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Northeastern United States Maple Syrup Production and Economics: A 2019 Survey of Producers

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Introduction

The United States annual maple syrup crop doubled in size from 2010 – 2020. Over the same ten-year period the annual farm-gate value of U.S. maple syrup has increased from roughly $90M to $130M (USDA, 2020). Continued expansion of this specialty crop brings opportunities for rural employment across the entire Northern Forest Region (Becot et al., 2015; Gabe, 2014) and ample forest resources are available in key production states to support this growth (Matthews & Iverson, 2017, Farrell & Chabot, 2012).

Bulk syrup market prices dropped by 30% from 2013-2018 (Perkins, Isselhardt & Van Den Berg, 2015). The record-high maple syrup prices at or over $3.00 (USD) per pound from 2009-2013 that fueled significant industry growth declined to prices near to $2.00 (USD) per pound by 2019 largely due to a change in the United States-Canadian currency exchange rates and multiple strong crop yields. Concerns in the U.S. mounted from 2016-2018 when, following record-high domestic production, producers experienced pay-price reductions. Simply put, the syrup supply was growing faster than market demand (Cannella & Lindgren, 2018). This price decline prompted a number of questions about the economic position of maple enterprises now and into the near future.

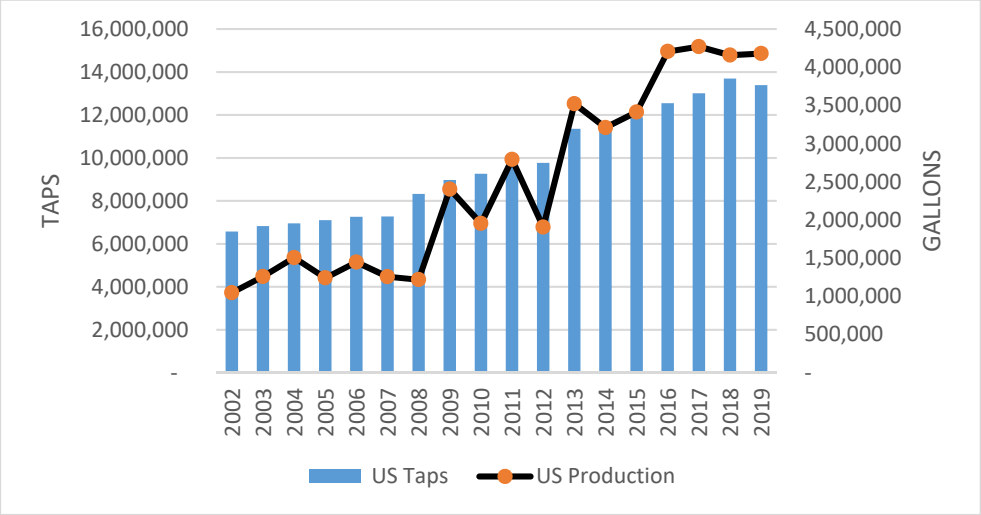


Figure 1: United States maple syrup taps and annual production 2002-2019 (NASS, 2020)

As dramatic as the growth in U.S. maple production may be, the growth in certified organic maple production has been even greater. Between 2008 and 2019 the data shows total U.S. organic syrup production increased from approximately 500,000 gallons to just over 2.6 million gallons (Figure 2). Consumer demand and a premium paid for organic bulk syrup are thought to be two of the leading drivers for the increase in production. Industry experts believe this demand will continue (Carbonetti et al 2020).

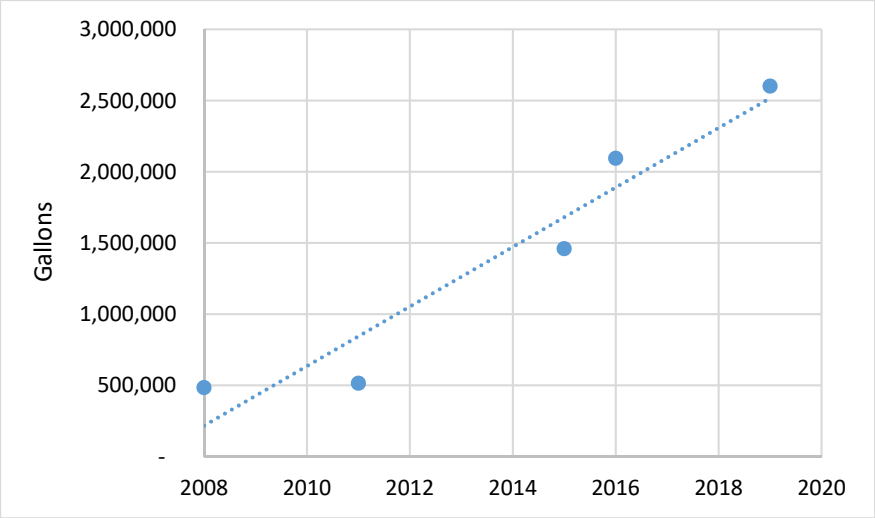


Figure 2: United States organic maple syrup production 2008-2019 (USDA NASS, 2019)

