

## The Economics of Buying Sap

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There are few businesses outside of agriculture that make large capital investments in equipment that is only used part-time during a 4-6 week period each year. In order to get the maximum return from their investment, businesses often try to utilize their equipment to the greatest extent possible. Sugarmakers invest tens of thousands of dollars in building sugarhouses and buying evaporators, reverse osmosis units, filter presses, and other items necessary to produce high quality maple syrup in a cost-efficient manner. These are fixed costs that a sugarmaker must endure each year no matter how many taps they put out or how good the sap runs. This large investment in fixed costs tends to lower the overall profitability for many sugarmakers. And while many sugarmakers produce syrup because it is a labor of love, it is important to realize that some people can and are earning a decent living producing syrup. These tend to be the large producers who can gain economies of scale in their production and spread their fixed costs out over a greater number of taps. Once a producer has made the initial investments in equipment, the variable costs for processing sap are usually much lower than the revenues gained from selling the syrup. Generally speaking, the more hours you can spend processing sap and utilizing your equipment, the more profitable your operation will be. This is especially true for large operations with energy efficient ROs and evaporators.

Many sugarmakers have expanded their operations over recent years by putting out more taps on their own property or leasing additional taps from neighboring properties. But if a sugarmaker doesn't have time to collect more sap, does it make sense to buy in sap from others? To help answer this question, I developed a simple Microsoft Excel calculator that allows sugarmakers to determine the amount of money they would make per hour (i.e. their hourly wage rate) for buying in and processing additional sap. This spreadsheet can be found on the Cornell Maple Program website at <http://maple.dnr.cornell.edu/sapbuying.htm>

In order to use this calculator, sugarmakers must have a good grasp of their costs and revenues for processing sap. They must be able to estimate their syrup production per hour, the bulk price of syrup, the fuel cost to produce a gallon of syrup, and the cost to store the additional syrup in barrels. Sugarmakers must also determine what percentage of the syrup (or bulk syrup revenues) they will retain and what percentage will be given to the sap seller. When a user enters in values for these variables, the spreadsheet provides the hourly wage (the amount of money a producer makes per hour) for processing sap according to the following formula:

Hourly Wage for Processing Sap = Gallons of Syrup Produced Per Hour \*

(Bulk Price of Syrup (\$/lb) \* 11.14 lbs/gallon) - (Fuel Cost per Gallon of Syrup + Storage Cost per Gallon) \*

Percentage of syrup (or bulk syrup revenues) retained by the person processing the sap

Let's now consider three examples of how this works...

*Large Sugarmaker with Energy Efficient Equipment.* For the sugarmaker who has made significant investments in a large evaporator and reverse osmosis system, the marginal revenues for processing additional sap are quite high while the marginal costs are significantly lower. If someone was able to produce 80 gallons of syrup per hour, the fuel cost to produce a gallon of syrup was only \$2, the storage cost for barrels was \$5/gallon, bulk prices averaged \$2.75/lb, and the producer gave the sap seller 50% of the bulk syrup revenue, the producer would still be earning \$930 per hour by purchasing and processing additional sap. Even if the producer gave the sap seller 70% of the syrup revenue, he or she would still be making \$558/hr. It is hard to imagine being able to make as much money in any other venture, and if a sugarmaker has already invested in the equipment to do this, it certainly makes sense to use this equipment to the greatest extent possible.

*Small Sugarmaker with Older Equipment.* For sugarmakers who have smaller, less efficient evaporators and do not yet use reverse osmosis, the marginal revenues are not as high and the marginal costs are much greater, so the hourly wage for processing sap is significantly lower. If someone was only able to produce 6 gallons of syrup per hour, the fuel cost to produce syrup was much higher at \$10/gallon of syrup made, storage prices were \$5/gallon, bulk prices averaged \$2.75/lb, and this producer gave the sap seller 50% of the syrup revenue, the producer would earn \$45.75 per hour. Although this is much lower than the wage described above, it is still profitable for sugarmakers to purchase sap under these circumstances. To be able to make \$45/hour doing something you love while generating a tremendous product is certainly a worthwhile venture (in my opinion).

*Hobby Sugarmaker with Inefficient Equipment.* For the hobbyists, it is difficult to make money boiling their own sap, let alone the sap that others gather and sell. For example, if someone can only produce 1 gallon of syrup per hour, the fuel cost to produce that gallon is \$12, storage costs are \$5/gallon, bulk prices are \$2.75, and the producer gives the sap seller 50% of the revenue, he or she would only be making \$6.63/hr. When it is very time consuming and energy intensive to process sap, it is hard to offer someone 50% of the revenues and still make decent money. Even when hobbyists get to keep 100% of the syrup revenues by boiling their own sap, that only equates to \$13.25/hr, so it is quite obvious that hobbyists are not in syrup production to make money.

