

# Chapter 14—Syrup

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## Description of the Product and Its Uses

Maple syrup is a sweetener, famous for its use on pancakes and waffles. It is made by boiling the sap of maple trees until it thickens into sugary, sweet syrup. About 30 to 40 gallons of sap are usually needed to make 1 gallon of pure maple syrup.

Pure maple syrup can only be made from the kinds of maples found in North America. While there are native maples on other continents, only North American maples have sap with the flavor cursor that creates the taste of maple.

The sugar maple (*Acer saccharum*), also known as hard or rock maple, is by far the species most often tapped for sap production. Black maple (*Acer nigrum*) is so similar to sugar maple that most foresters treat it as a variety of the same species. It is possible to make syrup from the sap of other maples such as red maple (*Acer rubrum*) and silver maple (*Acer saccharinum*), and even the box elder (*Acer negundo*) and the white birch (produced in Alaska). But the higher the sugar content of the sap, the fewer gallons of sap it takes to make syrup, and the sugar maple can yield 50 percent more sap with a higher sugar content than any other species. (A major drawback of the “soft” maples is that the buds—red and silver—develop much earlier in the spring than hard maples, and this changes the sap. Before the end of the sugar maple sap flow season, it is unusable.)

By far the greatest source of sugar maples for syrup production in the United States are trees growing on private lands. Those in the industry feel that there are so many trees available on private lands that there is little reason to turn to public forests. For example, in Wisconsin, less than 5 percent of the State’s sugar maples are being tapped.

In general, State and national forests are not perceived as being very accessible to syrup producers, due largely to foresters’ concerns about tearing up the terrain during the late winter months when activity in the woods is necessary but the ground is most easily disturbed. However, there is some production coming from publicly owned trees. A few producers tap sugar maples in the Green Mountain and the White Mountain National Forests. A special use permit is required, and the sap is taken to private lands to be made into syrup.

Maple trees become dormant in the winter and store food as liquid starches and sugars. In late winter as temperatures begin to rise, the trees start to mobilize these stored sugars, and the sap begins to move up the trunk to the branches. A combination of cold nights (20°F to 32°F) and warm days (45°F to 55°F) brings on the greatest sap flow.

Both sap flow and sweetness are influenced by heredity and environmental factors. Chief among these is a large crown with many leaves exposed to sunlight during the growing season for maximum sap and sugar production. Trees whose crowns have diameters greater than 30 feet can produce as much as 100 percent more syrup than those with narrower crowns and can produce sap as much as 30 percent sweeter than narrower crowned trees. Sap flow is further increased by large stem diameters, which develop from big crowns.

For these reasons, a good sugaring tree has characteristics somewhat different from those of a good timber tree. In a sugarbush (a woodland where syrup production is the major activity) the trees should be fairly widely spaced, so that they will grow in diameter and produce large crowns without gaining great height. Also, if trees are being grown for syrup, there is no concern about side branches or multiple stems. On the other hand, a long straight clean bole is important for timber production. Also, drilling holes in a tree for syrup production definitely reduces its timber value.

Trees generally smaller than 10 inches in diameter (measured at 4.5 feet above the ground) are not tapped. A tree is usually 40 or 50 years old before it reaches a size for maple syrup production. Overtapping damages a tree’s health. The following guidelines are suggested:

**Table 14–1. Sugar tapping guidelines**

Tree diameter	Number of sugar taps
10 to 15 inches	1
16 to 20 inches	2
20 to 25 inches	3

Growth rate rather than diameter should determine the number and depth of taps—only young, vigorous trees can produce new wood fast enough to cover the hole caused by tapping.

Not many years ago, the only way to collect sap was with buckets, and the only way to remove water from sap was by boiling it. New technologies have affected both the collection and processing of the syrup, however. Plastic tubing and vacuum pumps are now being used by the larger producers to speed the collection process and make it less labor-intensive. A reverse osmosis process can now be used to remove water from the sap, which makes the production process less energy intensive and may even make syrup production from other types of maples cost effective in the future.

The trees are tapped similarly whether the sap is collected in buckets, bags, or plastic tubing on a vacuum system. If tubing is used, the land must have suitable slope. Ten percent is optimal. For maximum vacuum and sap flow as well as ease of collection, the land must also face toward a few central collection points. Collection points should be accessible to roads and near the sugar house.

