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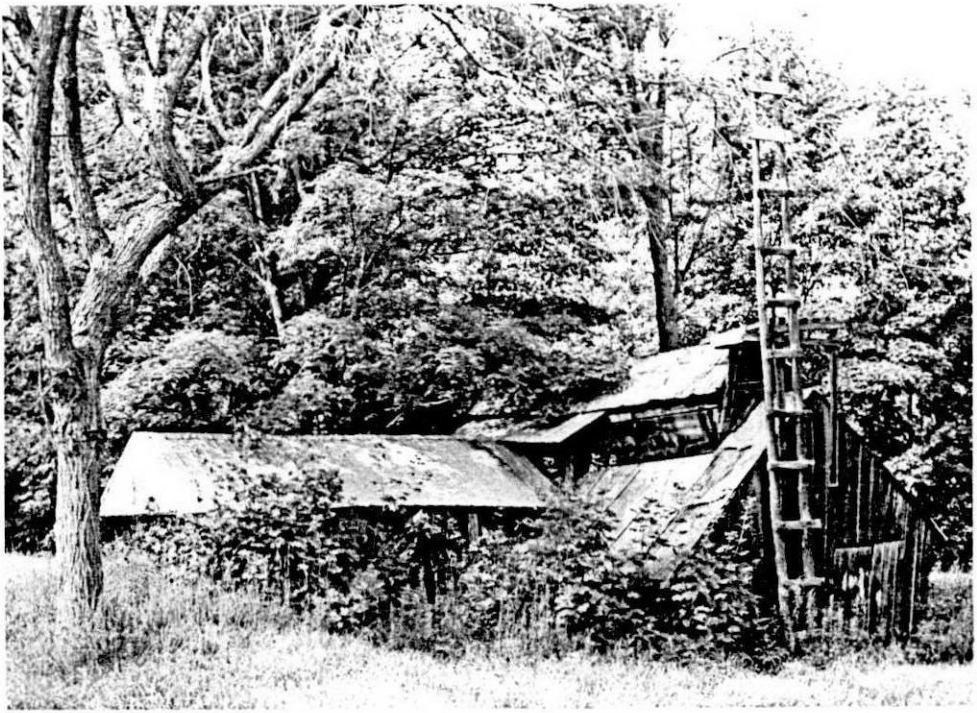

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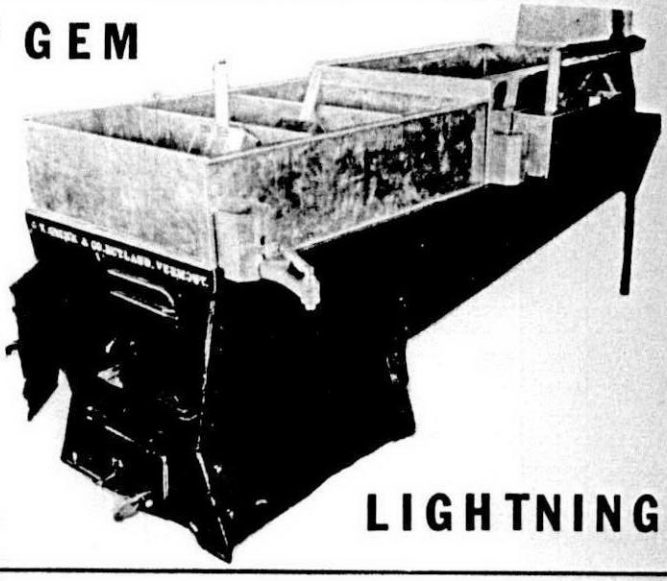

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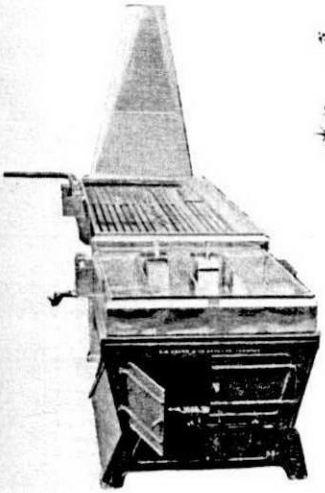

