Maple in Madison County:
An Assessment of the Past, Present
and Future of Production

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Executive Summary

This report examines the past, present, and future of maple production in Madison County, New York. It focuses on the economic, environmental, and social sustainability of the maple industry, and what its major vulnerabilities might be in the future. Through an analysis of scholarly material, available statistical data, and quantitative interviews the authors conclude that while there is a large possibility for economic expansion, two major vulnerabilities--a lack of new producers and weather unpredictability--may impede on that possibility. Predictions are detailed for three possible future scenarios in the maple industry: 1) expansion, 2) decline, or 3) stagnation. Recommendations are also provided to best ensure maple’s expansion in scale and importance.
Introduction

In today’s dynamic society, humans struggle to maintain a balance between a healthy environment and the everyday habits that encompass our daily lives. Human interaction with the environment has caused an alteration of Earth’s climate, an exhaustion of natural resources, and an adaptation of technology in attempt to mitigate the effects of our unsustainable lifestyles. Sustainability is a term that emphasizes the “connections among social equity, economic productivity, and environmental quality” and seeks to balance these three pillars in a consistent manner (Al-Hallaj et al., 2012). This concept is split up into these three dimensions and is expressed through the integration of these factors with an eye towards the future. All of the actions made by governments, businesses, and organizations should ensure that sustainability “meets the needs of the present without compromising the ability of future generations to meet their own needs” (Kates et al., 2005). To accomplish this, there needs to be a notion of strong sustainability, “where tradeoffs among natural, human, and social capital are not allowed and very restricted” (Al-Hallaj et al., 2012).

Although the concept of strong sustainability appears feasible on the surface, there are many challenges faced when assessing the three dimensions of sustainability as a whole. Often, one of the three pillars is sacrificed in order to advance the agenda of the other two. Typically, the social pillar is “more difficult to analyze, comprehend, define, and incorporate into sustainability projects and planning than the other dimensions of sustainability” (Boström, 2012). However, there are other challenges to sustainability aside from the balancing of the three dimensions. One barrier challenging strong sustainability is the high number of vulnerabilities to each of the three pillars and to many industries in the United States. One of the main industries that has become vulnerable is agriculture (Hatfield et al., 2014). With the
changing climate and increased costs, agriculture is one particular industry that is struggling to flourish from the lens of sustainability.

Although the agricultural industry is susceptible to the dynamic changes in climate, specific adaptive strategies can be utilized to combat the alterations in seasonality, temperature, and extreme weather. Domestically, “New York State is increasingly faced with a changing climate that is beyond the range of past experiences” (Solecki, et. al, 2014). This shows that innovative adaptive strategies are necessary in order to preserve the industry and ensure its future. Agriculture is extremely dependent on the weather and climate, thus making adaptation to any change crucial in respect to the overall business. One sector of agriculture that has adapted over time is the maple industry, specifically in Central New York.

Although the origins of maple are widely debated, many experts believe that maple was first discovered by the indigenous Native Americans, who were producing since “the 1670s or 1680s” (Whitney & Upmeyer, 2004). The Northeastern United States is famous for maple production, especially in areas like Maine, Vermont, and upstate New York. Our study focuses on the maple production in Central New York and, more specifically, in Madison County. Madison County has 21 maple producers, according to the U.S. Census Bureau (USDA, 2014). First, we will discuss our methodology for reaching these producers, the history of maple, and how maple tapping works. Next we will use the framework for the concept of sustainability to further examine the environmental, social, and economic factors regarding the industry. We will then conclude by outlining the vulnerabilities of the current state of the maple industry and offering recommendations for the preservation of the future of the industry.
Methods

In order to completely analyze maple production in Madison County from sustainability and vulnerability perspectives, it was crucial to utilize multiple forms of research materials. The main research for this project included a detailed analysis of scholarly material, full review of available statistical data, and collection of qualitative data through stakeholder interviews. Gathering research in multiple ways allowed for findings in the qualitative portion to supplement scholarly conclusions and to shed light on otherwise unknown local producer and consumer perspectives on maple production.

Our examination of literature intended to serve multiple purposes. First, it helped to better understand the impacts of maple production, specifically through social, environmental and economic lenses. Works reviewed addressed issues such as the social and economic impacts of production on local communities, the effects of production on sustainable forest management, and the potential economic growth of the industry on national, state and regional levels. Second, it provided perspective on the impacts of climate change and how they applied to Central New York now and in the future. Through a scholarly research analysis, we were able to understand that the rising average annual temperatures and increasing unpredictability of weather patterns were making it difficult for producers to maximize production of quality syrup without implicating adaptive techniques. Additionally, research led us to discover the Asian Longhorned Beetle, an invasive species in North America that damages maple trees. It is possible that the insect could spread its range to include Madison County, severely impacting the maple production of the region. Lastly, our scholarly research analysis aided us in understanding the producer perspective. Articles addressing landowner attitudes towards increased maple production gave us the necessary background knowledge to better create survey questions in the qualitative data-gathering portion of our research.
An analysis of statistical data allowed for a comparison of maple production statistics across multiple scales and an understanding of the current state of production in Madison County. The USDA Census of Agriculture published data allowing our team to assess the relative size of production in Madison County as compared with other counties and New York State. For example, by looking at the production levels for Madison County and New York, we were able to comprehend that maple production in Madison County makes up roughly 1% of the total amount of maple produced in New York. USDA Census data is published every five years, so our team looked at archived data to grasp an understanding of how production in Madison County has changed over time.

Our qualitative data was gathered primarily through interviews with maple experts and producers. The development of the interview questions was shaped by both the themes of vulnerability and sustainability, and by our literature and statistical data review. First, we reached out to maple experts such as the Executive Director of the New York State Maple Producers Association and the Director of the University of Vermont Maple Research Center. The questions asked via phone and email interview helped to gather information on climate change impacts, difficulties of production and the local cultural significance of maple. Specifically, we were in contact with New York State Maple Producers Association (NYSMPA) Executive Director Helen Thomas, University of Vermont Director of the Proctor Maple Research Center Tim Perkins and Cornell Cooperative Extension experts Karen Baase and Stephen Childs. After the completion of maple expert interviews, we met with three maple producers. The producers were Ben Benjamin of Ben and Judy’s Sugarhouse, Dick Loomis of Loomis Family Homestead and Dan Beasley of SweeTrees Maple. Interview questions asked
about the history of their facility, motivations for production, consumers, difficulties of being a producer, environmental concerns and adaption strategies, and future plans and predictions.

