a useful life of more than one year) by an average lifespan. This report does not account for accelerated depreciation taken for tax purposes.

Fixed (overhead) costs. Costs of running a business that remain stable regardless of the production output. In this analysis, fixed costs include insurance, rental payments, interest payments, taxes, utilities, repairs and maintenance. Fixed costs also include office expenses, professional services, license and registration fees, association dues and educational expenses.

Intermediate assets. The total value of hive equipment, vehicles, and other machinery and equipment with a useful life greater than one year. The value of real estate improvements, including barns, sheds and other structures, is excluded from intermediate assets in this analysis.

Investment. Equal to the historical purchase price of all intermediate assets, excluding real estate improvements, owned by the business as of December 31, 2017.

Mean. The sum of all reported values divided by the total number of reported values.

Median. The middle value in a set of values. Half of reported values in the set are greater than the median, and the other half are less than the median.

Net Farm Income (NFI). This measure of profitability equals the Total Adjusted Income minus the Full Economic Cost of Production, which accounts for the value of operator and family labor.

Net Farm Income from Operations (NFIFO). Equal to Total Adjusted Income minus the Cost of Production with Depreciation. NFIFO is a common measure of farm profit that does not account for the value of unpaid operator and family labor.

Total adjusted income. This measure of revenue represents the total value of production in 2017. It includes cash income; plus the value of products used for gifts, trade or home consumption; plus accrual adjustments based on changes in colony counts, product inventory, supplies inventory, accounts receivable, and prepaid expenses.

Unpaid operator and family labor. The value of unpaid labor represents a significant cost of production that often goes unexamined, particularly when a small or mid-size beekeeper has additional sources of income. In this analysis, operator labor is valued at $20/hour, or $40,000 annually for a full-time operator, while family labor is valued at $10/hour. Unpaid operator and family labor provides an estimate of the value of management (time and expertise) in 2017.

Variable (Direct) Costs. Business expenses that fluctuate depending on the level of production. For beekeepers, direct costs are those that fluctuate depending on the number of colonies managed, pounds of honey produced, or acres of cropland pollinated. This analysis considers feed, medicine, bees, veterinary expenses, supplies, transportation, and paid labor to be variable costs.

Financial Ratios

Asset Turnover Ratio. Equal to Total Adjusted Income divided by Average Total Assets. This ratio measures how efficient a business is at generating income from the assets that it owns. For instance, a ratio of 0.35 indicates that each dollar of business assets generates 35 cents of income.

Operating Expense Ratio. Equal to COP from Operations divided by Total Adjusted Income. This ratio indicates the percentage of the total adjusted income that is allocated to fixed and variable operating expenses, excluding depreciation. For instance, a ratio of 0.25 indicates that 25 cents of every dollar of business income goes to pay for operating expenses.

Depreciation Expense Ratio. Equal to the annual Depreciation Expense divided by Total Adjusted Income. This ratio indicates the percentage of the total adjusted income that is consumed by depreciation in a given year. For instance, a ratio of 0.10 indicates that 10 cents of every dollar of business income are offset by depreciation.

NFIFO Ratio. Equal to NFIFO divided by Total Adjusted Income. This ratio indicates the percentage of total adjusted income that is retained by the business as profit. For instance, a ratio of 0.60 indicates that 60 cents of every dollar of income are retained as profit.

Participant Overview

Nine beekeepers completed the financial analysis for the 2017 financial year. The section below describes key characteristics of the beekeepers and their operations.

Honey Bee Colonies

- Fewer than 50 colonies: 1 respondent
- 50 - 99 colonies: 5 respondents
- 100 - 350 colonies: 3 respondents

Apiary Products

- All 9 beekeepers produced and sold liquid honey
- 8 beekeepers produced and sold beeswax
- 2 beekeepers produced and sold comb honey
- 2 beekeepers produced and sold pollen
- 2 beekeepers produced and sold propolis

Nucleus Colony & Queen Production

- 4 beekeepers produced and sold nucleus colonies
- 1 beekeeper produced and sold queens

Pollination

- 1 beekeeper provided commercial pollination services to apple growers, yet this was a minor source of income for the business