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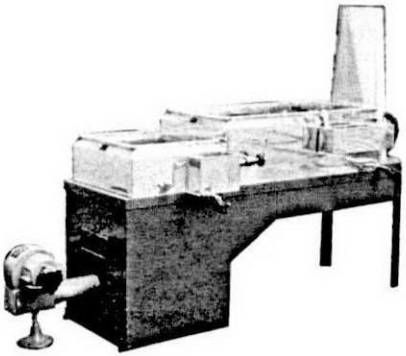

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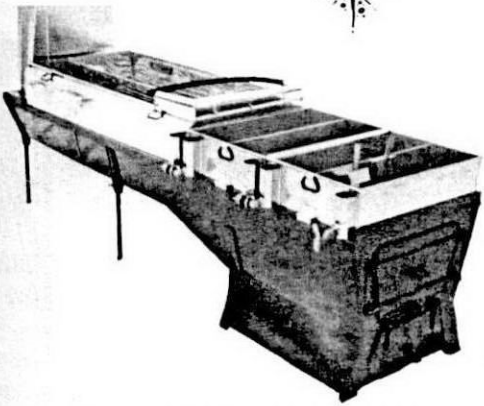

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Cover Picture—

A picturesque sugar house in Canada. Photo taken by Bob Lamb at the 1972 Ontario Maple Tour.

Editorial

There is an old adage "quit while you're ahead" which I am about to ignore.

The last issue carried an editorial about the problems maple producers face when dealing with the misinformed public. Judging from the response I received since then, I must have hit the nail on the head, and I want to thank everyone who sent me their compliments. I know I can't do any better and should quit while I'm ahead, but the Digest must go on and, as usual, I've got another gripe, so here goes.

Several times, at previous National Council meetings, I've heard someone urge the chairman to set the dates for the next Council meeting well in advance, which, I thought at the time, was a very commendable idea. What good does it do?

Last winter I received a note from Robert Coombs, Chairman of the National Maple Syrup Council, setting the dates for this year's annual meeting. To be more precise, I think it was about the first of January. Along about May or June, I heard the Extension Service had decided to hold a meeting in Wisconsin for all the Extension Foresters on the exact same days.

Now whether you know it or not, the extension foresters are a vital part of our National Council. Most of them in the maple producing states are associate members of the Council, and I can't remember a Council meeting where at least some of them didn't play a pretty important role.

Who's to blame for the confliction? I don't know. You certainly can't blame Bob Coombs. He set the date early enough and couldn't change it if he had wanted to because of accommodations. On the other hand, you can't expect the Extension Service to ask every two-bit organization in the country if it is all right if they hold a meeting at a certain time. I guess we'll have to get along the best we can without at least some of our foresters this year and hope it doesn't happen again.

The second part of this editorial is more like information than a complaint.

I received a letter a few days ago from a party who had sent a check several months ago for the Digest but had never received the Digest or the cancelled check. In checking the mailing list I found this party was correct—they were not receiving the Digest. What happened to the letter and check, I don't know. It's very possible it was lost in the piles of confusion that comprise my office. All I can say to this party or to anyone else who may have had the same experience—please try again. I assure you, it was not intentional.

This party also mentioned that maybe it would be better if they wrote to the Secretary-Treasurer of the Digest. That won't do a bit of good because that's me. I'm also the publisher, editor, business manager, advertising salesman, circulation manager, bookkeeper, bill collector and newsboy. It wasn't intended to be this way, it just happened, and it presents a problem. I have to make a living.

You see, the Digest can hardly afford to pay me for the time I put into it, let alone hire any other help, and since this isn't a full time job, I do a little work on the side—I believe it's called moonlighting (not to be confused with moonshining.) I make a little maple syrup, eat all I can and

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occasionally sell some. I don't expect I'll ever get rich at either job, but so far I've managed to stay at least one jump ahead of both the creditors and the sheriff. I believe this qualifies me to assume I have reached some degree of success.

With this thought in mind, it appears that this is as good a place as any to end this monologue.

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1972 ONTARIO MAPLE TOUR

W. A. Humphreys

Visitors registered from Quebec, New York State, Vermont, Massachusetts, Michigan, Pennsylvania, and Wisconsin, at the 2nd Annual Ontario Maple Tour, which was held in Leeds, Grenville and Lanark Counties of Eastern Ontario on July 21 and 22, 1972. The tour was sponsored by the Ontario Maple Syrup Producers' Association, in co-operation with the Ministry of Natural Resources and the Ministry of Agriculture and Food.