Modern maple producers have adopted new production technologies that increase yield and increase the labor efficiency within these enterprises. High vacuum tubing systems to collect sap and reverse osmosis technology to concentrate sap sugar content in the processing facility are the major production innovations that have enhanced yield and streamlined labor to a level that has enabled stronger performing business models that differ from less profitable ventures of the recent past. Maple producers are also innovating with new marketing strategies to emphasize the unique elements of this specialty crop. Fueled by increased consumer interest in lightly processed natural sweeteners or high fructose corn syrup substitutes (Eggleston et al., 2021) maple and other sweeteners are positioned for sustained demand growth. Large crops and expanded production in primary maple states have also influenced stronger market competition for buyers (Vermont Sustainable Jobs Fund, 2020). With more syrup and more producers promoting a similar product there is a trend toward market innovation in various forms. The established bulk syrup market with packers that redistribute syrup nationally is essential in large production states and this market channel continues to expand in order to move the majority of the U.S. maple crop as pure maple syrup (Figure 3). Some producers choose to differentiate their product offering through packaging, branding and non-syrup formats to capture sales in both direct and wholesale market channels. Confections, sap beverages and infused syrups are a few examples of the new product categories that maple is sold through.

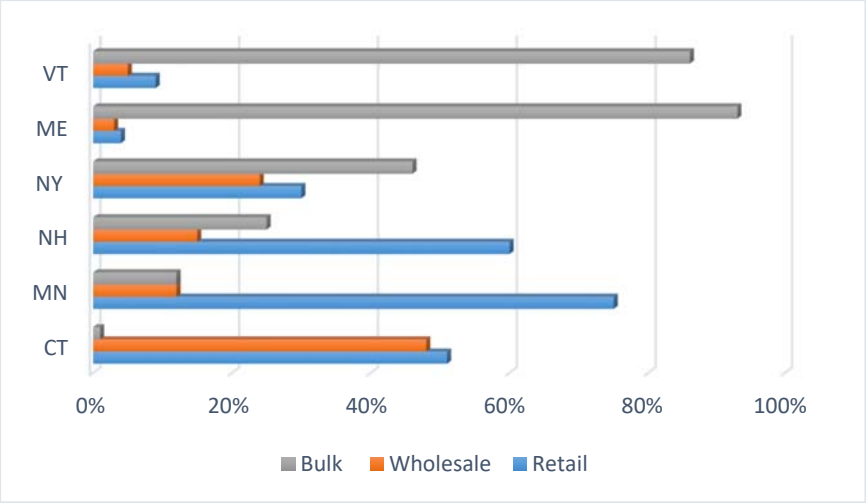


Figure 3: Percentage of 2015 U.S. annual state crop sold in various market channels (USDA NASS, 2017)

Methods

A survey of northeastern maple syrup producers was completed to explore factors of business scale, economic viability, organic production and the outlook for the maple crop in the coming years. The University of Vermont conducted a regional survey of northeastern maple producers using a convenience sample procedure. The UVM Institutional Review Board reviewed the survey instrument and it was approved as an exempt social science survey. The survey was adapted into an online format using Survey Monkey™. Respondents for the convenience sample were recruited by sharing an advanced notice 7-10 days prior to survey distribution followed by the online full survey distribution. Advance notice and the active survey link were distributed via newsletters and network email lists through the following collaborators: a) Vermont Maple Sugar Makers Association, b) New Hampshire Maple Producers Association, c) New York State Maple Producers Association and maple research specialists at University of Vermont, Cornell University and University of Maine. Survey responses were collected online from September 1, 2019 to October 30, 2019. The aggregate total of active maple producers on this list was approximately 2,500 maple producers after removing non-producing association members. Completed surveys were returned by 312 maple producers.

