

Maple Research Programme

“Nova Scotia Maple Production Informatics and Maple Syrup Chemical Analysis”

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Executive Summary

The Maple Research Programme was established at the Faculty of Agriculture, Dalhousie University, in partnership with the Maple Producers Association of Nova Scotia (MPANS) to provide Research, Development, Innovation, Education and Training to the Nova Scotia Maple Industry. This is of historic importance to both Dalhousie University and MPANS as Canada accounts for nearly 76% of the world's maple production, while Nova Scotia accounts for less than 1% of this production and there is a great deal of research to be done to position the Nova Scotia maple industry. Through this project we aim to determine if there is (i) a link between syrup output, and management, operational and geographic location that would explain the variation in tap yield in Nova Scotia. Additionally, we (ii) investigated how unique Nova Scotia's maple syrup is in its chemistry.

A baseline survey was conducted of the major maple production areas in Nova Scotia to assess the influence of geography (county), operation size (small, medium, large), and technological diversity (minimal, vacuum, reverse osmosis, and combination) on maple syrup production. Twenty-two (n=22) producers were surveyed and each provided maple syrup for chemical analysis. Maple syrup was also collected from New Brunswick, Quebec, Ontario, Vermont, and New York for comparative analysis of brix, pH, colour, ultraviolet analysis, sugar content, phenolic compounds and minerals.

Fifty percent of the producers surveyed were located in the Cumberland County, which is currently the largest concentration of maple syrup producers in Nova Scotia. The use of technology to enhance production and processing was used among 70% of the producers with: 48% using a combination of reverse osmosis (RO) and vacuum to enhance their production efficiency, 13% using only an RO and 9% using only vacuum, while 30% use minimal technology (no RO and no vacuum). The majority surveyed were small operators (<4000 taps) (48%), with 26% managing medium (4001-15,000 taps) and large (>15,001 taps) operations. Overall, those surveyed account for 211,475 taps of the approximately 374,000 taps currently in Nova Scotia.

A large proportion of the producers (41%) surveyed started working in the maple industry after 2000, and on average operates on 109 acres. The sugarbushes tend to be split between young

and older stands with 48% of the stands younger than 75 years old, and 43% between 76-100 years old. Many of the younger stands were previously clear-cut; suffered blow down from hurricanes, or had been burnt. Of the 3912 acres of land estimated to be available to the producers, 61% of it is currently under syrup production.

Nova Scotia's maple operations tend to be located on sloped terrain, with 65% of the participants indicating that they have slopes between 11-15%, and 34% have slopes greater than 15%. More than half (52%) described their soils as shallow (less than 6") and of low to moderate fertility. Producers commented that weeds, disease and pests are not an issue on their operations and few have applied fertilizers, lime or other nutrients to their stands due to the cost and difficulty associated.

The NS maple industry primarily produces maple syrup, which accounts for 69% of the operators' time. The second largest part of the maple business is maintaining the sugar woods, followed by maple butter production. Though the industry is considered a backyard economy in NS, on average operations are employing 3-4 full and/or part-time employees in addition to the owner during the 6-8 week period. Full time employees' work on average 8 hours/day and 1-4 volunteers such as family members and friends help out on a weekly basis.

In 2013, production ranged from 110 L up to 18,000 L, depending on the size of operation with an average yield of 0.38 L syrup/tap. Maple syrup yield was not affected by geographic location, operation size or processing method. The length of the season (number of sap flow days) was also not affected by geographic location, operation size or processing method. Stand age and tree diameter, % sugar maple in sugarbush, and length of the season were also investigated and found not to have an impact on syrup yields. Currently, maple syrup is sold through bulk (37%) and retail (39%) sales with the highest price point for maple syrup (syrup only) from retail sales at \$16.87 per liter.

Eight operations are currently registered with the Canadian Food Inspection Agency (CFIA), while one is in the process of being registered. Those registered felt it gave them a marketing edge as there would be consumer confidence in their product by being overseen by a third party. Food safety challenges producers face include: meeting CFIA's requirements and paperwork, access to power, running and hot water at remote locations, cost of materials (such as stainless steel), record keeping/paper work load, and maintaining a tracking system for traceability. Challenges producers indicated that the overall Nova Scotia maple industry face are: low yields, need for education/marketing, unpredictable weather and costs of equipment/infrastructure. Challenges facing their "own" operations were cost of equipment/infrastructure, marketing followed by age/succession. Yield and education were of lower priority on their own operations. The leading costs associated with maple production are evaporation (33%), tapping (17%), and sugarbush management (15%). Agrochemicals and fertilization are not used by the majority of the producers therefore, are of low cost. Overall, all operations tended to break their key operation costs down in a similar manner indicating that their cost and time is similar just on a different size of scale.

Forty-three percent (43%) of the producers indicated that they felt climate change has impacted yields, timing of tapping, season length and sugarbush composition. Due to the high number of new entrants into the maple industry since 2000 many felt they hadn't been in the industry long enough to see the impact of climate change.

Analysis of syrup identified several unique properties specific to NS syrup. Overall, Nova Scotia syrup samples were found to have greater concentrations of P, K, Mg, Na, Al, B, Fe, Zn and Mn than samples obtained from the USA. The phenolic compounds, coniferyl alcohol, sinapyl aldehyde, and vanillic acid were also found in greater concentration in the Nova Scotia samples compared to the samples from QC, ON, NB, VT and NY. These compounds aid in the development of the characteristic maple flavor and have been investigated in the prevention of diseases and cancer. This provides us with a unique product that requires further investigation. Differences within NS were found by geographic region, operation size and processing method, however there were no consistent impacts on the syrups chemistry by any one of these factors. Therefore, harvest timing, boiling time, soil fertility, climate, as well as operation effects all influence the syrups chemistry in a variety of ways, even on neighboring operations.