Registration was at Confederated Foods, Delta, which is the largest packer of maple products in Ontario.

After a welcome by Walter Humphreys, Maple Syrup Extension Specialist for Ontario, Brent Brown spoke for Confederated Foods and groups of about 30 were taken on tours of the plant. The tour left Delta for a trip to the Drummond's sugar bush at Spencerville. The complete tour was under the guidance of Clarence Coons, Ministry of Natural Resources.

The sugar bush at Drummond's covers about 35 acres and in 1972, 2,600 taps were set out, 1,600 on vacuum tubing, with two Surge milker pumps and a dumping unit. Last spring was the best ever in the Drummond Sugar Bush, with a production of 593 gallons of syrup.

The evaporator is a 5' x 16' Lightning, with cover, and two Powerflame high velocity oil burners are used in a wood-fired arch (no alterations). A propane gas-fired finishing pan with a Cholette automatic controller completes the evaporation picture.

The next stop was at the Experimental Sugar Bush of the Kemptville College of Agricultural Technology. In 1972, this bush had 465 taps on tubing, with a dry vacuum system. Production was one gallon syrup from 5.47 taps, with most of the first run and the last run not being utilized. The sap was boiled on a 4' x 14' covered evaporator, using wood for fuel, and finished in a 2' x 4' gas-fired finishing pan.

Accommodation was provided at the college and a very delicious buffet banquet served in the cafeteria, featuring maple baked beans, maple green grape salad, maple mousse, maple syrup pie, maple pumpkin pie and maple sundaes.

At the evening program, Clarence Coons of the Ministry of Natural Resources was presented with a mobile of real maple leaves, and a small spirit level, the latter for grading the plastic lines in his maple bush. These duties were performed by Kathy Paul, the Ontario Maple Queen. Jim Purvis, Head of the English Department at the College, and Manager of the College Maple Bush, was Master of Ceremonies. Entertainment was provided by show-

ing a film of the College Maple Bush, another film on maple syrup production, and by the musical excellence of Glen Cochrane on the electric organ.

On Saturday morning, a long line of cars and campers wound its way to the Paul's Maple Sugar House. Brien and Marion Paul operate the largest maple syrup operation in Lanark County. In 1972, sap was boiled from 7,500 taps, 4,675 of which were on tubing (gravity system), 1,700 on buckets, and the balance of the sap was purchased from neighbours. Sap first goes through a 5' x 10' oil-fired Lightning flue pan, then through a 5' x 16' oil-fired Lightning evaporator and flows directly into a 2' x 4' propane gas Lightning finishing pan. A Cholette automatic controller is used and the complete unit will produce 10 gals. of maple syrup per hour.

The Pauls have a modern, attractive sugar house made of cedar planks cut in their own bush. At one end is a candy kitchen and some tables and benches where pancakes and maple syrup can be served. Marion makes about 3,000 lbs. of maple sugar and 250 lbs. of maple butter every year.

The last stop on the tour was at Bob McEwen's Sugar Camp and Pancake House. Bob uses a Duro piston pump to apply vacuum to 750 taps on tubing. The pump is located 1,100 feet from the sugar camp and it also pumps the sap from the storage tank in the bush to the sugar house. Production of 455 gallons of maple syrup was from a total of 2,750 taps, some of which were rented and sap was purchased from others. A 4' x 12' wood-fired Lightning evaporator is used to boil the sap. Bob's son, Bill, helps in the maple syrup operation and his wife Kaye looks after the Pancake House.

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TAPHOLE NUMBERS & TUBING SIZES

by
Russell S. Walters and H. Clay Smith
USDA Forest Service
Northeastern Forest Experiment Station
Burlington, Vermont

Sugarmakers are often concerned about the proper size of tubing to use for transporting sap from their sugarbush to their collection tanks. They want to use a size large enough to carry the volume—but not too large, because larger tubing is more expensive.

The necessary tubing size can be estimated. We suggest a method based on maximum flow-rate data for various tubing diameters and slopes, and on the relationship between flow rate and number of tapholes.

Although these data are only estimates, the information should help the sugar producer select the size of tubing best for transporting sap from his sugarbush trees to his collection tanks.