If tubing is used, a plastic spout is placed in the tap hole (instead of a metal spout on which a bucket would hang) and it is tapped higher. An 18-inch drop line attaches to a lateral line 5/16ths inch in diameter and connects to a main line up to 2 inches in diameter. The downhill runs terminate in a tank at the bottom of a hill, which may or may not be in the sugar house. A vacuum pump can be added at the bottom of the hill to create a negative pressure within the tubing system, which evens out the sap flow over time and allows more sap to be collected from the trees. The tree still gives up only a small percentage of its reserves, and there is no indication that the vacuum pump system harms the tree.

The sugar content of the maple sap is measured by drawing off a sample of sap and floating an instrument called a hydrometer in it, which measures sap sweetness. Generally, sap is above 1 percent sugar by weight. Occasionally, a tree will have as much as 4 percent sugar. By dividing 86 by the percentage of sugar, one can calculate the number of gallons of sap that will be required to produce a gallon of syrup. (For example, if sap with a 2 percent sugar content were used, one would need 43 gallons to make 1 gallon of syrup.) It is conceivable, with very large crowned trees in a very good year, to make 100 gallons of syrup from only 200 taps.

Once the sap is running, the maple sugaring operation demands a lot of attention. The sap must be collected frequently either from the buckets or tanks and brought to the evaporator pans. Sap allowed to sit in containers can begin to ferment or become contaminated. Spouts should be removed soon after sap flow stops.

The ideal location for evaporator pans is inside an enclosure (called a "sugar house" in New England). The

pans should have a minimum clearance of 4 feet from all outside walls. Steam vents in the roof and both air intake and exhaust vents for the smoke from the fire or other heat source are needed. It is very important that the structure be kept as clean as possible, since the syrup is a food product. Storage tanks should be kept close to evaporators, and the sap must be kept cold until it is boiled.

There are USDA standards which divide marketable syrup into the following categories: US Grade AA (Fancy), US Grade A, US Grade B, and Ungraded. There are six standards relating to (1) color, (2) clarity, (3) weight, (4) sweetness, (5) flavor, and (6) purity. Each of these can vary according to the location of the sugarbush. The type of soil is especially important in determining flavor.

## Market and Competition Considerations

The annual production of maple syrup is 10 to 12 million pounds in the United States and 35 to 40 million pounds in Canada. About two-thirds of all the syrup made in the world is made in Canada. Quebec alone produces three times the amount of syrup as the whole United States. However, most of the syrup made in Canada, as well as in the United States, is sold by large American food companies such as Borden and Heinz.

The total U.S. maple syrup production and value in 1991 was estimated at 1,545,000 gallons and \$39,279,000, respectively. Vermont is currently the leading producer State followed by New York, Wisconsin, and Maine. Massachusetts, Michigan, Minnesota, New Hampshire, Ohio, and Pennsylvania, and Wisconsin all have active State maple syrup producers associations as well.

There have been some recent problems in the market due to very cyclical production, and syrup producers in 1991 found themselves in an oversupply situation. The market is expected to stabilize in a couple of years, however. The prices received by New England maple syrup producers averaged \$25.78 per gallon for retail, wholesale, and bulk sales of the 1991 maple syrup crop, down 29 cents per gallon from the 1990 average. In New Hampshire and Vermont, prices dropped 3 and 2 percent, respectively. Maine syrup prices were off 6 percent from 1990, but the price in Massachusetts rose 6 percent. Table 14-2 shows recent price data for four New England states.

There are generally few agroforestry activities that are more productive economically, given that the activity occurs at a time of the year when the farmer or timber producer cannot do a whole lot else because the ground is wet and soft. Many dairy farmers are also maple syrup

**Table 14–2. Prices of maple syrup, by type of sales and size of container, 1990–1991**

Type of sale and container size	Maine		Massachusetts		New Hampshire		Vermont	
	1990	1991	1990	1991	1990	1991	1990	1991
Dollars								
<b>Retail</b>								
Gallons	35.40	34.00	33.90	33.60	33.30	32.20	30.90	29.80
1/2 gallons	19.10	18.70	18.60	18.60	18.70	18.00	17.60	17.10
Quarts	10.60	10.20	10.10	10.10	10.10	10.30	10.10	9.75
Pints	6.25	6.00	6.50	6.50	6.30	6.15	6.10	5.95
1/2 pints	3.80	3.70	4.20	4.10	3.75	3.70	3.75	3.75
<b>Wholesale</b>								
Gallons	27.90	26.70	26.70	27.00	28.50	28.70	28.40	24.80
1/2 gallons	15.40	15.30	15.60	15.20	16.00	15.40	15.70	14.40
Quarts	8.90	8.35	8.70	8.85	8.95	8.75	8.75	8.30
Pints	4.90	4.65	4.90	5.05	5.25	5.05	5.15	4.70
1/2 pints	2.80	2.85	3.10	2.90	2.75	2.90	3.10	2.90
Bulk (pounds)	1.35							
<b>Grade A</b>								
Light amber		1.45	2.35	1.75	1.85	1.60	1.95	1.70
Medium amber		1.25	2.10	1.55	1.70	1.50	1.65	1.55
Dark amber		1.20	1.60	1.35	1.20	1.30	1.25	1.20
Grades B and C		0.85	1.20	1.15	0.90	1.00	0.85	1.05
All sales—equivalent per gallon	17.80	16.70	31.80	33.70	33.70	32.80	26.50	26.00

