The University of Vermont PROCTOR PAGE

News from the University of Vermont Proctor Maple Research Center

How often should you replace droplines?

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Several studies have demonstrated the benefits of improved spout and dropline sanitation on sap yields. Annual spout replacement, the use of Check-valve adapters or spouts, and/or periodic replacement of droplines all result in reduced microbial levels within tapholes, better sap volumes produced in the latter half of each season, and increased total sap yields. While higher sap production can mean higher profits, the precise economic costs and benefits will vary depending not only upon the additional sap gained, but also upon the cost of implementing each strategy.

Several studies by the UVM Proctor Maple Research Center, the Cornell Maple Program, and Centre Acer, in addition to extensive producer experience, all indicate that replacing droplines (along with spouts) generally results in the highest levels of sap production. Replacing droplines however is very costly, and although sap gains are high, the costs can outweigh the benefits, resulting in a net economic loss for the producer.

However not replacing droplines often enough can mean a loss of potential sap, and thus a loss of potential income. While seemingly simple, several interacting factors are involved, including how much more sap is gained by replacing droplines, how much sap is produced over the next few seasons if droplines are not replaced, what is the cost (both materials and labor) of replacing droplines, and how much is the sap worth to the producer. Thus the question of how often droplines should be replaced is not always straight-forward.

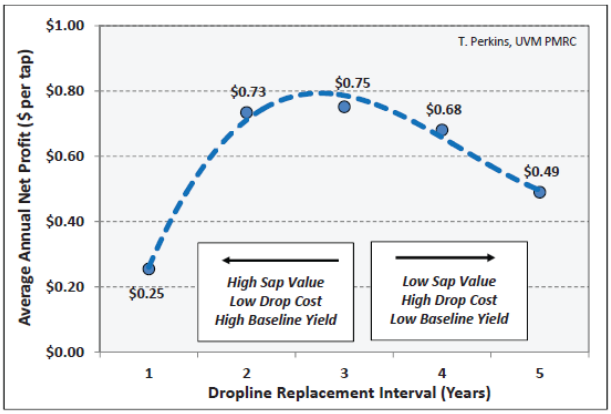

Figure 1. Effects of dropline replacement interval on net profits in vacuum maple tubing operations. Replacement of droplines assumes that spouts are being replaced annually. Note that this scenario is based upon sap yields in tubing systems with vacuum. Tubing systems on gravity will yield different results.

Using the results of previous research, we constructed a Microsoft Excel-based tool to help maple producers determine the effects of various replacement strategies on sap yields and net profits. This tool is titled "Economics of Replacement" and is available for download in the "Recent Publications" section of our webpage at http://www.uvm.edu/~pmrc Users need to have Excel on their computers in order to use this spreadsheet.

Although this paper doesn't explain the full functionality or operation of this tool, there is some documentation within the spreadsheet itself and further papers are cited if further background information is desired. Producers can alter the input variables, but cannot view or change the assumptions that the model is based upon. While this tool will allow users to examine several possible strategies, this paper focuses mainly on dropline replacement in tubing systems in which check-valve spouts or adapters are NOT being used.

Using this tool we ran through a large number of possible scenarios using a wide range of reasonable input variables for tubing systems on vacuum. The results are shown in Figure 1, which depicts the average annual net profit (over a 5 yr time span) for dropline replacement intervals from 1 year (replacement of drops every year) to 5 yrs.

In general, although sap yields are high, due to the cost, net profits are lower if droplines are replaced every year. If we are getting the highest sap yields with frequent dropline replacement, why would we not get the highest economic return? This is the result of two factors. The first is that dropline replacement is costly.

Although there is a good result in sap yield when replacing drops annually, the cost of doing so is close to, or sometimes more than the additional profit realized by the increased sap yield. The second reason is that since the droplines are only 1 yr old when replaced, the potential increase in sap (the difference between what you get in yield minus what you might have expected if you had not replaced the droplines) is fairly modest. After only one season of use, the droplines are somewhat contaminated, but yields will not drop by more than about 14-17%. Therefore you can't expect to gain

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more than 14-17% if you replace the droplines each year. If you had waited and replaced them the following year, the potential gain would be closer to 20-24%. Thus both the potential increase in sap yield is larger, and your cost of replacing droplines is half (you replaced them every other year as opposed to every year).

Clearly replacing droplines every year is not economically optimal unless the cost of the dropline material and associated labor of constructing and deploying them is very low or if both the producer sap yield and value is very high.

As dropline replacement interval increases, net profits increase. In order to maximize net profits, producers should choose the peak region of the curve.

At this point, the indicated replacement interval should produce the highest net profit for the given circumstances. For our "average" scenario, the peak of the curve (the highest profit potential) is met at a dropline replacement interval of 3 yrs. Although a replacement interval of 2 yrs is very close in this case, replacing drops every 3 yrs is considerably easier than the shorter time frame.

Eventually, as dropline interval gets longer, net profits begin to decrease again, indicating that some amount of potential sap was not collected due to reduced sanitation. In other words, some potential amount of sap might have been produced if droplines had been replaced more frequently.

Although Figure 1 indicates that for many producers a dropline replacement interval of 3 yrs will maximize their net income, in some cases however, a shorter or longer replacement interval is more advantageous.

For those producers who place a high value on their sap (due to high sugar content, retail sales, etc.), or those that have a low dropline cost (materials and/or labor), or producers who have very high baseline yields (high sap production levels per tap), then a more frequent dropline replacement interval might make sense. In those cases, dropline replacement every 2 yrs might be better. The opposite is also true. For producers with low sap value, high dropline costs, and/or low production yields, extending dropline replacement to 4-5 yrs can be more advantageous.

Producers may use these as general recommendations, or can use the spreadsheet tool to calculate the estimated economic consequences of dropline replacement for their own operation.

DR. TIMOTHY PERKINS of the University of Vermont, Proctor Maple Research Center, checks his research equipment in Proctor's sugarbush last spring.

One simple consequence of this is that for producers who are going to replace their droplines regularly, constructing droplines from tubing that is guaranteed for shorter time periods (5 yr versus 10 yr tubing), and thus slightly less expensive to purchase, may be something worth considering.

For those operations in which check-valve spouts or adapters are used, dropline replacement is far less advantageous in terms of increased sap yield or net profit.

We have seen only small improvements in sap yield upon replacing droplines with check-valves out to dropline ages of 10 yrs. At that point, depending upon the tubing, breakdown in dropline materials may become more of a factor than sanitation, and necessitate dropline replacement regardless of the spout being used.

In summary, regular dropline replacement can result in higher sap yields for maple producers. Choosing the right dropline replacement interval is part of an integrated sanitation strategy that is vital towards the goal of maximizing net profits from your sugaring operation.