Assumptions

We made three assumptions. First, information for gravity movement of water through plastic tubing is applicable to sugar maple sap flow because sap is 96 to 98 percent water. Second, we assumed a sap-flow rate, during a peak flow, of ½ gallon per hour per taphole. Third, although sugar maple trees give off gases (mainly carbon dioxide) as well as sap, we believe that the data are still satisfactory.

Slope percent is a measure of slope steepness—the change in elevation or topography for a given horizontal distance.

Plastic Tubing Diameter

A sugar maple sap-collection tubing system is a network of plastic tubes of various diameters. In this network there are many small or lateral lines hanging from tree to tree. Each will have 20 or more tapholes connected to it. The lower ends of these lateral lines connect into larger conduit lines; and as the sap moves down the slope, these lines merge with increasingly larger sizes of plastic tubing (fig. 1 and 2).

Plastic tubing used for collecting sugar maple sap (fig. 3) ranges in size from ¼ inch to 2 inches (inside diameter measurement). The smaller tubing is normally used to collect sap from the tree, and the larger sizes are used to carry the sap from several lateral lines. If the tubing operation has several thousand trees, sap may be transported through several sizes of tubing before reaching the collection tank.

Flow Rates

Data published by the Republic

Steel Corporation (table 1) give information about water-flow rates through tubing of various sizes. These data indicate the number of gallons of water per hour that will move through tubing diameters of ½ inch to 2 inches, for each of seven slopes ranging from 6 to 40 percent.

Slope steepness greatly influences the gravity movement of sap through plastic tubing. A conduit line can carry sap from more tapholes on a steep slope than it can from a less steep slope. For example, on a 15-percent slope a ½-inch tubing line is adequate for handling the sap from about 500 tapholes. On a 30-percent slope a ½-inch line can handle the sap from about 750 tapholes.

Water-delivery data were not given for 1/4-inch or 5/16-inch tubing. However, our experience indicates that 20 tapholes per line works satisfactorily. Morrow (1971) reported using up to 50 taps per 5/16-inch line on a 5-percent slope and up to 80 taps per line on a 10-percent slope.

Discussion

Gravity sap-flow data indicate the number of tapholes that can be used with a given diameter of plastic tubing for several slope percentages. These are based on the assumption of ½ gallon of sap per hour per taphole during maximum flow periods. Although the peak sap flow of ½ gallon per hour may occur only once or twice during the sugaring season, it is important for the producer to have tubing capable of handling these peak flows, or valuable sap may be lost.

For using the tubing size–slope–number-of-tapholes information from table 2, you should consider several

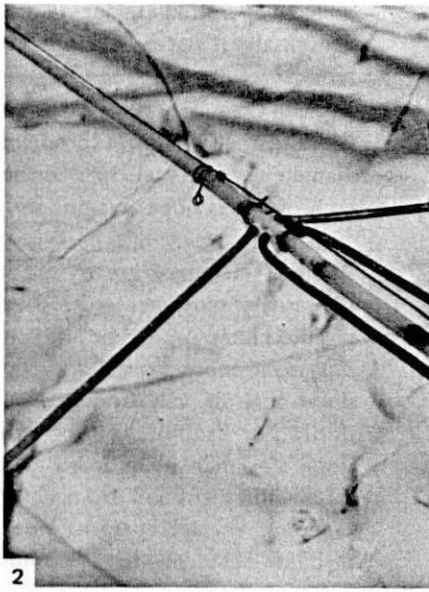
Table 1.– Water delivered per hour by gravity movement through plastic tubing of various diameters on a designated slope.

[In gallons per hour]

Slope Percent	Plastic tubing diameter, in inches					
	½	¾	1	1¼	1½	2
40	444	933	1,752	3,600	5,400	10,450
30	378	795	1,500	3,120	4,620	8,940
25	342	720	1,350	2,820	4,200	8,040
20	303	640	1,215	2,520	3,720	7,140
15	258	549	1,050	2,160	3,180	6,120
10	207	444	840	1,740	2,526	4,860
6	156	336	630	1,320	1,920	3,720

Source: Republic Steel Corporation: Water delivery tables using Republic flexible plastic pipe. 12 pp., 1956.