Although our analysis of maple production in Madison County provided valuable insight, there were some limitations of the study. First, the amount of scholarly literature on climate change and maple production was small. The lack of available research was due to the scale of the project. Maple production itself does not make up a large percentage of the total agricultural production in the United States, nor is Madison County a large enough area to be considered for a climate change impact study. Thus, the relative unimportance of maple production in Madison County meant that some of the scholarly material analysis had to consist of research done on a larger scale, such as Central New York or New York State. Another limitation was the lack of available statistical data. As the USDA Agricultural Census is only published every five years, it was difficult to generate and analyze trends in the region, as low production data one year could be an outlier rather than a major change in production rate. The lack of complete statistical information meant that this portion of our research was used mainly for comparative purposes with other county and state maple production levels. A final limitation of the research method was the low amount of qualitative data available to be collected. Madison County is home to only nine NYSMPA recognized maple producers and seven did not return our multiple attempts at communication with them. A solution to this problem would have been to simply increase the breadth of the study. However, increasing the scale would have resulted in a project size that was beyond the time and resource capability of the researchers.

The History of Maple

Early settlers in the United States and Canada likely learned about maple syrup from the Native Americans (Pickert, 2009; New England Maple Museum, 2014; UVM Libraries,
Native Americans would slash trees and collect the sap, then add hot stones to enable boiling, and would usually boil it until it was a crystallized sugar (New England Maple Museum, 2014). They traded maple sugar with European settlers, and eventually taught them the techniques of making maple sugar (New England Maple Museum, 2014). For the settlers, maple was a cheaper alternative to sugar or molasses, so it became a popular choice of sweetener. As early as the 1600s, dairy farmers produced maple syrup to supplement their otherwise milk dependent incomes in the off-season (Pickert, 2009). The maple trees were called “sugar bushes” and farmers drilled small holes into the tree and set up buckets to collect the sap, which they would transport to sugar houses to boil down into syrup, or boil it further into crystallized maple sugar. In the 1700s and 1800s, maple sugar was promoted as a counter-product to slave produced cane sugar, mainly by abolitionists and Quakers (UVM Libraries, 2014). It was also a way for remote communities to create sweeteners without importing cane sugar (Whitney & Upmeyer, 2004). Now, in placement of boiling buckets of sap, technology has developed the use of plastic tubing that brings the sap from the tree directly into the sugarhouse where it can be boiled more efficiently and in larger quantities.

In the United States, maple production peaked in the 1800s and steadily declined through the 1900s and has recently been making a comeback since the 2000s. Conversely, maple production in Canada in the 1800s was minimal compared to the United States until a spike in Quebec in the 1980s due to implementation of new technologies (Farrell & Chabot, 2011). The following graph shows the decline of maple production in the United States with a recent resurgence, and the growth of production in Canada.
In Central New York and Madison County, maple was originally produced for personal consumption, and expanded in the 1800s when dairy farmers looked to maple production as a supplemental income in the off season for milk production. Using the profit from maple syrup produced on their land, the dairy farmers were able to pay for feed for their cows. In 1860, New York State was the largest producer of maple sugar and maple syrup, as seen in the figure below (Whitney & Upmeyer, 2004). This demographic of maple farmers shifted as the number of dairy farms in the area decreased and the average size of the existing dairy farms grew significantly larger. Whereas a dairy farmer used to be able to make enough to pay for their small number of
dairy cows, maple syrup production is not profitable enough to purchase enough feed for the current norm of large dairy operations.

Source: Whitney & Upmeyer, 2004

Through our interviews and research, we discovered that maple is still seen as a supplemental income. The main reason maple farmers decide to be in the industry is because they grew up making maple, and their parents grew up making maple, and they want to expose their own children to making maple. The family tradition of maple production has been strong

Source: Whitney & Upmeyer, 2004
enough that farmers have decided to continue making maple syrup. In order to make a profit, though, production needs to be larger than it used to. As Dan Beasley said, it is not impossible to make maple producing your livelihood; it just requires a very large initial investment for a large-scale production. This is demonstrated by the transition in the number of maple farms and the number of taps per farm over time. In 1909, the United States had 87,537 farms making maple syrup with an average of 216 taps per farm (Whitney & Upmeyer, 2004). In 1997, there were 4,850 farms with an average of 1,382 taps per farm (Whitney & Upmeyer, 2004). While the number of farms has decreased, the size of the existing farms has increased. As mentioned by the maple farmers we interviewed, production needs to be on a large-scale in order to make enough of a profit for it to remain worthwhile.

Tapping Methods and Equipment

Maple production has come a long way over time with the implementation of newer, more efficient technologies, which make tapping more effective by allowing producers to create more products. The methodologies behind tapping maple trees vary depending on the size of the farm and the particular farmer’s personal preferences. Some farmers may want over 3,000 taps, while others will settle for under 1,000. Scale plays a large role in this process as there are increased costs associated with the more taps a farmer may have, yet this also means an increase in potential profit. Primarily, sugar maples are the most common species used for tapping in Central New York because of how high their sugar content is and how easily accessible they are. Tapping can be as simple as drilling a hole into a tree, inserting a spout, and having a bucket to collect the sap. There are many communities where citizens produce their own syrup for personal consumption instead of trying to turn a profit. Although this is a much more localized,
small-scale approach, it is still effective in making an enjoyable product. Even in today’s society, the hobby of producing maple products is prevalent throughout local communities.