Overwintering

- All 9 beekeepers overwintered colonies in New York State

Beekeeping Experience

- 2 beekeepers had fewer than 10 years of beekeeping experience
- 2 beekeepers had between 10 and 19 years of beekeeping experience
- 5 beekeepers had more than 40 years of beekeeping experience

Primary Occupation and Income Source

- 7 beekeepers reported beekeeping as their primary occupation
- 2 beekeepers reported beekeeping as their primary source of income

Results

Honey Prices

Overall, beekeepers reported a mean honey price of $5.38 per pound. There was considerable variation in sale price according to operation scale and market channel. Producers with 100 to 350 colonies sold the majority of their honey by the 55-gallon barrel in wholesale markets for $2.68 per pound, on average. Alternatively, most producers with fewer than 100 colonies sold a majority of their honey directly to consumers in retail markets for $6.73 per pound, on average. Small honey producers added value by packaging and labeling their own honey products, while some created additional value-added goods including candy, granola, soap, lip balm, candles, and more.

Table 1. Honey Price ($/lb)

	Range		Average	
Measurement (9 observations)	Min	Max	Mean	Median
Honey price	$2.30	$12.00	$5.38	$5.00

Table 2. Honey Price ($/lb) by Operation Size

	Range		Average	
Operation Size	Min	Max	Mean	Median
Fewer than 100 colonies	$4.00	$12.00	$6.73	$6.20
100 - 350 colonies	$2.30	$3.00	$2.68	$2.73

Productivity

Productivity refers to the level of productive output per unit of input. Using a single colony as a standard unit of input facilitates comparisons across operations of different sizes. In our sample, two beekeepers reported honey yields over 100 pounds per colony, while thee reported yields lower than 40 pounds per colony. This productivity gap has economic implications. A 60-pound yield increase could translate into a revenue increase of $300 or more per colony.

Low honey yields may reflect a focus on other productive activities, such as colony splits or pollination. Reduced yields may also indicate high winter losses, and a corresponding need for colony replacement. Poor forage availability or substandard management practices may also limit honey yields.

Table 3. Honey Yield (lb/colony)

	Range		Average	
Measurement (9 observations)	Min	Max	Mean	Median
Honey yield	30	118	61	52

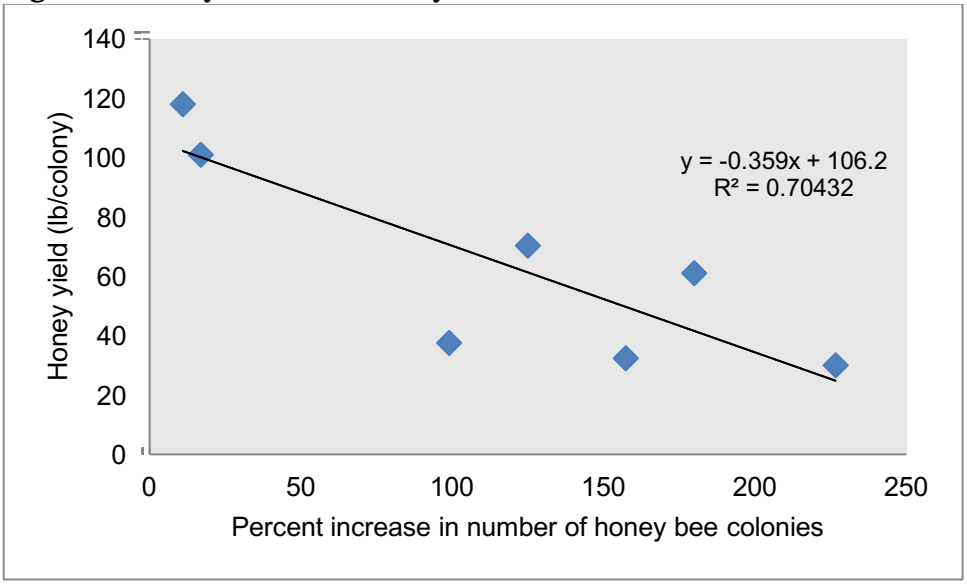
Table 4. Honey Yield (lb/colony) by Operation Size