Demographics

The three states with the largest number of responses were Vermont (34%), New York (25%) and New Hampshire (11%) making up seventy percent of the total responses. Thirteen percent of respondents chose not to disclose the location of business operations. Additional Northeastern states with responding businesses included Massachusetts (5%), Maine (4%) and Pennsylvania (4%). Additional states accounted for less than four percent of total responses analyzed.

A Bachelor's Degree was the most common level of education completed (28%). The next most common highest level of education completed by respondents were High School Diploma (22%), Associate Degree (21%) and Master's Degree (16%).

Ninety-six percent of respondents were male and the survey did not collect the genders of additional business partners. Over half of respondents (52%) were operating businesses as a single owner with an average age of 55 years old. Businesses with two owners comprised thirty-three percent of responses and a smaller percentage of respondents (11%) indicated the business had three owners. The average age of the second business owner was 52 years old and the average age of the third business owner was 44 years old.

Business Information

Employment

Respondents provided information on the number and type of paid employees within their business. The most common type of employment was Seasonal Part-Time (less than 30 hours per week). Thirty-six percent of respondents indicated the presence of paid Seasonal Part time employees. A smaller number of respondents indicated the presence of Full Year-Full Time, Seasonal-Full Time and Full Year-Part Time employees (Table 1).

Table 1: Presence of paid employment categories within maple businesses

	Percent of Respondents
Full Year- Full Time	15%
Full Year- Part Time	9%
Seasonal- Full Time	18%
Seasonal- Part Time	36%

Number of Maple Taps and Land Use

The survey asked respondents about the number of active maple taps in operation in the 2018 and 2019 sap collection seasons. Respondents reported a total of 1,174,289 taps in 2018 on 29,221 acres of forestland. The 2019 total tap count for this group was 1,244,315 taps on 30,164 acres of forest land. A summary of taps, acres and yields reported in this survey is shown in Table 2. Nineteen percent (19%) of the total taps in 2019 were drilled into red maple trees (*Acer rubrum*).

The survey captured the wide range of production scale and thus, the wide range of participants that identify as maple producers and participate in the networks linked to maple syrup. The majority of producers (82%) raised maple sap or syrup on less than 5,000 taps. Only 18% of producers make up the larger tap number groups above 5,000 taps.

Crop Distribution

Looking into more detailed tap count groups, the survey shows the smaller number of producers that are operating at larger scales above 5,000 taps (Table 3). This small group of producers is responsible for the majority of the maple crop produced by respondents in the survey in both 2018 and 2019. Figure 4 demonstrates that the 18% of respondents that manage 5,000 taps or more produced 81% of the 2019 annual crop recorded across all respondents to this survey.

Table 2: Maple production, land use and crop production from survey respondents

	2018	2019
Taps	1,174,289	1,244,315
Acres	29,221	30,164
Gallons Syrup Produced	408,274	448,019
Pounds Syrup Produced	4,547,356	4,990,036
Taps Per Producer (Mean)	3,875	4,026
Taps Per Producer (Median)	1,098	1,000
Acres Per Producer (Mean)	95	98
Acres Per Producer (Median)	30	30
Taps Per Acre (Mean)	40	41
Gallons Syrup Per Tap (Mean)	0.35	0.36
Pounds Syrup Per Tap (Mean)	3.9	4.0

Table 3: Percentage of producers across four tap count groups in 2019

Tap Count Group	Percent of Respondents
4,999 taps and less	82%
5,000 - 9,999 taps	10%
10,000 - 19,999 taps	3%
20,000 taps and more	5%

A small number of maple producers reported harvesting and selling only sap rather than processing this sap into sellable maple syrup. Six percent of respondents identified as sap-only producers.

Respondents to the survey indicated their status as certified organic, transitional organic or not organic. The majority of producers were not organic (83%) and 13% of the producers were certified organic at the time of the survey. Four percent of respondents indicated they were in a transition to organic but not fully certified. The average tap count of organic maple enterprises was 17,834 taps and much larger than the average tap-count of the non-organic or transitional organic enterprises. This small number of organic producers is responsible for a majority of the 2019 maple syrup crop reported by this survey group. Sixty-one percent of the 2019 crop was produced by the small group of organic producers (Table 4). This same small group of organic producers resulted in 13,871 acres in certified organic status or 46% of total acres managed in 2019.