For Madison County, there are many farmers who produce maple products to sell to the general public and surrounding communities. Many farmers have upgraded from metal taps and metal buckets to plastic tubing and plastic spouts. The plastic tubing allows for an increased sapflow while also eliminating any metallic taste. Despite these advantages, there are some drawbacks to the plastic tubing. First of all, the tubing is not as durable, meaning they can fall and become dislodged much easier than the metal tubes. In addition, the plastic tubing runs the risk of deteriorating. When interviewing the farmers Dick Loomis and Ben Benjamin, they expressed that squirrels typically chew through the tubing. This causes problems because the farmers need to examine the entire line and sometimes replace the entire set of tubing in order to ensure the sapflow reaches the sugarhouse.

To help the sap reach the sugarhouse, the trees are located uphill so that the sapflow from the trees is moving downhill with the help of gravity. The sap flows in an intricate system of plastic tubing as mentioned above, which connects to a central main line that flows into the sugarhouse. Some farmers own a vacuum, which also helps capture a larger portion of the sapflow and therefore produces more syrup. The vacuum provides suction into the main line, capturing a larger portion of the available sap from the trees. This sap is then placed in large storage tanks, which can help filter out excess waste before it is placed in either the R.O. machine or the evaporator pan. The R.O. machine is a relatively newer product which also can further help filter out bacteria and other waste products before the sap is heated. If farmers do not own an R.O. machine, the sap is transferred into the evaporator pan. The evaporator pan then heats the sap, which increases the sugar content in the syrup so it does not taste bitter. Once
the syrup is made, it can be stored in metal barrels, similar to kegs, and stored by refrigeration. Some farmers save up their syrup in case they have bad seasons so they can recover, while others try to sell as much as they possibly can.

One of the main barriers for entering this industry is the cost of the equipment. According to Ben Benjamin, costs of the machinery alone can reach around $100,000 initially. However, this is just for a basic setup for maple syrup, not for the value-added products such as maple cream, maple candy, or maple flavored nuts. If running a large-scale operation, there could be increased costs due to the purchasing of extra machinery. There are specific types of machines, which produce maple candy, maple flavored cotton candy, or maple cream. However, other farmers limit costs by making these value-added products by hand, or not making them at all. Although all of this equipment is not necessary to making syrup, it strictly depends on what scale the farmer is trying to produce. If on a large-scale, farmers will need an evaporator, R.O. machine, vacuum, storage units, and an intricate system of tubing. On the other hand, if someone is trying to produce strictly for him or herself, they will only need a tap and a bucket to collect the sap.

For the purposes of our study, the farmers we interviewed primarily are small to medium scale, meaning they produce for a profit. Despite producing on a larger scale in comparison to a more individualized operation, maple production is not a direct threat to the immediate environment. Maple tapping is a form of sustainable land use, which encourages tree growth. Unlike other agricultural sectors, maple production does not harm the environment when producing on a large scale. Other environmental implications include the usage of plastic tubing to transport the sap from the trees into the sugarhouse. Although plastic may be more practical than metal tubing, it is still a method which is particularly unsustainable.
Environmental Factors of Maple Production

The success of maple production on both long and short time scales is tied to the environment. For the purposes of this study, a short time-scale refers to environmental factors that affect maple production over the course of one year. Long-term environmental factors are those that affect maple production over the next 30 years. Through our research, we identified weather unpredictability, increasing annual temperature, invasive species, and deer overpopulation as major environmental factors in production.

Weather Unpredictability

Producers Dan Beasley, Dick Loomis and Ben Benjamin all identified the unpredictability of weather as the greatest inhibiting factor of production. Specifically, they meant the unpredictability of the temperature during the late winter and early spring season. If the start of tapping season is colder than normal, the maple trees will not be able to produce as much sap. Similarly, if the start of the tapping season is too warm, producers will have already missed out on a portion of the sap collection season, reducing their total production for the year. Head of the NYSMPA, Helen Thomas, also believed that weather unpredictability was the most important environmental factor. Thomas explained that maple is a unique crop in that it is impossible to predict the yield because productivity is so dependent on the weather. The fact that crop insurance is not offered to maple producers highlights maple’s dependency on the weather. The figure below shows the variability of the maple season in New York for the last 3 years.
Increasing Annual Temperature

Part of the reason weather unpredictability affects yield can be attributed to an increasing annual average temperature in New York. It is well documented that temperatures in New York across all regions have increased in the past 50 years (Skinner et al., 2010). Research has indicated that increased temperatures in the tapping months (January, February, March, April and May) over the past 25 years have explained a large majority of the yield fluctuations for maple production (Duchesne et al., 2009). Additionally, temperatures are expected to continue to increase over the next 50 to 100 years in New York (Skinner et al., 2010). This will result in a decrease of as many as 14 in the number of sap collection days by the year 2100, if traditional collection methods are kept (Skinner et al., 2010). Additionally, continued temperature increase will also lead to a shift in the time period sap is produced. By 2100, the sap collection season is predicted to occur almost 30 days earlier than its current start date (Skinner et al., 2010).

Increased temperatures also reduce the amount of cold days in a season. This is also a major issue for maple tree productivity as a number of consecutive cold days are required before the tree produces sap. If adaptive measures are not taken, temperature increase will result in significantly shorter seasons as the productive seasons will, on average, begin almost a month

Source: USDA, 2014
earlier. It can be reasonably assumed that part of the temperature increase effects will occur over
the next 30 years, impacting the current and next generation of maple producers in Madison
County.

Invasive Species

Though not a present factor of production, all producers interviewed expressed concern
about the potential of pests spreading to Central New York and impacting maple production.
Helen Thomas, Dick Loomis and Dan Beasley all believed that the Asian Long-horned Beetle
(*Anoplophora glabripennis*) was the most concerning potential invasive species for maple
production. First introduced from China in 1996, the beetle has not caused serious damage in
New York but has the potential to expand its range as much of the continental United States has
been found to be a suitable habitat for the species (Keena & Moore, 2010). The beetle can
remain highly localized for a long period of time if it has an abundance of suitable host trees
within a radius of a few hundred meters (Sawyer & Panagakos, 2009). However, a sudden
decline in food resources or negative interactions between adult beetles could lead to a sudden
expansion into Central New York (Sawyer & Panagakos, 2009). Additionally, research has
shown that some beetle infestations have gone unnoticed for many years, further increasing the
difficulty of damage mitigation or prevention (Sawyer & Panagakos, 2009). Given the fact that
the beetle prefers maple to all other trees as its host tree, it is not surprising that producers are
worried about the potential for future infestation. However, it is almost impossible to tell when
and where an infestation might occur as well as the extent of the damage the beetle can cause.
The figure below highlights areas that are highly susceptible to an Asian Long-horned Beetle
invasion, with a majority of New York marked as such. Thus, while adaptation methods can be
considered before an invasion, it is so difficult to tell when one may occur that it is likely more
effective to consider response when the infestation occurs. While not specific to the current
environmental state, the potential damage and looming threat of invasion are enough to warrant
invasive species as an environmental factor in maple production.