	Range		Average	
Operation Size	Min	Max	Mean	Median
Fewer than 100 colonies	30	118	63	56
100 - 350 colonies	33	101	57	38

Figure 1 illustrates the tradeoff between making honey and making bees. The percentage increase in the number of honey bee colonies, shown on the horizontal axis, equals the number of increases from April 1 to October 1 divided by the starting number of colonies on April 1, then multiplied by 100. For example, an operation that doubled its colony count from 30 to 60 colonies between April 1 and October 1 would show a 100% increase in the number of colonies. An operation that tripled in scale over the same period, from 20 to 60 colonies, would show a 200% increase.

Most of the beekeepers in our sample reported colony increases between 100% and 250% of their starting colony counts. Notably, the two operations with honey yields greater than 100 pounds per colony grew the least in 2017, increasing their colony counts by less than 20%. The line of best fit in Figure 1 predicts that increasing the growth rate by 10 percentage points will reduce honey yield by 3.6 lbs per colony, on average.

Figure 1. Honey Yield vs. Colony Increases in 2017



Note: Two operations with colony increases over 500% were excluded from this figure due to their atypically high growth rate, which reflects a management emphasis on rapid operation expansion.

Revenue

In this analysis we use **total adjusted income** as our measure of revenue. In addition to cash income, total adjusted income includes the value of products used for gifts, trade or home consumption, plus accrual adjustments based on changes in colony counts, product inventory, supplies, accounts receivable, and prepaid expenses. Thus, total adjusted income represents the true economic value of production for the 2017 financial year. It is important to consider the total value of production for the year, rather than total sales, because honey sold in the current year was often produced in the previous year. Using total adjusted income allows for comparing the total cost of production with the total value of production for the same time period.

Per-colony revenues vary by operation scale, with larger operations generating less revenue per colony. This pattern reflects scale-dependent differences in honey prices and market channels,

with smaller producers earning more per colony due to their emphasis on direct marketing and value added processing activities.

Table 5. Revenue ($/colony)

	Range		Average	
Measurement (8 observations)	Min	Max	Mean	Median
Total adjusted income	$291	$1,220	$544	$462

Table 6. Revenue ($/colony) by Operation Size

	Range		Average	
Operation Size	Min	Max	Mean	Median
Fewer than 100 colonies (retail)	$433	$1,220	$667	$517
100 - 350 colonies (wholesale)	$291	$388	$340	$340

Investment

In order to operate a business, beekeepers must invest in a variety of durable assets, including hive woodenware and equipment for extracting, bottling, and transporting honey. This section reports beekeeper investment in intermediate assets on a per-colony basis. Investment is equal to the historical purchase price of all intermediate assets (hive woodenware, vehicles, and equipment) owned by the business. In this analysis, the value of real estate improvements, including barns, sheds and other structures, is not counted as investment.

Average investment was $654 per colony. Although beekeepers with 100 to 350 colonies had greater total investment than the smaller producers, their investment was used to support more colonies. Thus, beekeepers with more colonies had lower per-colony investment, on average.

Table 7. Investment ($/colony)

	Range		Average	
Measurement (9 observations)	Min	Max	Mean	Median
Intermediate assets	$177	$1,258	$654	$662

Table 8. Investment ($/colony) by Operation Size

	Range		Average	
Operation Size	Min	Max	Mean	Median
Fewer than 100 colonies	$177	$1,258	$778	$723
100 - 350 colonies	$256	$662	$405	$297

Cost of Production

The total cost of production (COP) can be broken down into several categories, including variable costs, fixed costs, depreciation, and management. This section presents production costs in each of these categories, followed by three measures of the total COP. The value of unpaid operator and family labor represents the cost of management.

Production costs are presented on a per-colony basis (Table 9), which can be compared with per-colony revenues (Table 5). For a business to be profitable, per-colony revenues must exceed per-

colony costs. Production costs are also presented in terms of dollars per pound of honey production (Table 10), which can be compared with honey prices (Table 1). For a business to be profitable, the honey price per pound must exceed the cost of production per pound.