1



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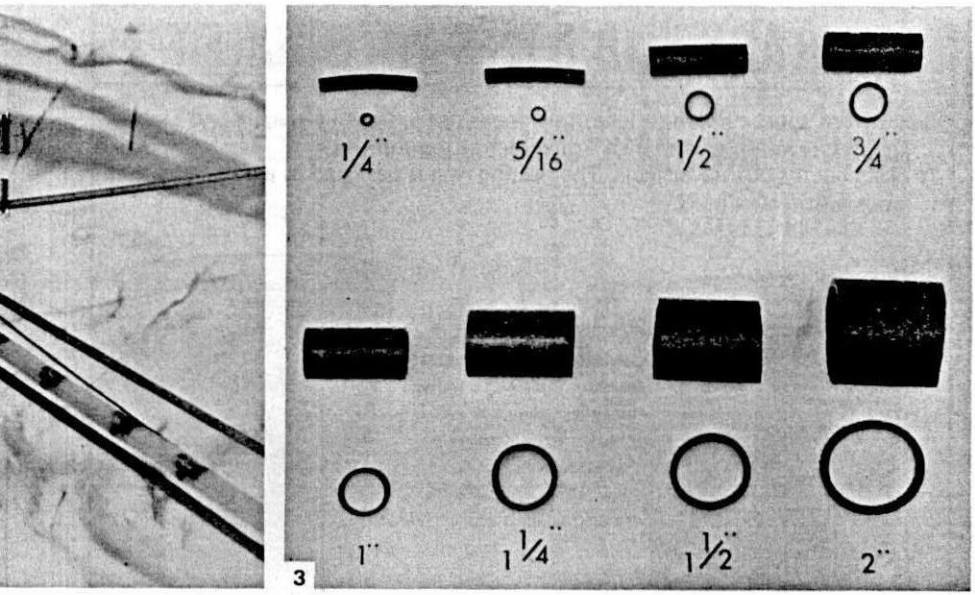
points. The tubing must be installed with a minimum of severe bends or crooks. The sap should be able to move by gravity through the tubing to the collection tank. Slope percentages should be estimated carefully, because this factor is important in choosing the correct size of tubing. Also, in installation, the slope of the lines should be as uniform as possible.

These data will help new producers who are installing tubing for the first time. They should also benefit producers who are having problems with

Table 2.– Approximate maximum number of tapholes that can be used for collecting sap by gravity flow, using various diameters of plastic tubing on a designated slope.

Slope Percent	Plastic tubing diameter, in inches					
	½	¾	1	1¼	1½	2
40	888	1,866	3,504	7,200	10,800	20,900
30	756	1,590	3,000	6,240	9,240	17,880
25	684	1,440	2,700	5,640	8,400	16,080
20	606	1,284	2,430	5,040	7,440	14,280
15	516	1,098	2,100	4,320	6,360	12,240
10	414	888	1,680	3,480	5,052	9,720
6	312	672	1,260	2,640	3,840	7,440



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their tubing, especially in determining if the problem is too many tapholes for a given size of tubing. Sugar producers successful with tubing say that it is better to have tubing that is too large than tubing that is too small and inadequate for handling the volume of sap during a peak-flow period.

Figure Captions

Figure 1.—From the spout in the tree, sugar maple sap is transported through small tubing to larger mainlines.

Figure 2.—Feeder lines of 5/16-inch tubing join a suspended line of 3/4-inch tubing.

Figure 3.—The plastic tubing used in sugarbush operations ranges from 1/4 inch to 2 inches in diameter.

Reference

Morrow, Robert R.
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Nat. Maple Syrup Dig. 10 (3) :16-17.

RELATIONSHIPS BETWEEN TREE CHARACTERISTICS AND MAPLE SUGAR YIELDS

by Barton M. Blum
Northeastern Forest Experiment Station
Forest Service,
U.S. Department of Agriculture
Orono, Maine

Maple sugar producers have always been interested in relationships between the size of sugar maple trees and the potential yield from the trees. For instance, many think that the sweetest sap comes from trees with wide, deep crowns like those of open-grown trees; and that large trees yeild more sap than smaller trees.

Usually these relationships are observed by the man working in the sugarbush. However, such casual observations are subject to the usual human frailties. (My trees are always the biggest and the best!) And it is often an eye-opener to check the accuracy of observed relationships with actual measurements free from any bias. Once measurements of this sort are made, they can be further evaluated statistically.

One statistical measure of the relationship between two factors is called the "simple linear correlation coefficient." If two factors are perfectly correlated, the linear correlation coefficient would be 1.00; and for any change in one factor there would be a corresponding and proportional change in the other. When plotted on graph paper, the points would all fall along a straight line.