Source: Cornell Cooperative Extension, 2008

*Sustainable Land Use*

Maple production on a large scale requires an extensive amount of land acreage and
maple trees. Unlike other crops where it is beneficial to rotate the fields used for planting and
harvesting, tapping can be done for many years in a row without causing major damage to the
trees. Any damage that occurs would result from inserting a spout into the tree to collect sap.
After the collection season, a hole is left in the tree when the spout is removed. However, the
trees are able to heal from the holes naturally when the drilling is done correctly. Furthermore,
the diameters of the spouts used have been decreasing from 7 millimeters to 5 and 3 millimeters over the past few years. Producers Dick Loomis and Dan Beasley recently switched to 5-millimeter spouts and Dan Beasley plans to soon use the 3-millimeter spout once it becomes more readily available on the market. Increased implementation of the 3 millimeter spouts for production would further reduce the damages done to the maple trees. While maple production is already a sustainable form of land use, these current technological innovations continue to reduce production damage.

However, the alternative to maple production is often timber harvesting. Timber harvesters buy the land, cut down the trees and sell them to manufacturers seeking to use wood in their products. While timber manufacturing is certainly more profitable, it can be an unsustainable practice and takes away many of the benefits that maple production brings to the community. Harvesters often sacrifice on sustainable practices in order maximize profit, but there are sustainable ways to utilize the land in this regard. Regardless, the chance of unsustainable usage is significantly higher with timber harvesting than with sap collection. As the current generation of maple producers continues to grow older in both New York State and Madison County, the potential for the land to be used for timber harvesting increases. In order for Madison County to continue using the land sustainably, it is important to ensure the future generations of landowners are committed to maple production and not timber harvesting.

**Social Factors of Maple Production**

Madison County has a rich tradition of producing maple products and distributing them to the community. Maple farming has spanned generations here in Madison County, and the hope is that it will continue for years to come. Needless to say, maple products hold a cultural
importance in the region through the distribution at local farmers’ markets, tourism, and special events such as Maple Weekend. Maple products have been ingrained in the community and hold a level of importance for both the consumers and producers in the community. This is due to the history of maple products in Central New York, spanning over multiple generations from family to family. Because of this historical context, communities have become attached to the value-added products such as maple cream and maple candy, and also the syrup itself.

**Historical Context**

When assessing the social dimension of the maple industry in Madison County, one must first point towards the history of the industry. Although the origins of maple have been widely debated, many scholars point towards the indigenous Native Americans as the first to boil sap into sugar. However, some scholars doubt this due to the fact that Native Americans lacked metal pots to boil the sap into sugar. From there, European explorers picked up the trade and began producing sugar for themselves. By the early 19th century, it became known “that maple sugar was made in the greatest quantities in northern New Hampshire, Vermont, New York, and northern and western Pennsylvania” (Whitney & Upmeyer, 2004). The farmers interviewed in our study have been producing maple products for over two generations, having it passed down to them as a trade habit. According to Ohio State extension representative Gary Graham, “People who make syrup do it for the tradition, the history, the family” as opposed to the prospect of turning a large profit (Graham, 2004). Graham also recognizes the importance of it being a family activity that brings relatives together on a daily basis to complete the laborious task of maple production. For Central New York communities, maple production is an activity passed down from generation to generation. For example, a farmer may oversee the maple
operation, but needs help from his or her family to set up the tubing, to create the final products, and even to tap the trees themselves. Because of this long history of production, farmers view producing maple as a habit worthy of sustaining for the future since family engagement plays an integral role in society.

Maple sugar established itself in the marketplace as well, accounting for approximately 12% of the total amount of sugar produced in the United States in the 19th century (Whitney & Upmeyer, 2004). Communities became attached to the taste of the maple sugar, using it to create granulated sugar used for everyday activities such as cooking. Because of its accessibility and distinctive taste, maple sugar was highly sought after in New York State. In the Madison County region, maple connoisseurs prefer the lighter colored syrup because of its sweet and light taste. However, many consumers enjoy the darker colored syrup, especially in regions surrounding maple production areas. This resulted in the use of maple as a supplemental income for agricultural farmers in the region as they saw it was perhaps a somewhat profitable venture.

**Importance of Value-Added Products**

Since maple has existed in Madison County for generations, it has established itself as a staple for the community. Although the syrup is the primary product produced, farmers have begun to produce other maple products in order to capture other demographics, such as children. Farmers in Madison County have produced a number of different products, including maple cream, maple sugar, maple-flavored dog treats, maple walnuts, maple tea, maple cotton candy, and maple candy to name a few. These products are not necessarily mass-produced, but they are sold directly from the sugarhouses or in retail stores in the area. Children especially
enjoy the maple candy and maple cotton candy, which is produced earlier in the season when the light-colored syrup is produced.

These products have expanded the diversification of the industry in Madison County. People from all ages are able to connect with their roots by consuming any number of maple products. Typically, these products have labels that link them to the exact locations of production, further providing a linkage between the community and the maple products. For example, Ben Benjamin of Ben & Judy’s Sugarhouse created his own label for his syrup products which has a detailed picture of his sugarhouse and surrounding property, thus painting a picture and putting a face to a name for the consumers.

These value-added products are also important for the expansion of the industry. Some of the bitter syrup, which is created towards the very end of the season, is sold to large tobacco companies. These companies use it as flavoring for tobacco products, which is also sold in the Madison County region. The practicality of these products allows for producers to diversify their available products for consumers, which in turn attracts more customers to their industry. For the farmer, this proves to be particularly enjoyable because he or she is not simply producing the same products on a daily basis, but instead is able to create variations of maple products. This proves to be helpful in terms of the resilience displayed by the farmers in terms of production.