Source: New England Agricultural Statistics Service, 22 Bridge Street, Room 301, P.O. Box 1444, Concord, NH 03302–1444. 603–224–9639.

producers, and dairy prices have been so deflated that, even with the seasonal downturn in maple syrup prices, many dairy farmers have been helped considerably by their syrup business.

The demand for maple syrup has remained strong, and it continues to benefit from an excellent image as one of nature’s cleanest, purest products. This image has been very good for the maple industry. The industry has also been able to capitalize on the “romance” associated with maple syrup production. Syrup is also a luxury, gourmet product, and luxury items are often “recession proof.”

The success or failure of a maple syrup operation will largely depend on how good a producer is at retail marketing. It is essential that the producer have access to a retail market and be willing to engage in creative marketing. The consumer is being asked to spend between 10 and 15 times what he or she would pay for an alternate, artificially flavored syrup. Creative marketing is essential to make people understand why the “real thing” costs so much more. Avenues for direct sales

include direct farm sales, mail order, farmers markets, flea markets, and local supermarkets. One of the best ways to sell syrup is to have the public come directly to the farm to purchase the syrup, perhaps in conjunction with a restaurant or tourism activity. This approach requires access to a large population center or other tourist attractions in the area, however. Sometimes a large company will buy a large amount from one producer to give as holiday presents to employees.

There are some who sell all their syrup in bulk, but this means that not much profit will be made. It is also possible to sell sap directly to other producers. The sap is priced according to its sugar content—at 2 percent it might be priced at 25 cents a gallon. At 3 percent, it might be priced at 35 cents a gallon.

U.S. producers currently cannot easily make a good return on investment in the wholesale market because it is too difficult to compete with Canadian prices. Anyone trying to only wholesale the syrup may have a hard time just breaking even.



*Tapping maple trees with a battery tapper.  
Photo courtesy of Paul Sendak, USDA  
Forest Service, Northeastern Forest Experiment  
Station, Burlington, Vermont. (SFP-7)*



*Tapping maple trees with a drill.  
Photo courtesy of Paul Sendak,  
USDA Forest Service. (SFP-8)*

Maple sugar, maple cream, maple candies, and even unusual items such as maple barbecue sauce, maple sparkling water, and maple hot sauce are other products that can be made. While companies such as Log Cabin that produce artificially flavored syrup use only 2 percent pure maple syrup, the total amount of pure syrup purchased for flavoring in these products is not insignificant.

Maple festivals are popular in many maple-producing States. Several States and the International Maple Syrup Institute have had maple promotion activities over the past few years, and these have definitely stimulated demand for the product. Overall, demand for syrup has remained strong.

Canada is regarded as being much better organized in its marketing efforts than the United States. Public and private cooperatives (which the Canadians term “syndicates”) are effective organizations, and most producers sell through some type of syndicate. Because they control so much syrup, syndicates have a lot of power in the marketplace. Typically, the syndicates pay the producers a certain percentage up front at the start of the year for their syrup and then pay a dividend at the end of the year when they know the actual syrup prices.

In the United States, the best sources of marketing advice are the State maple syrup producers associations and the cooperative extension service. Members of the State maple syrup producers associations are automatically members of the North American Maple Syrup Council (NAMSC). There is also an International Maple Syrup Institute (IMSI). The council and the institute sponsor considerable research as well as provide marketing information.