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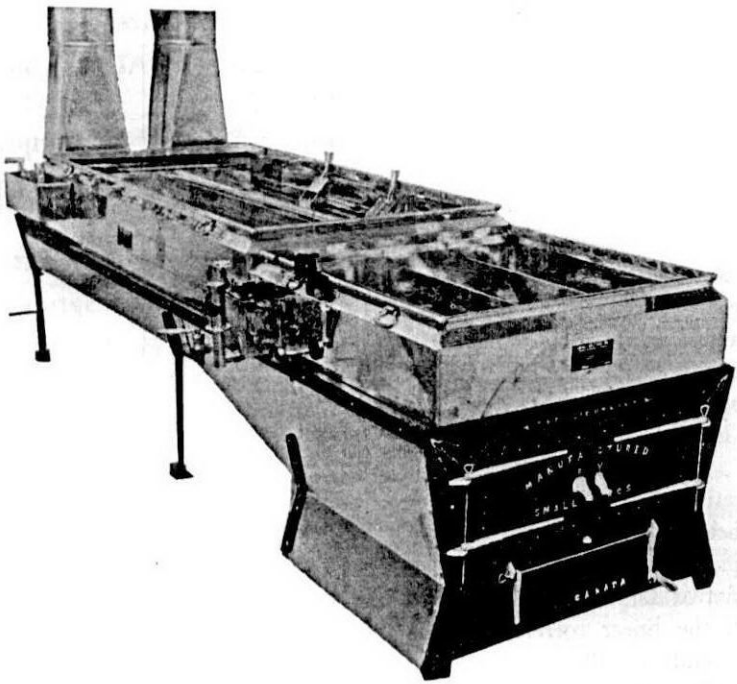

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On the other hand, if there were absolutely no relationship between two factors, the correlation coefficient would be 0.00; and the graphed data would not display a consistent pattern.

For example, if there were a perfect relationship between the length of an angleworm used for bait and the size of fish caught, longer worms would always catch bigger fish. Of course, this relationship exists only in the minds of some fishermen. The plotted data might look like Figure 1.

In my own case, the correlation coefficient between worm size and fish length would be close to 0.00–I don't catch big fish regardless–and the plotted data might look like Figure 2.

A correlation coefficient calculated from a sample is usually called "significant" if there is less than a 5-percent chance (1 chance in 20) of obtaining such a number when in fact no linear relationship exists. The correlation is "highly significant" if this risk is reduced to 1 percent (1 chance in 100).

In the summer of 1968, researchers at the Sugar Maple Laboratory of the Northeastern Forest Experiment Station in Burlington, Vermont, measured a number of characteristics of individual sugar maple trees, including diameter at breast height (d.b.h.), total height, average crown width, live-crown length, live-crown ratio, and past growth (measured as the average width of the last 10 annual rings at d.b.h.) on 30 trees in each of three sugarbushes. Sap-volume yield, sap-sugar concentration, and total sugar yield had been determined for these trees in the 1968 sap season.

I will deal with the results from only one of the three sugarbushes studied, because results were relatively consistent in all three.

Known as the Powell sugarbush, it is located within 6 miles of Burlington, Vermont, at an elevation of 550 feet. It is an old-growth sugarbush with a long history of tapping for sap. The average d.b.h. of trees in this sugarbush is 24 inches, and the average height is 80 feet.

Results

Bole size–The relationships between two measures of bole size–d.b.h. and total height–and the yields of individual trees were examined. The correlations between these variables and sap-sugar concentration were non-significant and quite low–0.11 for d.b.h. and -0.13 for total height. However, there were significant relationships between sap-volume yield and total sugar production and these two variables:

Figure 1. – A perfect correlation.

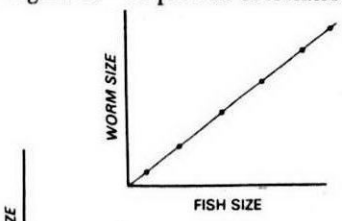
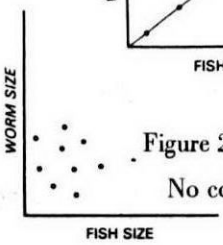


Figure 2.

No correlation.