Local Markets

In Madison County especially, maple production relies on local farmers’ markets to boost sales and promote their brand name. In the Hamilton farmers’ market, farmer Dan Beasley sells a multitude of products to the community while also offering recipes for maple inspired
cooking. These local markets allow for the farmers to spread their products to the nearby community while also providing a marketing strategy for their operation. Repeat customers are extremely important to a successful maple operation, which is why maple producers make an extra effort to attend these local markets. In comparison to large-scale producers, “most US producers enjoy the advantages of a ready market close to their base of production” (Whitney & Upmeyer, 2004). This is because “many have built up a reliable retail clientele through direct farm sales, mail order operations, [and] farmer’s markets” since they are not large enough to sell in bulk to larger corporations (Whitney & Upmeyer, 2004).

Since the Madison County farms are primarily small to medium sized, they cannot afford to market through traditional methods such as TV commercials, billboards, or other medias of advertising. At the farmers’ markets, however, producers are able to establish themselves in the community by relating to customers and distributing literature to clients. Also, word-of-mouth is essential in the flourishing of the industry. Consumers can refer to websites and purchase products as gifts for holidays, birthdays, etc. Some of the largest purchases come during the holidays, according to farmer Ben Benjamin, who believes that farmers’ markets are crucial to attend on a regular basis.

Maple Weekend

In addition to farmers’ markets, special events such as Maple Weekend are indispensable in the community. Maple Weekend is a weekend strictly dedicated to maple appreciation, including stakeholders ranging from die-hard consumers to maple producers in the central New York region. Special events such as Maple Weekend allow for the advancement of the industry, because farmers are able to spread knowledge about practices or equipment that are particularly useful. The maple industry in central New York, especially in Madison County, is competitive
because there is a finite market for maple products, yet producers surprisingly see this as healthy competition. This is why a special event such as Maple Weekend can be made possible.

At the event, products other than simply maple syrup or value-added products can be purchased. For example, children can produce a Maple coloring book for enjoyment, which is another effort to establish demographic variety. Consumers can also learn about the origins of the industry, the history of the industry, and the difficult work undertaken to produce the products the consumers enjoy. The community can taste-test the products before purchasing and ask the producers themselves any questions they may have about either the industry or the products they are selling.

Another unique aspect about the Maple Weekend event is the ability for the community to actually practice the process of producing maple syrup. There are maple trees on the farms that the attendees can tap into and physically experience the act of production, and hopefully discover a new passion or hobby. This hands-on experience enables the community to bond over the historical roots in which they grew up. Overall, Maple Weekend is an inquisitive, informative, and fun weekend for both the producers and consumers. It provides a medium for the community to connect and enjoy, displaying the cultural importance of a single product in a community. In fact, Ben & Judy’s Sugarhouse will be hosting its first Maple Weekend, which engages the immediate Madison County community by strengthening ties between producers and consumers.

**Economic Factors of Maple Production**

Maple does not provide for an incredibly profitable livelihood, though there is tremendous room for economic growth in the United States, particularly in New York State. The maple farmers we interviewed all mentioned that their customer base was strong, because once
an individual tasted their maple syrup they were customers for life and, through word of mouth, would spread the knowledge of their maple farms. The main economic factors to consider in maple production include its role as a supplemental income, the large amount of untapped maple trees, the established educational infrastructure, technology, and producer characteristics.

*Maple as a Supplemental Income*

Helen Thomas, the Executive Director of the New York State Maple Producers Association, shared that she could maybe think of ten maple farmers in central New York that relied on maple as their sole income. This was consistent with our findings from talking with maple farmers, who all had other sources of income apart from maple. Dan Beasley said that it is not impossible to rely on maple for a living, but that it is very difficult, and that it would require several hundred thousand dollars of investment. Getting into the maple industry is expensive, but trees are tappable for 150 to 200 years, so there is a long-term and reliable payback. All in all, supply and demand for maple exists, but most existing producers do not wish to expand dramatically and there is a lack of new maple producers entering the industry.

*Untapped Maple Trees*

There are a large number of untapped maple trees in New York State that could be used to increase the market. New York has the second highest potential for taps on existing sugar maple trees, the highest potential for taps on existing red maple trees, and the highest overall potential for tap expansion in the United States (Farrell & Chabot, 2011). The average American’s maple consumption is 2.6 ounces, which is a 155% increase since 1975, yet New York still imports four times as much maple syrup from Canada as it produces (Farrell & Chabot, 2011). If New York State increased its syrup production by utilizing the same
proportion of potential taps as Vermont, the industry would see an additional $57,837,585 per year (see table below). This shows that there is a huge room for expansion in the maple industry, because the demand and the supply both exist.

<table>
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<th># Of Potential Taps</th>
<th># Of Actual Taps</th>
<th>Average Price per Gallon</th>
<th>Current Value of Maple Syrup</th>
<th>Potential Value of Syrup Production at Vermont’s Utilization Rates</th>
<th>Economic Impact of Increasing Syrup Production to Vermont’s Level</th>
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Source: Farrell & Chabot, 2011

*Educational Infrastructure*

There is also a recent educational infrastructure in place for maple production in New York State, which has proved to be helpful for producers. Cornell University and the New York State Maple Producers’ Association host maple events, maple educational seminars, maple producing tutorials, and a Maple Weekend. The seminars and tutorials try to educate maple producers, or individuals interested in producing, on the newest technologies, techniques, and maple science. Stephen Childs, an Extension Associate for Cornell University, is a maple specialist for New York State and provides educational instruction to producers. In all of our interviews, Stephen Childs was mentioned as an invaluable tool for better understanding maple as a producer. He is available to educate producers on sustainable forest sugar bush management, product quality improvement, sap collection and processing technology, and development of value added products. As mentioned earlier, the purpose of Maple Weekend,
which occurs a weekend in March every year, is to educate consumers on maple production and bring in tourism. For current producers, or individuals interested in becoming producers, there are lots of resources available to utilize to successfully enter the industry.