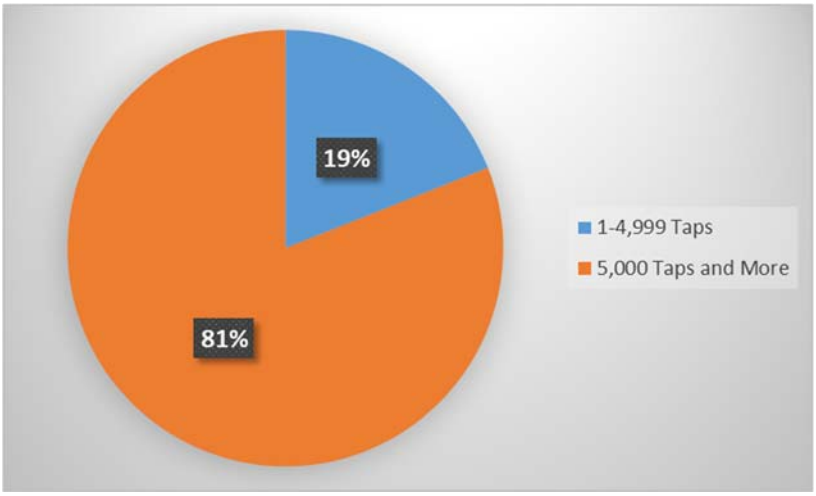


Figure 4: Contribution to total 2019 maple syrup crop between two tap size groups (percent of crop)

Table 4: Contribution to 2019 maple syrup crop based on organic status

	Percent of Respondents	Percent of 2019 Crop Volume	Taps Per Producer (Mean)
Certified Organic	13%	60%	17,834
Not Organic	83%	38%	1,931
Transitional	4%	2%	2,273

Forestry and Land Ownership

Over two thirds of respondents (68%) do not follow a forest management plan prepared by a professional forester compared to 32% of respondents that do follow a formal forest plan. Property tax abatement programs (often called "current use") are available for maple producers with certain eligibility criteria. Depending on the specific state statutes maple production may qualify for either agricultural or forestry land use. Fifty-three percent of respondents are not enrolled in a tax abatement programs and 47% are enrolled. Looking at total forest acres specifically, however, one sees 20,393 acres or 67% of reported acres in 2019 were enrolled in a tax abatement program.

The respondents of the survey represented 1.24 million maple taps in the 2019 season. Forty-two percent of respondents indicated they leased woods or taps in 2019 and the total number of maple taps rented was 479,759 taps. Roughly 39% of total taps in 2019 were leased and 61% were owned. Fixed-price rental rates were most common. In 2019 the most common rental rate was $1.00-$1.24 per tap. The prevalence of different rental rates is shown in Figure 5 below.

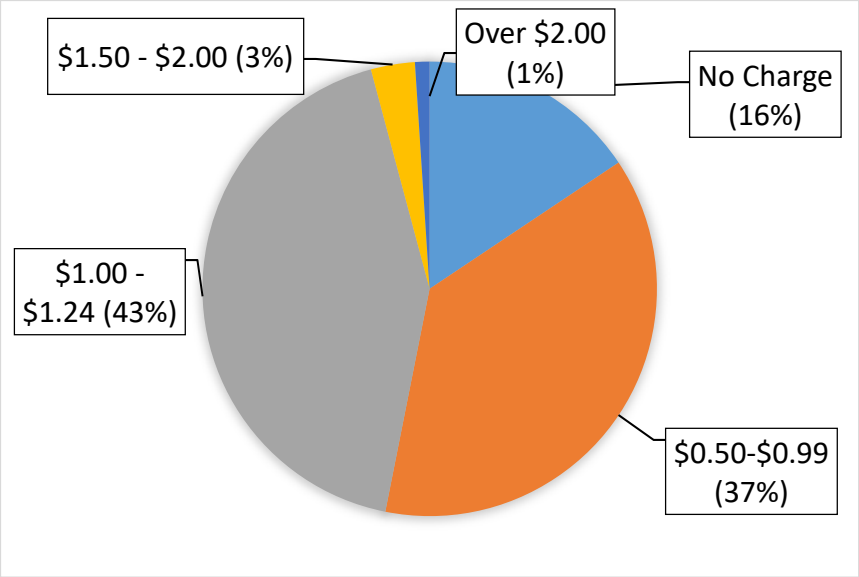


Figure 5: Rental rates per tap in 2019

Production Practices and Technology

Tapping, sanitation and tubing replacement

Respondents answered several questions about their production practices and the types of technology they used to produce sap and syrup in 2019. The most common target tapping depth is 1 ½ inches reported by 52% of survey respondents. The next most common target depth was 1 ¼ inch or less (16% of respondents) and 1 ¾ inch (16% of respondents). The remaining 16% of respondents indicated a target tapping depth of 2 inches to 2 ½ inches. The two most common spout diameters were 5/16 inch spouts (74% of respondents) and 3/16 inch spouts (12% or respondents).