## **Packaging and Distribution**

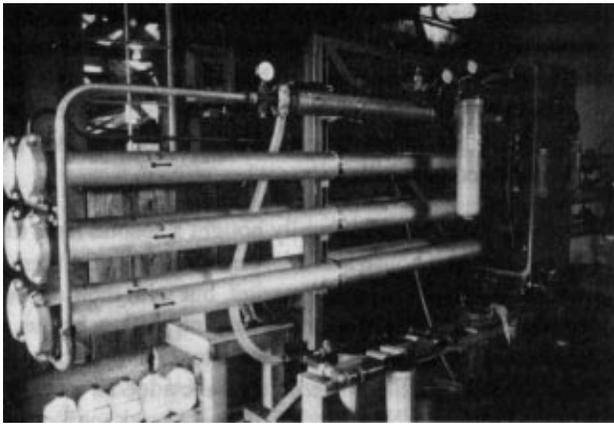
Syrup is packaged for retail at between 180°F and 200° F. Tin, hard plastic, and glass containers are used in a variety of sizes. Few customers purchase syrup by the gallon. Most customers buy pints or quarts. Some producers feel it is important to know the weight of the containers and fill by weight rather than volume, using 11 pounds per gallon as the standard.

Most part-time producers market their syrup directly from their sugar house. This requires a fair amount of drive-by traffic. The syrup retails for an average of \$30 per gallon from the sugar house.

It is impossible for producers to retail through the large grocery store chains unless they are very large producers. In New Hampshire, for example, only two packers sell to Safeway, IGA, and similar stores. The packers buy syrup by the trailer truckload at quantities well beyond the reach of most new entrepreneurs.

## **Equipment Needs, Costs, and Suppliers**

Opinions on the size of commercially profitable sugaring operations vary from area to area. In some areas, producers with fewer than about 500 taps are generally considered hobbyists, while producers with 2,000 or more taps are considered “serious” syrup producers. A level of 3,000 to 4,000 taps is considered large. Even large producers are seldom making their living exclusively from syrup, however.



*Reverse osmosis system for making maple syrup. Photo courtesy of Paul Sendak, USDA Forest Service. (SFP-6)*

Minimum levels for profit are estimated at anywhere from 30 to 90 taps per acre. The widely accepted “target minimum” for a cost-effective undertaking is 40 taps per acre. Below that number, the trees are just too scattered to make collection worthwhile, whatever collection system is being employed. The only exception to this target that would justify fewer trees per acre would be in a situation where easy access to roadside trees was possible.

Sugarbushes that are fully stocked with sugar maple commonly have about 100 taps per acre. Each tap should be capable of yielding a yearly average of a quart of syrup, which amounts to 25 gallons of syrup per acre per year. At \$30 per gallon retail, annual gross income would be \$750 per acre. Sugarbushes that have fewer taps per acre (60 to 80) often have more and sweeter sap per taphole, as much as 1-1/2 or 2 quarts of syrup per tap, or 25 to 40 gallons of syrup per acre.

While many people picture horse-drawn sleds or wagons being drawn through the woods and buckets of sap being emptied into a gathering tank, the maple syrup industry in reality has changed. Most commercial producers today use plastic pipelines in closed dropline aerial systems to reduce labor needs, achieve more sanitary collection and transportation of sap, and eliminate road upkeep, among other reasons. Vacuum pumps are used to help move sap through the lines. In addition, new technology has changed the syrup processing system. Reverse osmosis is now frequently used by larger producers to remove the water from the maple sap in combination with the traditional open-pan evaporator systems.

It is estimated to take between \$7 and \$10 a tap to fully equip a sugarbush (not including the sugar house), and those estimates assume that the producer is able to use

existing tractors and wagons and a building. For about \$10,000 it would probably be possible to purchase an evaporator, filter tanks, a collection system, a gathering tank, and a storage tank. The single largest investment is the evaporator, which may cost \$5,000 to \$6,000. A 1,500- to 2,000-tap operation “from scratch” (that is, no existing vehicles, buildings, etc.) might cost between \$35,000 and \$50,000.

Syrup making often is part of a family farm operation. The sugar maple business is very labor intensive, and many producers find that it is getting increasingly difficult to get dependable seasonal help. When the sap is running, the operation can be a 7-day, late-night effort for up to about 6 weeks. This is one reason why more and more producers are turning to new technologies as a substitute for labor. Many producers above the hobbyist level are investing in the plastic tubing with pumps, trucks, tanks, and storage as well as the actual evaporating equipment. Good used equipment can be found, and new equipment manufacturers often carry large inventories of used equipment as well.