*Technology*

Technology plays an important role in the maple economy. Maple production has gotten more efficient over the last few hundred years, mainly due to improved scientific knowledge and technological advancement. For instance, the tubing that captures the sap and transports it into the sugarhouse is cheap to purchase and decreases the time and cost of labor. Additionally, the processing technology for maple has made it more profitable and consistent in quality.

One more recent innovation for expanding the maple market is value-added products. Value added products include maple cream, maple candy, maple sugar, maple jelly, maple cotton candy, etc. Essentially, these items are made by changing the temperature and length of time at which the maple is processed. Dick Loomis told us that he makes twice the profit of a gallon of maple syrup when he uses it for his value-added products.

*Producers*

Our interviews and scholarly research demonstrate that the issue for maple does not rest with the demand or the supply, but more so with the production of the supply. All of the farmers said that there was more of a demand than they knew what to do with, but that expanding their production— in terms of the numbers of trees, the maintenance of taps and the overall processing— would require a timely and expensive investment. In general, maple farmers seem to be in the industry as a hobby or family tradition more than to make a lot of money. Said differently, the
demand exists for maple production, but the producers do not have a desire to expand their production on a larger scale.

**The Vulnerabilities of the Current State**

This section will first provide background statistics that characterize the current state of production in Madison County to demonstrate its potential for growth. It will then detail the two largest vulnerabilities of the industry (producer characteristics and weather and climate), followed by a brief commentary on the discrepancies between maple’s economic potential and its vulnerabilities.

*The Current State of Production in Madison County*

There were 358,603 gallons of syrup produced in 2012 in New York State, a 36% increase from 2007 (USDA, 2014). This syrup came from a total of 1,460 farms, an increase of 147 farms from 2007 (USDA, 2014). According to the USDA Census of Agriculture, Madison County has 21 maple farms, which is 1.4% of the total number in New York State (USDA, 2014). Madison County’s maple farms have 1.1% of the total number of New York’s maple taps, and 0.98% of New York’s gallons of produced maple syrup (USDA, 2014). From 2007 to 2012, Madison County saw an increase in both the gallons of syrup produced per tap and the number of taps per farm. New York State’s current value of maple syrup production is $15,543,598 per year (Farrell & Chabot, 2011). While there is not data specifying the economic value of maple in Madison County, we can assume that it is approximately $152,327 per year since it produces 0.98% of New York’s total gallons of syrup. Additionally, New York is only utilizing 0.45% of the possible maple taps (Farrell & Chabot, 2011), which leaves room for
tremendous expansion. The industry may be small in Madison County, but there is room for growth if people are willing.

<table>
<thead>
<tr>
<th></th>
<th>New York State</th>
<th>Madison County</th>
<th>Madison County in proportion to NYS</th>
</tr>
</thead>
<tbody>
<tr>
<td># Of farms</td>
<td>1,460</td>
<td>21</td>
<td>1.4%</td>
</tr>
<tr>
<td># Of taps</td>
<td>2,064,864</td>
<td>22,528</td>
<td>1.1%</td>
</tr>
<tr>
<td>Number of gallons produced</td>
<td>358,603</td>
<td>3,510</td>
<td>0.98%</td>
</tr>
<tr>
<td>Value of production</td>
<td>$15,543,598</td>
<td>$152,327</td>
<td>0.98%</td>
</tr>
</tbody>
</table>

Source: USDA, 2014

Vulnerabilities in Producer Characteristics

Despite the room for growth, maple production has remained a relatively small industry, mainly due to the characteristics of producers. Farrell and Stedman (2013) showed that farmers in New York State do not have a favorable attitude towards syrup production, and cited that likely reasons were time constraints, lack of knowledge, lack of personal interest, and concern over the impact on timber production. Helen Thomas of the Maple Producers Association mentioned that the number of producers entering for the first time is low, and that most current producers are older people who have been in the industry for a long time. Additionally, she said the vast majority produces maple as a supplemental income. Interviews with maple farmers revealed a strong dedication to the land and family tradition. The information that we learned from Helen Thomas and the maple producers lines up nicely with a study done by Hinrichs (1998) who cited that the main motivations for producing maple syrup included, “managing risks, making seasonal use of land and labor resources, developing a retirement income,
demonstrating a rural, agrarian identity, and strengthening family and community ties.” Since most producers are on the elderly side, and not a lot of young producers are entering the field, the cultural ties that kept producers in the maple industry may not be sustainable for the future. In other words, a huge vulnerability for the continuation or expansion of the maple industry in Madison County is that the younger generations have less of a social or cultural connection to it.

**Vulnerabilities in Weather and Climate**

Another important factor in the current state of Maple Production is weather and climate, one of the industry’s largest vulnerabilities. When asked the biggest challenge that maple producers face, all of our interviewees cited year-to-year variability in weather patterns. The maple farmers said that the tapping season shifts slightly every year based on the time of thawing and freezing, but that over their lifetimes the tapping has overall moved earlier. However, the weather makes it impossible for farmers to rely on a steady amount of maple syrup they will harvest each year, and the date by which they will collect enough maple syrup to sell. As climate change worsens, we can predict that these fluctuations in weather patterns will intensify and the maple industry will be negatively affected by changes in the tapping season, the sapflow, the tree health, and the quality of sap.

**Discrepancies Between Economic Potential and Vulnerabilities**

Overall, while there is a huge economic potential for expansion in the maple industry, the vulnerabilities that exist in the unpredictable weather and the lack of new producers entering the field makes expansion less likely than one might expect. Additionally, if the weather grows more unpredictable, the anticipated economic potential may not be as high as researchers currently think. In essence, the largest vulnerabilities to the future of maple exist in the
unpredictable weather and the diminishing cultural connection to maple, which may impede on future economic viability.

**Future Predictions**

The next thirty years of maple production in Madison County are unclear, but the industry will increase its relevance, slowly die out, or maintain its current significance. This section of the report will outline the future circumstances that occur or that will need to occur in order for the industry to take each of the three potential paths.