Healthy trees and the proper location of tap holes into healthy wood is important for sap collection. Producers reported drilling into brown or stained wood in 4% of their total holes drilled. Two hundred and ninety producers responded to the question which asked what their primary method to clean and sanitize their tubing system was. Table 5 shows the results to the tubing cleaning question. The most common method was to pull spout under vacuum with no sanitizer solution.

Table 5: Frequency of different tubing system cleaning methods

Cleaning Method	Percent
Does Not Apply- No tubing systems	11%
Pull Spouts Under Vacuum (no sanitizer solution)	53%
Pressurized Air and Water	15%
Inject Sanitizing Solution Into Spouts and Drain Immediately	12%
Inject Sanitizing Solution Into Spouts and Leave to Soak	9%

Survey respondents indicated how often the components of tubing systems were replaced. Table 6 demonstrates the average replacement age for spouts, drop lines, lateral lines and mainlines.

Table 6: Replacement age of tubing system components

Component	Replacement Age- Years
Spouts	1.8
Drop Lines	4.9
Lateral Lines	9.6
Mainlines	14.9

Vacuum and Reverse Osmosis

In 2019, 63% of respondents were using a powered vacuum pump for sap collection. In the same year there were 13% of the total maple enterprises responding that were utilizing a vacuum monitoring system. Producers indicated their typical vacuum system reading in 2019 and the average was 23.6 inches Hg.

Reverse osmosis (RO) technology has been a common practice for many commercial maple enterprises for over twenty years. In more recent years, the demonstrated efficiency of RO and greater access to small sized units has increased adoption of the technology across all scales of production. In 2019, 62% of respondents were using Reverse Osmosis to concentrate maple sap. The average RO concentration level in 2019 was 12.1 % sugar.

Economics and Business Management

Maple producers responding to the survey answered a series of questions about economics and business management. Table 7 shows the level of annual gross sales generated by responding producers in 2018. Approximately 90% of respondents operated businesses that generate gross sales less than $100,000 per year.

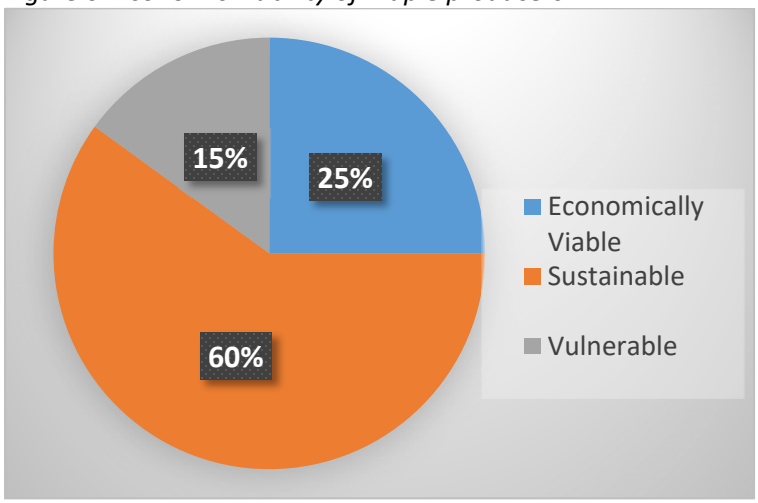
Table 7: The percentage of maple businesses in several gross sales categories

Gross Sales	Percent
Less than $50,000	77%
$50,000-$99,999	14%
$100,000-$199,999	5%
$200,000-$299,999	< 1%
$300,000-$399,999	1%
$400,000-$499,000	< 1%
$500,000 or more	3%

Producers identified which economic viability definitions best fit their current business. Respondents selected from the following three definitions: a) *Economically Viable*: this maple business has the capacity to cover all costs and pay family labor at the average agricultural wage for this region, b) *Sustainable*: this maple business does not meet the economically viable definition but it is sustainable due to the presence of built-up equity or other non-maple income sources and c) *Vulnerable*: this maple business does not meet the economically viable definition and does not have equity or non-maple income sources. The majority of respondents (60%) defined their business as *Sustainable*. Twenty-five percent of respondents were *Economically Viable* and 15% were *Vulnerable* (Figure 6). Further analysis

of economic viability is presented in the "Characteristics of Different Tap-Count Size Classes" section later in this report.