Tubing collection systems can reduce labor demands somewhat, but a 1,000-tap operation (producing an estimated 250 gallons of syrup, worth about \$7,500) would probably be the limit for a two-person crew to handle. With the more sophisticated systems, some attention is needed to monitor the systems. For example, attention to detail and natural laws is required to make the tubing and vacuum system work properly. It is also necessary to maintain the very highest standards of cleanliness to avoid contaminating the sap. Good housekeeping distinguishes the high-quality syrup. Finally, the sap must be processed soon after it is collected. It does not keep.

The syrup business is also very energy intensive. Wood and oil are the most frequently used fuels, with oil being the more expensive alternative.

## Other Factors

The sugar maple depends on a certain amount of sustained cold in the winter to survive. The cold zone for winters may be gradually moving north. In fact, some researchers estimate that by the year 2000, the “warmer” winter climate will have moved 300 miles north.

Sugar maple is a fairly good “compartmentalizer.” If it has a wound, discoloration may occur 18 inches above and below the tap hole. The wood is usually fairly sound so long as rot does not set in before the hole seals up, which usually happens fairly quickly in a healthy tree. The discolored maple wood can be unusual and attractive. There may be special uses for it in the decorative wood market.

## Resource Conservation Considerations

Generally speaking, those in the syrup industry feel that the country's sugar maple trees are not as healthy as they used to be. The last good year for maple syrup production industrywide was 1981. Since then, good production has occurred, but it has been localized. Many in the industry feel that this is due at least in part to acidic deposition in our Nation's maple forests.

In addition to acid rain and snow damage, many in the syrup industry are concerned about the United States losing many of its best sugar maple trees to housing developments and insect damage. No one is planting many sugar maples because it requires 40 to 75 years for a sugar maple to mature. Insects are a factor because when premature defoliation occurs, the loss of leaves can deplete the starch reserves in the tree. When this happens, the tree should not be tapped until it regains its vigor. Early recognition of pests (such as the forest tent caterpillar) is essential to good management.

Because of its high shade tolerance, sugar maple can persist for long periods of time with little growth. Crowded young trees remain as poles too small to tap, and trees with small crowns have too little leaf area to produce sweet sap. Young sugar maples, however, have remarkable recuperative powers, and trees released from overhead shade and side competition can double or quadruple their growth if the crown of leaves is still vigorous. In fact, the thinning of young maple trees to allow more space and growth is one of the most rewarding activities in managing the sugarbush. Thinning at other stages in the life of a sugarbush must be approached with more caution to reduce the risk of a number of "shock" factors.

Protection is sometimes as necessary as thinning in a sugarbush. The trees should be protected from livestock and excess wind. Suitably located wind mantles or windbreaks are helpful.

Valuable ornamental or shade trees generally are not tapped because wood decay organisms, ordinarily of little consequence in an entire grove of trees, can enter taphole wounds and endanger the tree. However, trees that are not overtapped can produce without jeopardizing their health. The number of taps must be based on the vigor of the tree.

## Profile

Charles Buck, a dairy farmer in Jefferson, New York, started making maple syrup about 30 years ago with two old, second-hand evaporators and about 1,000 buckets. In the early years, most of the syrup was wholesaled because there wasn't much of a retail market. At that

time, there was a lot of competition in the area. In fact, at one time more maple syrup was being produced on a square-mile basis in Jefferson, New York, than anywhere else in the world. He helped start one of the first maple festivals in their county about 26 years ago, a festival that has continued to this day.

About 12 years ago, the family bought a second farm that had a newer sap house and a larger operation. By then they had built a small retail market, but with their added production they needed a larger market, so they began wholesaling to roadside stands and stores throughout New York State. Since then, they have added a weekly farmers market in New York City and a brisk mail order business. They sell many personal and corporate gifts, particularly during the holiday season.

The Bucks' operation currently consists of two 5- by 14-foot evaporators, and a very large reverse osmosis machine that allows the processing of up to 26 gallons of syrup per hour. Sap from about 17,000 taps comes into the sap house; 7,000 taps are theirs, and they purchase sap from about 10,000 additional taps. Some buckets are still used, but more and more the operation has gone to tubing in order to reduce labor costs. Mr. Buck, his wife, daughter, and son-in-law run the maple syrup operation of the farm. Some seasonal help is needed, especially during the holidays. In addition to maple syrup, the farm maintains 150 head of dairy cows.

In Buck Hill Farms' best year, they produced 4,200 gallons of syrup. Average annual production in the past few years has been somewhat less—3,600 to 3,700 gallons—because the weather has been warming up so fast in the spring.