**Expansion**

If the maple industry were to increase its relevance, a few changes would have to occur. First, the producers would need to increase the scale of production in order to create a supply of products that is equal to the demand. Increased supply would also mean that more local consumers would purchase the product, increasing the importance of maple for the community. In order for this to take place, more land would need to be purchased or utilized, although the supply of maple trees is not an inhibiting factor as Madison County and New York State both boast a high potential productive capacity. Additionally, the producers would need to make costly investments to upgrade the size, efficiency and amount of equipment. While expensive, producer Dan Beasley believes that purchases of equipment to increase the scale of production are usually a safe bet. This is because the demand for maple products is there in both the county and around the world. In fact, producers Ben Benjamin and Dick Loomis ship orders across the country and to consumers down the street from their maple facilities. Dan Beasley said that the difficulty for producers is to keep up with demand, so an increase in production scale could still be profitable. Increases in the average maple consumption per person and the price of maple
products could also motivate increases in the amount of production of maple products. It is also possible that continued technological innovation could allow for maple production to take on a more important role. Similar to the trend we see with a decreasing diameter of the spouts, major changes in the tapping method or processing efficiency could make the process significantly quicker. With a more efficient creation method, the maple production in Madison County may grow without necessarily increasing the number of producers in the region. Technological innovations may also help to offset and adapt to climate change impacts that inhibit production, however, upscaling does put the producers at more of a risk as production without adaption is reliant on stable environmental conditions. The environmental predictions for an increase in production will be evaluated further in the next section.

In terms of collection and production, the environment would not be impacted much more as sap extraction is sustainable land use practice. In fact, increased production would likely be better for the forests than the alternative, which is to cut down the trees to sell as timber. It is important to note, however, that increased production would likely lead to increased transportation, which would contribute to greenhouse gas emission in the atmosphere, thus increasing the effects of climate change. The current rise in annual temperature and weather unpredictability would also continue to negatively impact producers using traditional collection methods. However, producers who adapt by changing their tapping season to coincide with the weather will actually not be any less productive (Skinner, et. al, 2010). An increase in maple production significance would likely mean that no infestation of any invasive species had occurred. Specifically, the spread of the Asian Long-horned Beetle into Central New York would have likely been prevented with either human quarantine practices or by the preferences of the beetle itself. This analysis highlights the importance of producers to adhere to adaption
methods. If environmental effects are significant, environmental adaption methods will be necessary to avoid negative impacts on production. These adaptations will be further analyzed in the “recommendations” portion of the paper.

If maple production becomes more relevant over the next 30 years, it could also be because of the increased social meaning to consumers and other members of the community. Producers are very friendly with each other and there are many seminars in Central New York that address techniques of maple production. Perceived ease of entrance into production could increase the relevance of production, while an increase in the number of seminars could help to spread the importance of maple production and its products. Local farmers’ markets such as the one in Hamilton, New York, have been growing in popularity in the recent years. If this trend continues, the importance of maple could go up significantly as many maple products are sold at these markets. In fact, there are three maple sellers at the Hamilton farmers’ market alone, including producer Dan Beasley. There is also an increase in consumer preferences to buy local food as opposed to products mass produced at large facilities. Much of the maple syrup produced in Madison County is locally consumed, so it is possible that a continued increase in consumer preference for local food would result in greater social meaning and more production. While an increase in scale of production could reduce the benefit of buying locally, it is possible that an increase in the number of producers could be the cause of increased production. An increase in producer numbers would avoid the potential decrease in the region’s ability to appeal to the “buy local” movement. Tourism is a potential benefit of maple production as many people enjoy seeing syrup processing facilities and learning about the science behind production. While it does not play a major role today, it is possible that tourism could increase in the future and contribute to an increased connection with maple production.
Reduction

On the other hand, it is possible that maple production in Madison County may become less important to the community and slowly die out. A major cause of this path could be the current age of producers. NYSMPA executive director Helen Thomas highlighted the fact that a large majority of the producers in Central New York are old. Producer Dan Beasley represents a good example of this, as he recently retired from his full-time job earlier this month. Implied in the statement by Helen Thomas is that the next generation of maple producers is much smaller than the current one. As the current producers grow too old to produce, it is possible that no one will take their place and their land will go to other uses. Additionally, some producers may not want to make the costly investments necessary to increase the scale of production or will switch to more profitable industries.

Similarly, some producers may decide that their land is better used for timber production because of the higher profit, which could result in a much less sustainable use of the land. It is also possible that producers have to shut down production due to other environmental factors. The continued unpredictability of the weather and rising temperatures coupled with a lack of willingness or capacity to adapt could significantly decrease production and the number of producers. Even with minor adaptations from the producers, it is possible that the environmental effects of climate change could become too difficult to offset. The Asian Long-horned Beetle or other invasive species may spread to the area, significantly damaging the maple trees and reducing sap production as well. As it is difficult to understand and control for the spread of an invasive species, producers may not be able to withstand the damages and cease production.

Major changes in consumer preferences could also spell the end for maple production. Specifically, a reduction in preferences for local food and farmers’ markets would likely
decrease customer demand. Additionally, lack of attendance at maple production seminars would likely reduce maple’s importance in Madison County and reduce the knowledge of advances in production. Lastly, it is possible that producers may just not want to spend the time anymore. Many producers in Central New York make syrup and other maple products as a hobby. If the time commitment is too great for many of the producers, or production is no longer seen as preferred hobby, then the market supply will die out.

Stagnation

The third and final path for the future of maple production in Madison County is for the industry to continue its current levels of production and importance in the community. This is the most likely scenario due to the fact that maple is and has been a craft product for a long period of time. This means that production and consumer preferences limit expansion, but also indicate that current demand will likely still be present in 30 years. Environmental factors such as increasing temperature and unpredictable weather will pose significant problems for the longevity of the industry, but will be escapable with basic adaptation strategies. While adaption methods will help the producers continue current levels of production more easily, climate change effects are not likely to be so extreme that producers will no longer be able to produce. Thus, taking into account the lack of proactive measures by producers, the current trend in production is still feasible. Consumers and other members of the community appreciate maple products, but it is not likely that they will change their preferences so drastically in only 30 years, especially since buying local products continues to be more expensive than similar mass-produced items. Economically, the industry is not extremely profitable, but does provide sufficient supplementary income for many producers. Assuming major changes in prices of
equipment don’t occur, the cost of start-up will be too high for a large number of people to begin producing in Madison County.