	Correlation coefficient	
	Sap volume yield	Total sugar production
D. b. h.	0.55**	0.51**
Total height	0.46**	0.38*

NS = Nonsignificant.
* = Significant
** = Highly significant.

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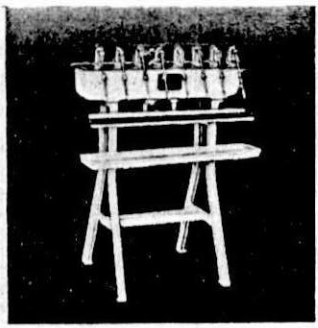

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In general, then, it can be said that fat, tall trees might be expected to yield more sap—but not necessarily sweeter sap—than short, skinny trees, at least within the range of sizes sampled in the Powell sugarbush.

Crown size—Most producers feel that there is a definite relationship between crown size and yields. In our study we measured average crown width, live-crown length, and live-crown ratios (ratio between total height and length of the live crown) as indicators of crown size. We determined the following correlations:

	Correlation coefficients		
	Sap-sugar concentration	Sap-volume yield	Total sugar production
Average crown width	-0.24^{NS}	0.16**	0.46**
Live crown ratio	0.20^{NS}	0.64**	0.63**
Live crown length	0.39*	0.46**	0.51**

Correlations between the measures of crown size and sap-sugar concentration are surprisingly low, considering the emphasis most people give to crown size as related to sap sweetness. Sap-volume yields and total sugar production are significantly correlated with the measures of crown size. This may be a further indication of a relationship between these variables and general tree size, although it is not possible to pinpoint any specific causal relationship from this analysis.

Correlations among yield variables—The correlation between sap-volume yield and sap sweetness in this study was nonsignificant. However, there was a highly significant correlation (0.93) between sap-volume yield and total sugar production; and the correlation between sap-sugar concentration and total sugar production was 0.42*. As one might expect, the more sap of a given sugar concentration a tree produces, the more sugar will be produced; while a change in sap sugar concentration alone does not produce as great a change in total sugar production.

With improvements in processing and sap-handling techniques taking place at a rapid pace, we may see the day when an increase in volume yield is more advantageous than an increase in sugar concentration. Of course, increases in both are always desirable.

Implications

The results of this study indicate that volume yield of sap and total sugar production are related to various characteristics of the tree bole and crown.

In general, it seems that large full-crowned trees yield more sap and sugar.

Sap-sugar concentration was NOT related to crown size, except for live-crown ratio—contrary to popular belief. Of course, these correlations are for a period of only 1 year, and long-term correlations might be quite different. However, variation in sap sugar concentration may be strongly related to other factors that were not measured in this study.

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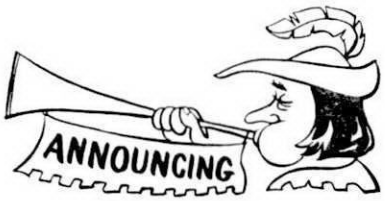

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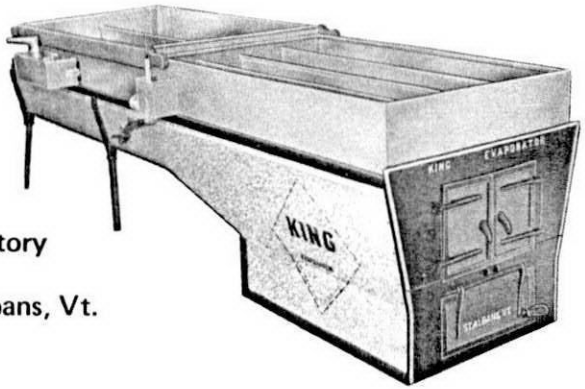

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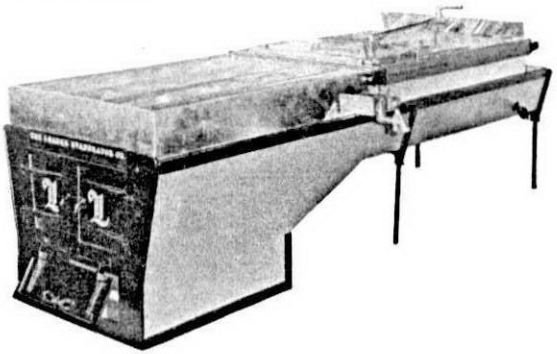

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