

# Influence of Demographic Characteristics on Production Practices within the Ohio Maple Syrup Industry

Gary W. Graham, P. Charles Goebel, Randall B. Heiligmann, and Matthew S. Bumgardner

ABSTRACT

Maple syrup production contributes approximately \$5 million annually to Ohio's economy and provides supplemental nontimber forest product income for forestland owners. To better understand the factors that influence this important nontimber forest industry in Ohio, including producer heritage, producer age, sap collection methods, size of maple operation, and educational programming, we conducted a detailed survey of all known Ohio maple syrup producers (761 total producers). Over 80% of producers responded to the survey (620 respondents), making our analysis one of the most extensive of a maple industry in North America. In general, most maple operations in Ohio are part-time, family-based enterprises and over 25% of Ohio's maple producers are of Amish heritage. Although we estimate that there are over 400,000 taps in the state, the typical sugarbush is relatively small—the average sugarbush is 27 ac in size and over a third of the operations have fewer than 100 taps. Chi-square analyses did reveal several significant ( $\alpha = 0.05$ ) associations among producer characteristics. Although Amish producers were significantly younger and had significantly larger operations than their English or non-Amish counterparts ( $P < 0.001$ ), a higher proportion of English producers reported using tubing collection systems than Amish producers ( $P = 0.031$ ). Additionally, while larger maple operations tended to use tubing systems more frequently ( $P < 0.001$ ), we did not detect a significant association between sap collection method (bucket versus tubing) and producer age ( $P = 0.169$ ). Finally, English producers tend to be older. Older producers ( $>53$  years old), producers using tubing collection systems, and producers with more than 250 taps were significantly more likely to participate in Ohio State University (OSU) Extension educational programming ( $P \leq 0.05$ ). These results suggest significant relationships among producer demographics and the characteristics of maple operations in Ohio, and future OSU educational programming should be tailored to reflect these important relationships.

**Keywords:** extension programming, maple production, maple producer characteristics, programming impacts, Amish

Recently, there has been an increased interest in production and management of nontimber forest products. This is particularly true with regard to the commercial production of maple syrup and related products that occurs primarily in the eastern United States and southeastern Canada where in late winter and early spring cold nights (below 0°C) and warm days (above 0°C) result in the flow of sweet sap (Tiree 1983, Chapeskie et al. 2006). Although there are seven native and at least one fairly common exotic maple species in this region, sugar maple (*Acer saccharum* Marsh.), black maple (*Acer nigrum* Michx.), red maple (*Acer rubrum* L.), and, occasionally, silver maple (*A. saccharinum* L.) are the most often used maple species (Heiligmann et al. 2006b).

Since 1992 the USDA, National Agricultural Statistical Service (USDA-NASS 1992–2006) has included Ohio in its annual statistics reporting of maple syrup production in the United States. Over the past 14 years Vermont and New York have combined, on average, to produce annually, over 682,000 gal of maple syrup, which has contributed annually over \$18 million to Vermont and New York economies (USDA-NASS 1992–2006). Ohio, which ranks as

the fifth largest maple syrup-producing state behind Vermont, New York, Maine, and Wisconsin, is typical of the smaller maple syrup-producing states and Canadian provinces, with approximately 400,000 taps producing 75,000 gal a year at an average retail price \$30.96/gal (Table 1; USDA-NASS 1992–2006). USDA-NASS, with a limited sampling of the states producers, estimates that maple syrup production contributes approximately \$2.29 million annually to Ohio's economy. (USDA-NASS 1992–2006). However, our comprehensive data place its economic value closer to a \$5 million annual contribution to the state's economy and income from maple products provides important supplemental income for many Ohio families (Graham 2005, Graham et al. 2006).

To serve this important clientele, many state and provincial agencies, universities, and extension services throughout the maple region have engaged in research, education, and outreach programs designed to improve maple syrup production and marketing practices. However, little is known about the relationships among demographics, production practices, and marketing strategies of maple producers and consumers in the United States or

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**Table 1. Average maple syrup production of the top five maple syrup-producing states from 1992 to 2006.**

	Average production (gal)	Average taps (1,000)	Average yield per tap (gal)	Average price (per gal)	Average value of crop to state's economy
Vermont	429,000	2,117	0.202	\$27.20	\$11,543,000
New York	253,000	1,374	0.170	\$26.17	\$6,607,000
Maine	212,000	1,228	0.212	\$18.61	\$3,893,000
Wisconsin	89,000	410	0.194	\$25.66	\$2,197,000
Ohio	75,000	386	0.193	\$30.96	\$2,290,000

Source: Data are from the USDA-NASS (2006).

Canada. Although USDA-NASS has surveyed limited aspects of the US maple industry, a complete statewide or provincewide assessment of the maple industry has not been attempted despite the important contributions the industry provides to the economies of the region. There are a variety of reasons for this including the lack of available financial resources to complete such assessments and the perception that maple producers often are a somewhat reclusive and independent group concerned with protecting the privacy of their cash-based supplemental income (Lawrence et al. 1993, Demchik et al. 2000). Additionally, few states or provinces require maple producers to register their operations or their production records, making the identification of a producer population challenging.