**Recommendations**

Given the future predictions analysis, we feel that in order for the maple industry to survive, maple production must expand in scale and importance within the community. In order to achieve this result, we propose a series of recommendations that will target the major vulnerabilities and strengthen each pillar of sustainability. We understand that our recommendations differ in scale and feasibility; however, not all of them need to be accomplished at once. Rather, they provide different methods for the community to increase the significance of maple, ultimately increasing the production and significance of maple in Madison County in a way that best fits the community.

Most importantly, we recommend that a comprehensive longitudinal study on climate change impacts and maple production be done. A study that relates the major climate change impacts to maple production will allow producers to be more prepared for adaption and generate a perspective on the production areas most likely to be benefitted or negatively impacted by climate changes. In an ideal world, we would like for a study to be produced on changing climate impacts in Madison County, but we understand that the small scale may make this type of localized research almost impossible. However, further research relating effects such as temperature increase and weather unpredictability to maple production in a region like New York State or Central New York would aid in understanding how maple production may change over the next thirty years. Without knowledge on climate change impacts and how they
specifically affect maple production, maple producers may not be well prepared to continue
production.

Outside of studying environmental effects on maple production, we also recommend
making some small changes to increase the environmental sustainability of the region. Maple
production requires a great deal of tubing to transport the sap to the processing facilities.
However, this tubing is made of plastic, which is harmful to both animals in the environment and
humans because of the chemicals added to the products during production. Substituting the
plastic tubing with a more environmentally friendly material such as bioplastic, which is made
from corn instead of petroleum, is a simple change that producers can make to significantly
increase the environmental sustainability of the industry. Additionally, producers should
increase usage of the smallest diameter spout drills if possible. These drills leave smaller holes in
the maple trees, reducing the potential for damage during collection season.

The maple industry will also need to improve from a social standpoint if it is to increase
in significance. We recommend improving this community importance by publicizing the local
production efforts and increasing opportunities for education and appreciation of maple
production. Seminars and maple appreciation events are growing in numbers across the region,
but the number of events specific to Madison County is still small. Similar to Central New
York’s Maple Weekend event, Madison County would benefit from the creation of a scaled
down version where community members can go to the production facilities and learn from the
producers face to face. An increase in the hosting of local seminars would also benefit the
producers. Maple seminars generally have informative lectures or brochures on how to get
started in the industry and how to increase the scale of production. More numerous and
accessible seminars would increase the potential for new producers to enter the market or
increase their production amounts. Attracting these new producers to the market is crucial for the sustainability of maple in Madison County as the current producers are mostly old and will not be able to produce for a long period of time.

We also recommend putting more effort into publicizing the producers. By putting a face to the name and product, we believe that members of the community will appreciate the significance of locally produced maple products and form a more personal connection with the producers as many facilities are family-run and owned. This could be accomplished through incorporating business-marketing lectures into the seminars. For example, emphasizing the concept of supporting local farmers over the purchase of Canadian maple products on a brochure could increase social value and strengthen the local economy. While not a crucial issue at the moment, marketing would also increase the consumer demand, allowing producers to have the opportunity to increase production if they wish to produce at a much larger scale in the future.

Madison County should look into the concept of cooperatives and increase the sharing of land and equipment in order to increase the economic scale and stability of the industry as well. A cooperative is, in essence, an organization or farm jointly run by its members. In this instance, a maple cooperative would involve a group of people that tap maple trees on their own land and transfer the sap to a jointly owned production facility. The main benefit to cooperatives is that they significantly reduce the production and start-up costs due to the costly equipment needed for processing. This also allows for the inclusion of a new kind of producer, as some landowners are willing to tap their trees but either do not have the financial capability or do not have the time and motivation to process the raw material. Similar to the cooperatives, we recommend that Madison County look into maple tree landowners who do not want to produce maple, but are willing to let other producers tap. Through a database or website, Madison County producers
could locate nearby landowners who would either sell their land or let producers tap their maple trees. Not only would this strengthen community ties, but it would also increase the productive capacities of producers, further strengthening the overall stability of the industry in the long run.

Lastly, we recommend that Madison County and the producers stay informed on technological developments in the industry. New inventions such as the vacuum have increased tapping efficiency, increasing the productive capacities of producers. Similar technological developments in the tapping or processing equipment will help producers maximize the amount of final product per tap. Additionally, technological developments may also reduce the costs of equipment. For example, a new type of sap evaporator could be smaller and cheaper to buy, reducing the cost of production. This would allow producers to increase revenue and the scale of production. Additionally, lower operating costs would mean that producers could sell their products at a lower price, increasing the competitiveness of locally produced maple products in the global and local markets. Lastly, the reduced cost of entry would encourage more potential producers to make the initial investment and enter the market, helping to offset the current aging generation of producers in Madison County.

Overall, it is clear that Madison County and its maple industry have some serious considerations to make in regards to the future of production. The recommendations outlined are intended to aid the community in achieving an increase in importance and production, as we supplied the industry with a range of policies to ensure all aspects of maple production were evaluated.

Conclusion

Through an extensive analysis of the maple industry based on a literature review of scholarly sources, an assessment of statistical data, and qualitative interviews conducted with
maple producers, we were able to determine the economic, environmental, and social factors associated within the industry. From our analysis, it is evident that when examined through the lens of sustainability, the maple industry attempts to balance these three dimensions in order to preserve the future of maple products. Our analysis has also allowed us to offer recommendations that may strengthen the sustainability of the industry and allow it to expand. Although there are vulnerabilities, barriers to entry, and necessary adaptive strategies that need to be addressed, the current state of the industry is in a place of high potential, meaning that there is ample room for growth and expansion. This potential, however, depends on a number of factors, including the producers’ willingness to continue production and future climate patterns. Because of this, the near and distant future are unclear, and the industry can either grow and become a dominant presence in the market, remain in its current state as a craft industry, or falter and become a historical process of the past.
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