It is important to realize that all of these “hourly wages” are simply the variable revenues from processing sap (i.e. the value of the extra syrup produced) minus the variable costs of processing that sap, determined on an hourly basis for the time spent processing. In actuality, maple producers do not always earn that much money processing their own sap, because these figures do not factor in the fixed costs. However, when deciding whether or not to purchase *additional* sap to make greater use of your equipment, these calculations should be based on the marginal revenues vs. the marginal costs of doing so. Maple production can be quite profitable on the margin for existing operations- it is the fixed costs that often drive down profitability. Purchasing additional sap can be one way to increase the overall profitability of a sugaring operation and help pay for the fixed costs of investments. This is especially true for sugarmakers who do not have the time or ability to collect more sap themselves.

So what can a sugarmaker afford to pay for sap? Sap prices should be based on the price of bulk syrup, sugar content of the sap, and the percentage of the bulk syrup that the sap seller receives. See the sap

price table in this edition of the Maple News and download a copy at <http://maple.dnr.cornell.edu/sapbuying.htm>. Since a producer cannot really control sap sugar content and bulk syrup prices are set by the market, the only variable that a producer can change is the percentage of the bulk syrup price that he or she provides the sap seller. What is an equitable distribution of revenues from that sap? That is up to the sap purchaser and seller to decide, but typically producers give the sap buyers 50% of the syrup that the sap would produce or 50% of the bulk price of that syrup. For smaller, inefficient producers, it may not be very profitable to give 50% of the syrup income to the seller, whereas larger producers may be able to distribute even more than 50% and still make a substantial profit. The higher the percentage of syrup or syrup revenues a producer can offer someone that provides them with additional sap to process, the happier that person selling sap will be. The person selling sap will have a greater incentive to gather and deliver more sap and more people will be enticed to get into the sap selling business. When both the person selling sap and the person buying/processing sap can both earn a reasonable return by collaborating, it's a win-win for everyone involved.

For all of the examples above, the average bulk price was used for revenue calculations. Even though producers often sell their syrup retail at higher prices, bulk prices should be used because they represent what the syrup is worth before any value is added by packaging and marketing the product. Since bulk syrup can be bought and sold at roughly the same price (assuming buyers and sellers have the same knowledge of prices), it is strongly recommended to use the bulk price when making these calculations.

It is important to consider the role of syrup storage in this analysis. If one has to buy additional barrels to store the extra syrup that will be produced, then the cost per gallon of storage should be factored in to the analysis, but just for the first year. Producers should put a zero in for storage costs when doing this analysis in subsequent years, since they will already have paid for the barrels in the first year. The costs of filter papers and diatomaceous earth to filter the additional syrup could also be factored in, but these are quite small in comparison to the value of the syrup being produced and are unlikely to influence the results.

Should a maple producer buy sap to supplement their existing operation? There are many aspects to consider, including whether the sap can be delivered or would need to be picked up, whether the sugarmaker is able to or wants to spend more time in the sugarhouse processing sap, and whether the additional syrup can be sold at a decent price. The sole purpose of this analysis is to assist sugarmakers in determining the financial aspects of this decision, in particular the amount of money they would make per hour for buying in and processing additional sap. It is important for sugarmakers to realize that the marginal revenues for processing additional sap usually far outweigh the marginal costs of buying this sap. Therefore, sugarmakers who are interested in making the most of their equipment and recouping their large investments in a sugarhouse, evaporator, RO, etc (fixed costs) should put out more taps themselves and/or purchase as much sap as their facility can reasonably handle.

For sugarmakers who are already buying sap or decide to do so, there is another spreadsheet on the Excel file that allows sugarmakers to keep track of volumes and payments throughout the course of the

sugaring season. Simply download the Excel file at <http://maple.dnr.cornell.edu/sapbuying.htm> , go to the tab entitled “blank worksheet”, follow the instructions on what variables to provide input data for, and the spreadsheet will keep track of payments for each load of sap purchased.

As a final note, it is worth mentioning that anyone purchasing sap should have at least one and preferably two reliable ways of measuring the sugar content and volume of sap delivered. Refractometers and sap hydrometers should be tested annually and throughout the course of the sugaring season to make sure they are providing accurate readings. Whenever sap is transferred to a sugarhouse, it should flow through a totaling water meter in order to get a precise measurement of the volume delivered. Finally, it is a good idea to develop a simple contract between the sap buyer and seller should any disputes arise throughout the course of the season. This contract should stipulate the terms of delivery, quality control mechanisms for the sap, payment schedules and rates, and any other issues that could arise between a sap seller and buyer.