In Ohio, Ohio State University (OSU) Extension is the primary source of technical production and marketing information for maple producers (Graham et al. 2006). Major educational strategies include workshops, fact sheets, the *Ohio Maple News* newsletter, the *North American Maple Producers Manual* (Heiligmann et al. 2006b), work through the Ohio Maple Producers Association, and personal consultation. Among the OSU Extension's workshop efforts, three 1-day workshops ("Ohio Maple Days") have been the most attended, and based on our analyses, have historically had the greatest impact on maple producers (Graham 2005, Graham et al. 2006). These all-day workshops are held each winter at three different locations across the state and include training and outreach on a variety of topics ranging from sugarbush management to marketing of maple products. From surveys of these attendees, Graham et al. (2006) have identified the major needs in the areas of production technologies, resource management, and marketing. In this study, our objective was to better understand industry characteristics and demographics and how educational strategies might be better structured to meet producer needs. Specifically, we (1) examined producer age, sap collection method, cultural heritage, and participation in the Ohio Maple Days Conferences and how these characteristics were associated with operation size; (2) explored the implications these results might have on the maple industry in Ohio; and (3) suggest how these results can guide future Extension educational programming and materials designed for the maple industry throughout the maple producing region of the United States and Canada.

## Methods

### Maple Producer Survey

An initial survey list was compiled from an OSU Extension database and private sources within the Ohio maple industry. In May 2004, producers on this master list ( $n = 1,050$ ) were mailed a multisectional questionnaire designed following the methods outlined in Dillman (2000). Data were collected using an 84-question questionnaire that addressed producer demographics, sap collection techniques, sugarbush and sugarhouse characteristics, type of equipment used, syrup production and grading practices, and marketing

methods. A final set of questions assessed educational resources that respondents used and their perspective on important educational program needs for the maple syrup industry. The design of the questionnaire, the questions asked, and the structure of the questions were selected to reduce perceived intrusiveness and increase return rates. All mailings were sent with return postage, instructions, and cover letters to encourage response rates.

After the initial survey and two reminder notices had been mailed, all nonrespondents were sent a second identical questionnaire ( $n = 703$ ). Individuals not responding to the second questionnaire received a third, shortened questionnaire ( $n = 377$ , with 26% [ $n = 100$ ] sent by priority mail). Follow-up phone calls were not used, although suggested by Dillman (2000), because of a significant Amish producer population that would not have been reached using this method. An overall response rate of 81% ( $n = 620$ ) was achieved. The initial survey list of 1,050 had 289 entries removed due to blank responses or an indication that the respondent no longer (or never) produced maple syrup, resulting in an adjusted list of 761 maple producers. Of the 620 questionnaires returned from active maple operations, 485 (78%) were first-questionnaire responders, 82 (13%) were second-questionnaire responders, and the remaining 53 (9%) were third-round responders.

### Data Analysis

Basic summary statistics of the maple syrup industry were conducted using MINITAB Release 14 software (Minitab, Inc., 2003). On completion of these analyses, we determined there were five categories of information obtained from the questionnaire that were important factors influencing the maple syrup industry: (1) producer heritage (*English, Amish*); (2) sap collection methods (*buckets, tubing*); (3) producer age compared with average age of producers (*less than 53 years old, 53 years or older*); (4) attendance at the OSU Extension sponsored "Ohio Maple Days" educational workshops (*attend, do not attend*); and (5) sugaring operation size based on number of taps. Producers were placed into one of five categories (Table 2) based on operation size (e.g., number of taps). Using the total number of taps reported on the questionnaires, each producer's annual production potential (gallons of syrup) was estimated using the state average of 1 qt of syrup per tap.

Chi-square analyses were used to identify significant relationships among producer heritage, sap collection method, attendance at the Ohio Maple Days workshops, and age. Categorical variables were defined based on OSU Extension's experience working with the maple industry. Additionally, chi-square analysis was used to evaluate the relationship between each of those four producer characteristics and size of operation. Pearson's chi-square test of association was selected because of its strength in evaluating associations among independent, categorical variables (Steel et al. 1997). Analyses were conducted using MINITAB Release 14 software (Minitab,

**Table 2. Relative proportion of maple producers and taps associated with maple syrup operations in Ohio by size category.**

Category	Number of taps	Projected production <sup>a</sup> (gal of syrup)	Relative proportion of producers (%)	Relative proportion of taps (%)
Hobby	<100	<25	29.4	3
Small retail/wholesale	101–250	25–63	19.3	6
Medium retail/wholesale	251–500	63–125	19.9	15
Large retail/wholesale	501–1,000	125–250	19.5	26
Commercial	>1,000	>250	11.9	50

<sup>a</sup>Projected production, 1 qt/tap.