Figure 6: Economic viability of maple producers



Respondents to the survey were closely split when asked if they knew the cost-of-production to produce and sell sap or syrup. Fifty-two percent did not know their cost-of-production while 48% answered yes to knowing their cost of production.

The majority of maple producers do not have an ownership transfer, succession or exit plan covering the active business. Seventy-eight percent of respondents have no plan leaving only 22% that do have a transfer or succession plan covering the business or property.

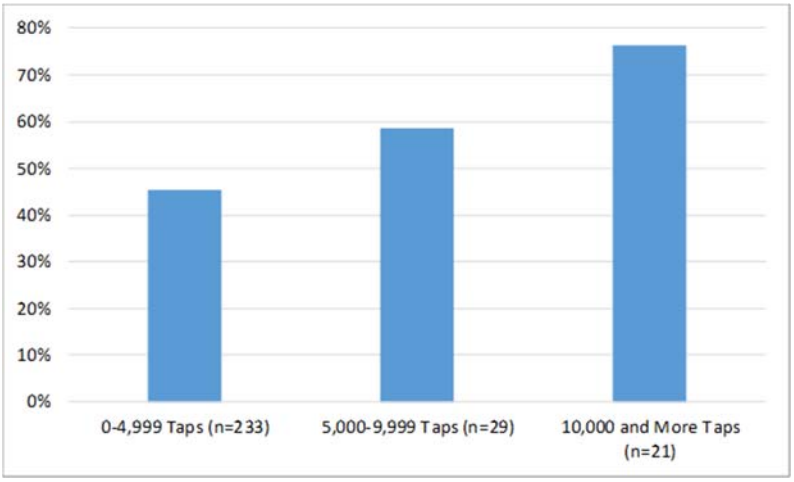
Marketing

Maple businesses in this survey demonstrate that they are selling their products through a variety of market channels. The majority of respondents (66%) sell maple products through at least two or more of the market channels presented while a small percentage (33%) sell exclusively through one market channel. The most commonly selected market channel was direct retail sales to consumers (78%) (not including online or shipping activity). The next most common market channels were bulk sales (45% of respondents), direct sales via online or shipping (42% of respondents) and wholesale (39%). This survey did not ask responding businesses to quantify the volume of sales through various market channels. More analysis of market channel participation is presented in the "Characteristics of Different Tap-Count Size Classes" section later in this report.

Characteristics of Different Tap-Count Size Classes

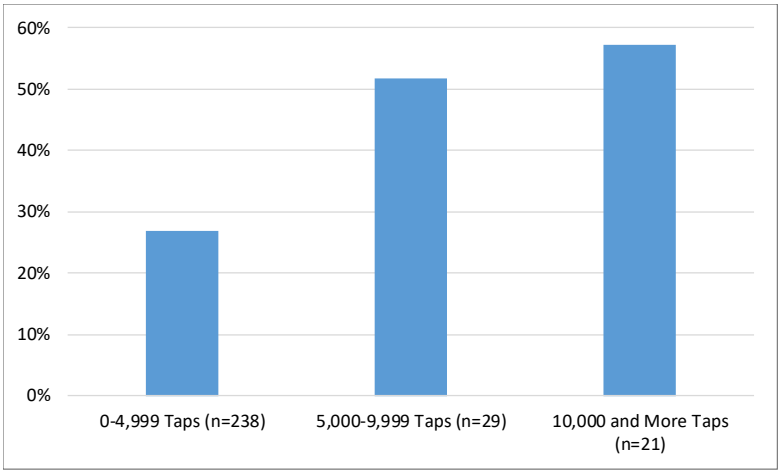
The respondents in this survey represent a wide range of tap counts from less than 100 taps to approximately 100,000 taps. Exploring survey questions in relationship to the production scale of a business is one approach to find themes about common practices, technology adoption and economics. While it is not possible to conclude whether a certain scale of production causes another outome or vice versa, the differences observed between production scales becomes the first step to understanding trends in management practices and techniques in use across the industry.