The farm has continued to sell to both wholesale and retail markets. The wholesale market presently is only fair due to the large surplus from Canada. Their wholesale market includes a small amount (5 percent) of sales of "off flavor" commercial syrup sold by the barrel and used in chewing tobacco. The remaining 95 percent of their sales are divided nearly equally between wholesale and retail canned syrup markets. They have succeeded in staying in the wholesale market by having a very efficient operation, but Mr. Buck attributes the farm's success in weathering the low prices of 1991, brought on by the Canadian surplus, to their retail market. The retail market accounts for about half of the farm's gross sales. Retail prices at the farm in 1991 were \$32.50 a gallon (\$2.95 per pound). This compares to prices on the wholesale market in the spring of 1991 of between \$1.25 and \$1.50 a pound, depending on the grade.

In addition to selling both tin and plastic containers of maple syrup, the farm sells maple cream, maple sugar, granulated maple sugar, maple-coated popcorn and peanuts, maple vinegar, and maple barbecue. Retail

sales are made out of one end of the sap house. A few other products like honey and pancake mix are sold as well. In late March and early April, visitors come to watch the maple operation.

## Considerations for a Rural Development Strategy

Syrup, an all-American product, was first produced by Native American people before Europeans arrived in America. Rural areas with access to the maple resource could take advantage of the “romance” associated with this product by making the story and production of syrup part of the culture and history of a rural area.

## Contributors

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Paul Sendak, Northeastern Forest Experiment Station, P.O. Box 968, Burlington, VT 05402. 802-951-6774.

Lewis Staats, Uihlein Sugar Maple Research and Extension Field Station, Bear Cub Road, Lake Placid, NY 12946. 518-523-9337.

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## Resources

Professor Melvin R. Koelling, Department of Forestry, 126 Natural Resource Building, Michigan State University, East Lansing, MI 48823. 517-355-0090.

A Maple Syrup Producers Manual is in the process of being updated and will be available through the North American Maple Syrup Council in late 1992 or early 1993. Interested individuals should contact Russell Davenport, Davenport Maple Farm, Route 1, Tower Road IIIA, Shelburne Falls, MA 01370. 413-625-2866.

Maple Syrup Digest, Roy Hutchinson, Ed., P.O. Box 240, Canterbury, NH 03224. 603-783-4468. Has many sources of new and used equipment listed. Field editors in 12 U.S. locations and 2 Canadian provinces are as follows:

Connecticut. Paul M. Williams, P.O. Box 81, South Woodstock, CT 06267. 203-542-2090.

Maine. Vicki Schmidt, P.O. Box 282, Kents Hill, ME 04349. 207-377-6275.

Massachusetts. James Graves, R.D. 1, Shelburne Falls, MA 01370. 413-625-9066.

Michigan. James Graves, R.D. 1, Baatz Road, Maple City, MI 49664. 616-228-5835.

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Wisconsin. Roland Jorns, 4518 Highway T, Egg Harbor, WI 54209. 414-868-3161.

Larry Myott, County Extension Agent, East Gate, Building 4, Fort Ethan Allen, Winooski, VT 05404. 802-656-4420.

Dr. Mariafranca Morselli, Research Professor Emeritus, Botany Department, 225D Marsh Life Science Building, University of Vermont, Burlington, VT 05405. 802-656-0427. Ask for a copy of their most recent Maple Publications Reprint Request List.

The Vermont Agricultural Experiment Station provides a "Maple Research Publications List," an abbreviated list of publications available from the UVM Extension Service. Contact the UVM Extension Service, Chittenden County Office, Fort Ethan Allen, 4A Laurette Dr., Colchester, VT 05446.

Vermont Maple Industry Council, Morrill Hall, Extension Service, University of Vermont, Burlington, VT 05405. 802-325-3203.

Vermont Department of Agriculture, State Office Building, 116 State Street, Montpelier, VT 05602. 802-828-2430.

Wisconsin Maple Syrup Producers Council, Route 1, Aniwa, WI 54408, provides information and also a video on maple syrup production for small producers that can be purchased or rented.

## Maple Sugaring Instruction

Fully illustrated catalogs and instruction books are available for the novice maple sugarer from these companies:

G.H. Grimm Company, Inc., Box 130, Rutland, VT 05701

Leader Evaporator Company, Inc., 25 Stowell Street, St. Albans, VT 05478.

Small Brothers, Inc., P.O. Box 160, Dunham, Quebec J0E 1M0 CANADA.

Les Specialties Techniques De Valcourt, Inc., 746 rue St. Joseph, C.P.68, Valcourt, P.Q. J0E 2I0, CANADA.