Table 9. Costs of Production ($/colony)

	Range		Average	
Measurement (7 observations)	Min	Max	Mean	Median
Variable (direct) costs	$41	$627	$256	$190
Fixed (overhead) costs	$16	$434	$119	$61
Depreciation expense	$23	$232	$77	$33
Unpaid operator & family labor	$123	$1,640	$694	$513
COP from Operations	$61	$1,043	$372	$329
COP with Depreciation	$94	$1,066	$449	$419
Full Economic COP	$217	$2,706	$1,143	$932

Table 10. Costs of Production ($/lb)

	Range		Average	
Measurement (7 observations)	Min	Max	Mean	Median
Variable (direct) costs	$0.57	$10.11	$4.12	$3.79
Fixed (overhead) costs	$0.24	$7.01	$1.97	$1.16
Depreciation expense	$0.23	$2.35	$1.23	$1.24
Unpaid operator & family labor	$1.59	$36.84	$13.62	$9.08
COP from Operations	$1.14	$16.82	$6.05	$5.00
COP with Depreciation	$1.37	$17.19	$7.28	$6.28
Full Economic COP	$2.97	$43.64	$20.90	$17.38

Profitability

Profitability is defined as the extent to which a beekeeping business generates revenues in excess of its expenses. This analysis uses two different measures of business profit (Table 11). Net Farm Income from Operations (NFIFO) is the profit remaining after accounting for all operating expenses, including depreciation. A positive NFIFO value indicates that a business is profitable in the short term, as business revenues cover operating expenses, including the replacement of capital assets.

Net Farm Income (NFI) is a better indicator of long-term profitability because it accounts for all operating expenses plus the cost of management. To be truly financially sustainable, a business must be able to compensate owner-operators for their time and expertise. In this analysis we calculate a management cost equal to the value of unpaid operator and family labor. A positive NFI indicates that business revenues can cover costs of operations and management.

As with other financial indicators presented in this analysis, profitability outcomes vary by operation size. Most beekeepers in the sample reported a positive NFIFO in 2017, yet only the operations with 100 to 350 colonies reported positive NFI values.

Table 11. Farm Profit ($/colony)

Measurement (7 observations)	Range		Average	
	Min	Max	Mean	Median
Net Farm Income from Operations (NFIFO)	-$394	$404	$131	$195
Net Farm Income (NFI)	-$2,034	$171	-$573	-$475

Table 12. Net Farm Income from Operations ($/colony) by Operation Size

Operation Size	Range		Average	
	Min	Max	Mean	Median
Fewer than 100 colonies	-$394	$404	$86	$98
100 - 350 colonies	$195	$294	$244	$244

Table 13. Net Farm Income ($/colony) by Operation Size

Operation Size	Range		Average	
	Min	Max	Mean	Median
Fewer than 100 colonies	-$2,034	-$415	-$841	-$492
100 - 350 colonies	$26	$171	$98	$98

Financial Efficiency

Financial efficiency refers to the extent to which dollars invested in business assets generate business revenues. The asset turnover ratio addresses this concept by dividing total adjusted revenue by total assets. For beekeepers in our sample, one dollar of total assets generated 58 cents of revenue, on average. As a general rule, an asset turnover ratio of 60% or higher is considered to be an efficient use of assets. However, an extremely high asset turnover ratio may point to under-investment and associated labor inefficiencies.

Table 14. Financial Efficiency Ratios

Measurement (7 observations)	Range		Average	
	Min	Max	Mean	Median
Asset Turnover Ratio	0.20	1.41	0.65	0.59

Revenue Allocation

The ratios presented in Table 17 show the percentage of total adjusted income that is allocated to operating costs, depreciation expenses, and business profits, respectively. A high Operating Expense Ratio, or a low NFIFO Ratio, indicates that expenses are relatively high and operators should look to cut costs. New beekeeping operations, and those experiencing rapid growth, are likely to show a high Depreciation Expense Ratio. Maintaining and using older equipment can reduce the Depreciation Expense Ratio for mature beekeeping businesses.