Figure 7: Percent of respondents in each tap-count size class that plan to expand production



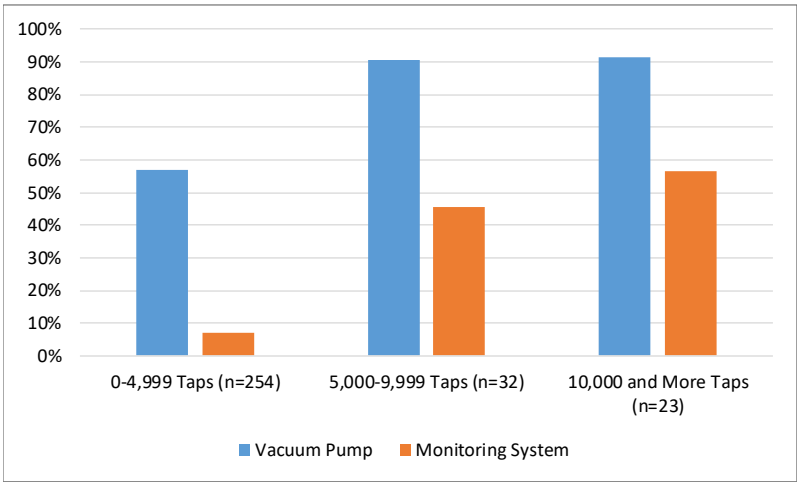
When asked about production plans in terms of maple tap count over the next three years, roughly half of participants plan to expand production (49%), a similar number plan to stay the same (49%) and only 2% plan to downsize production. Respondents that manage over 10,000 taps were the most likely to plan for expansion in the next three years (Figure 7). These larger scale enterprises are also more likely to follow a formal forest management plan prepared by a licensed forester (Figure 8).

Figure 8: Percent of respondents in each tap-count size class that follow a professional forestry plan



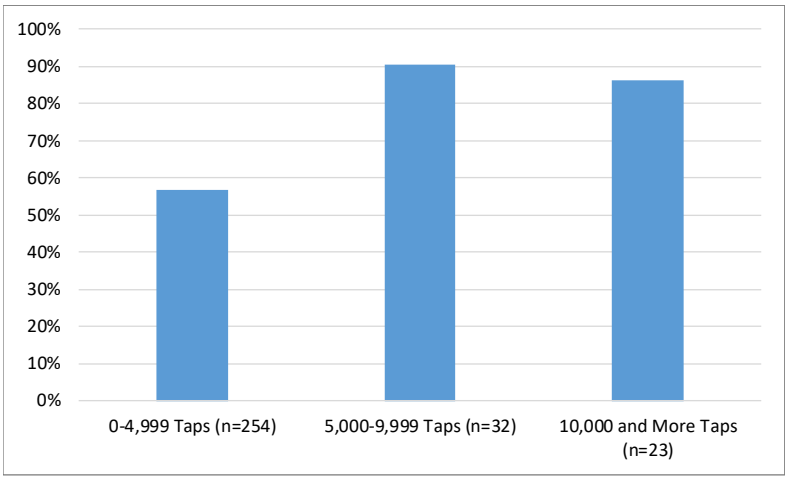
The larger tap-count size classes over 5,000 taps were more likely to use vacuum pumps, monitoring technology and reverse osmosis. Over 90% of businesses with 5,000-9,999 taps and businesses with 10,000 and more taps used powered vacuum pumps with their tubing system. Remote vacuum monitoring has not been as widely adopted among all vacuum pump users, but adoption has been greatest for the larger tap-count size classes (Figure 9).

Figure 9: Percent of respondents in each tap-count size class that utilize vacuum and vacuum monitoring technology



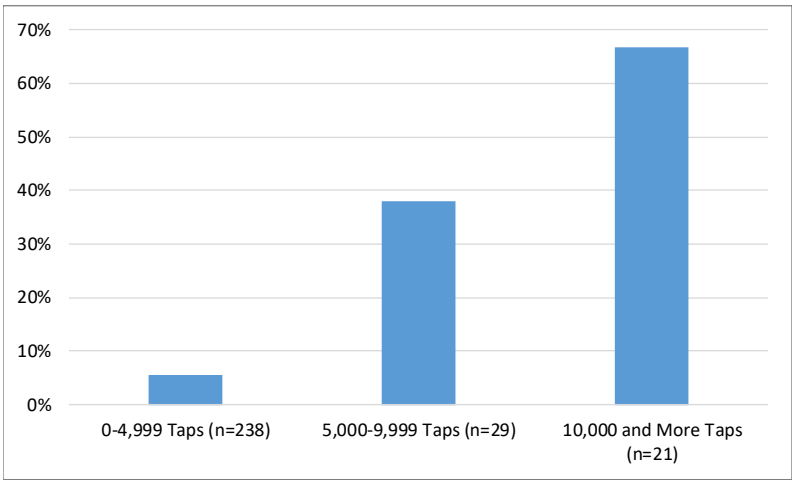
Reverse osmosis (RO) is used widely by producers of all sizes. Over half of all the respondents in this survey utilize reverse osmosis. Maple producers in the larger tap-count size classes had a higher percentage of RO utilization (Figure 10).