Table 15. Revenue Allocation Ratios

Measurement (7 observations)	Range		Average	
	Min	Max	Mean	Median
Operating Expense Ratio	0.16	1.55	0.60	0.48
Depreciation Expense Ratio	0.03	0.22	0.12	0.09
NFIFO Ratio	-0.59	0.76	0.29	0.33

Management Implications

Colony Productivity and Replacement

Beekeepers face management tradeoffs between producing honey, commercial pollination services, and new colonies. Operations undergoing rapid growth will prioritize making new colonies, which may come at the expense of honey yields. A beekeeper focusing on colony increases may lose out on potential honey revenue in the short term, while growing business assets and expanding productive capacity in the long run. Beekeepers who suffer high colony losses may be forced to forgo potential revenues from honey production or pollination in order to rebuild their numbers. The ideal number of colonies, and the exact pace of growth, are strategic decisions that depend on a beekeeper's overarching goals, resources, and marketing preferences.

Market Channel Selection and Profitability

The primary marketing decision facing small and mid-size beekeepers can be summed up as volume vs. value. Both production output and market channel are closely linked to operation scale. Small-scale operations managing fewer than 100 colonies tended to sell high-value products direct to consumers through retail outlets. This marketing strategy generates higher sale prices and higher revenues per colony. However, it also produces higher costs per colony, due in part to the expenses associated with value-added processing and direct marketing. Furthermore, small-scale beekeepers have fewer productive colonies across which to spread their overhead costs. This is especially evident when we consider the cost of management. While several of the small-scale beekeepers in our sample recorded positive Net Farm Income from Operations (NFIFO) in 2017, not a single one was profitable if we account for the value of operator labor.

Mid-size operations managing 100 to 350 colonies sold most of their honey by the barrel in wholesale markets. These beekeepers received lower per-pound prices for their honey, and generated less revenue per colony. However, they also reported lower production costs per colony. Importantly, the three operations that harvested honey from at least 200 colonies generated enough revenue to cover their cost of management. These operations all recorded positive Net Farm Income in 2017, which signals long-term profitability and financial sustainability.

Investment and Depreciation

This analysis shows high variation in per-colony investment, with some beekeepers investing more than $1,000 per colony in intermediate assets, and others investing less than $200 per colony. While we cannot specify ideal cutoffs for investment in equipment and machinery, both overinvestment and underinvestment can cause economic inefficiencies. Beekeepers who select equipment that is appropriately scaled for their business are likely to avoid this pitfall.

Low per-colony investment may cause labor inefficiencies by substituting manual labor for work that would otherwise be done automatically. Underinvestment may also cause production inefficiencies by creating bottlenecks in production processes. For example, undersized extraction equipment can dramatically raise the amount of operator labor needed to process honey. Any bottleneck that extends the extraction process may increase the risk that small hive beetles will damage the unextracted honey. Thus, low investment may result in labor and/or production inefficiencies with potential to hinder business profitability and growth.

High per-colony investment may be appropriate for beekeepers that produce high-value products. In some cases, high investment may indicate that a business is initiating a period of expansion. However, operators with high investment levels should examine whether or not they are fully utilizing their machinery and equipment. Beekeepers with oversized equipment may consider increasing their level of production to more fully utilize their existing assets. Alternatively, some beekeepers may be able to generate additional revenue by renting out the equipment or using it to provide a service for others.

Depreciation is an important business expense that links historical investment decisions to present day profits. Depreciation costs are determined not only by the initial cost of business assets, but also the length of time the assets are in use. Mature beekeeping businesses that have operated for several decades have the advantage of lower depreciation costs, as much of their equipment has already been fully depreciated. Repairing and maintaining productive assets so they can be used beyond their expected lifespan will reduce depreciation costs in the long run.

Labor Management

Unpaid operator and family labor is a significant production input for small and mid-size beekeeping operations. In contrast, hired labor makes up a tiny or nonexistent portion of total labor at this scale. Only three beekeeping operations, those that harvested honey from at least 200 colonies, were profitable when we account for operator labor valued at $20 per hour. Thus, beekeepers managing fewer than 200 colonies struggle to adequately compensate themselves. Unpaid operator labor is accepted as a necessary investment for small and growing farm businesses. However, a business must eventually compensate operator labor to be economically profitable and financially sustainable in the long run.

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