Figure 10: Percent of respondents in each tap-count size class that utilize reverse osmosis technology



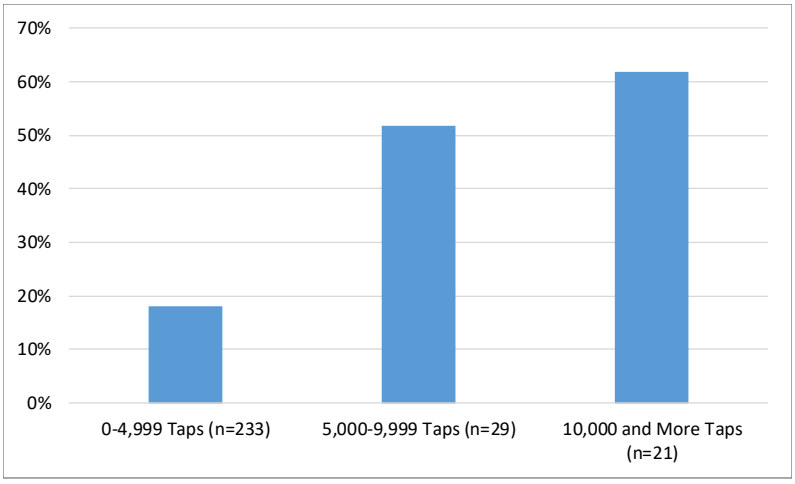
There were a larger percentage of producers in the larger tap-count size classes that are certified organic. Thirty-eight percent of producers in the 5,000-9,999 tap size class were certified organic and 67% of producers in the 10,000 and more taps size class were certified organic in 2019 (Figure 11).

Figure 11: Percent of respondents in each tap-count size class that are certified organic



The majority of businesses represented in this survey (60%) reported being *sustainable* with access to other funds or non-maple income sources. Twenty-five percent of respondents indicated they were *economically viable*. A larger percentage of producers in the larger tap-count size classes were economically viable. In the business scale group of 5,000-9,999 taps there were 52% that were economically viable. The percentage of economically viable businesses increased to 62% among producers with 10,000 taps and more (Figure 12).

Figure 12: Percent of respondents in each tap-count size class that are economically viable



Conclusions

Results from this survey demonstrate the wide range of hobby and commercial scales present within the maple producer community across the Northeastern United States. As the U.S. domestic maple syrup crop continues to grow the influence of different scales and types of business can shape local communities and national trends. Survey results presented here demonstrate the dramatic difference in the scale of maple enterprises as represented by tap count and the resulting working forest acres these businesses utilize. Survey respondents operated enterprises that ranged from 10 taps to over 105,000 taps.

Our survey findings verify that the majority of maple syrup producers in the Northeastern region operate at scales under 5,000 taps. The barriers to entering the industry are relatively low for those who are motivated by noneconomic factors. Meanwhile, a small number of producers operate at 5,000 taps or more and this smaller group is responsible for over 80% of the maple syrup production in this survey group. Approximately 60% of the maple crop in this survey is certified organic, produced mainly by a small group of larger enterprises. The market demand for organic syrup remains strong and has been driven by changing consumer preferences, especially in areas beyond where maple syrup is produced. If these preferences continue as expected it is likely more producers will transition to certified organic production. Organic bulk syrup producers have received an approximately $0.15-$0.20 per pound premium over non-organic syrup prices which provides a motivating factor to enhance business revenue, especially at the larger scales of production.

The substantial syrup crop contribution by a small number of producers may have implications to ongoing industry organizations, policy advocacy and policy compliance. Future decisions have the potential to impact size classes differently. Survey results here demonstrate that the magnitude of acres managed and maple syrup produced highlight the influence of the scale of production. The small number of producers at larger scales are utilizing technology to enhance yield, contribute a larger share of the domestic crop and they indicate they are more profitable than their small producer counterparts. However, the large number of smaller producers could create a disproportionate representation of the number of businesses impacted by changes or initiatives that is not reflective of the actual crop impact in the marketplace or forested acres impacted.

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