Inc., 2003) and significant relationships were recognized at  $\alpha = 0.05$ .

## Results

### Producer Age and Cultural Heritage

Over 90% of Ohio's maple operations are family owned, and the average age of Ohio maple producers is 53 years old (ranging from 16 to 90 years). On average, these producers have 19 years of experience in the maple industry and have been producing maple syrup for more than one generation. Almost one-half (47%) of Ohio's producers indicated they have a new generation that will take over maple syrup production when they retire. Almost all producers (99%) indicated that maple production was a part-time occupation, with most producers indicating their full-time occupation as a technical or trade field or agriculturally related. Finally, over 25% of the producers indicated they were of Amish heritage. When we analyzed these patterns in more detail, Amish producers were significantly younger than their English or non-Amish counterparts ( $X^2_{(1,n=610)} = 16.9; P \leq 0.001$ ). Only 32.9% of Amish respondents were above the average producer age of 53 years, and 52.4% of the English respondents were older than 53 years.

### Sugarbush

The typical Ohio sugarbush is 27 ac (ranging from 0.25 to 190 ac); however, the majority of sugarbushes are below the average size (26% range from 1 to 9 ac; 40% range from 10 to 25 ac). When maple syrup operations were classified into categories based on the number of taps (Table 2), we found that 29.4% are best described as "hobby" operations (less than 100 taps) despite comprising only 3% of the total taps in the state. The remaining operations are distributed among "small retail-wholesale" (101–250 taps), "medium retail-wholesale" (251–500 taps), "large retail-wholesale" (501–1,000 taps), and "commercial" (more than 1,000 taps) operations. Despite only representing 11.9% of all operations in the state, commercial operations account for 50% of all taps.

Amish producers were more likely to have larger sugaring operations (based on the number of taps) than English producers ( $X^2_{(4,n=620)} = 48.6; P < 0.001$ ). Eighty percent of the Amish operations contained more than 250 taps, and only 51% of English operations contained more than 250 taps (Figure 1A). However, no significant association was found between operation size and producer age ( $X^2_{(4,n=610)} = 4.6; P = 0.330$ ), with 58.9% of producers less than 53 years of age and 56.7% of producers more than 53 years of age associated with operations with more than 250 taps (Figure 1B).

### Sap Collection and Processing

The survey indicated that most producers have adopted some conservative tapping guidelines that are designed to protect tree health. For example, 37% of producer's indicated they are only

using 2 taps/tree or the recommended tapping practices in Ohio, and 67% adjusted the number of taps per tree because of the tree health and environmental conditions. Additionally, 70% responded that they have the potential to expand their operations in the future. We estimate there currently are over 400,000 taps in the state, most (78%) associated with traditional bucket collection systems. The average bucket collection operation has 417 taps, with most producers using galvanized metal buckets rather than plastic containers. Of those operations using a tubing collection system, most used a dendritic layout (71%) and gravity to transport the sap from the tree to the sugarhouse.

There was a significant association between the heritage of maple syrup producers and their sap collection method. A higher proportion of English producers reported using tubing collection systems than Amish ( $X^2_{(1,n=620)} = 4.4; P = 0.031$ ), with 23.8% of English and only 15.7% of Amish respondents reporting that tubing was their primary collection method. There was, however, no significant association between sap collection method and producer age ( $X^2_{(1,n=610)} = 1.9; P = 0.169$ ). Seventy-six percent of producers who were less than 53 years old and 80.8% of producers who were more than 53 years old reported using buckets for sap collection, and 23.8% of producers who were less than 53 years of age and 19.2% of producers who were more than 53 years of age collect sap with tubing systems (Figure 1B).

Sugaring operations using tubing systems to collect sap were more likely to be in the three larger size classification categories ( $X^2_{(4,n=620)} = 46.6; P < 0.001$ ). Only 52.8% of bucket collection operations were associated with the three larger size categories (more than 250 taps), and 75.5% of tubing collection operations were associated with the larger size operations (Figure 1C).

Almost all (89%) of maple producers indicated they boil collected sap the same day of collection or within one to two days of collection. Additionally, over 95% indicated that they filter the sap before boiling, most using a cloth filter (71%). Most producers also have a sugarhouse located near the sugarbush that houses a wood-fired evaporator. Very few producers blend their syrup to adjust color, density, or flavor. Additionally, although syrup grading is not required by Ohio law, 36% of producers currently grade their maple syrup, most (73%) using the Vermont Temporary Grading Kit (Vermont Maple Sugar Maker's Assn. Inc., South Royalton, VT).

### Educational Activities

Ohio Maple Days workshops typically provide attendees with programs built around the latest research-based knowledge and experience on efficiently and effectively producing and marketing maple syrup. The role these workshops play and their effectiveness in the Ohio maple products community have been reported elsewhere (Graham et al. 2006). The purpose of this analysis was to characterize those Ohio maple producers participating in the workshops using the variables evaluated in this study.

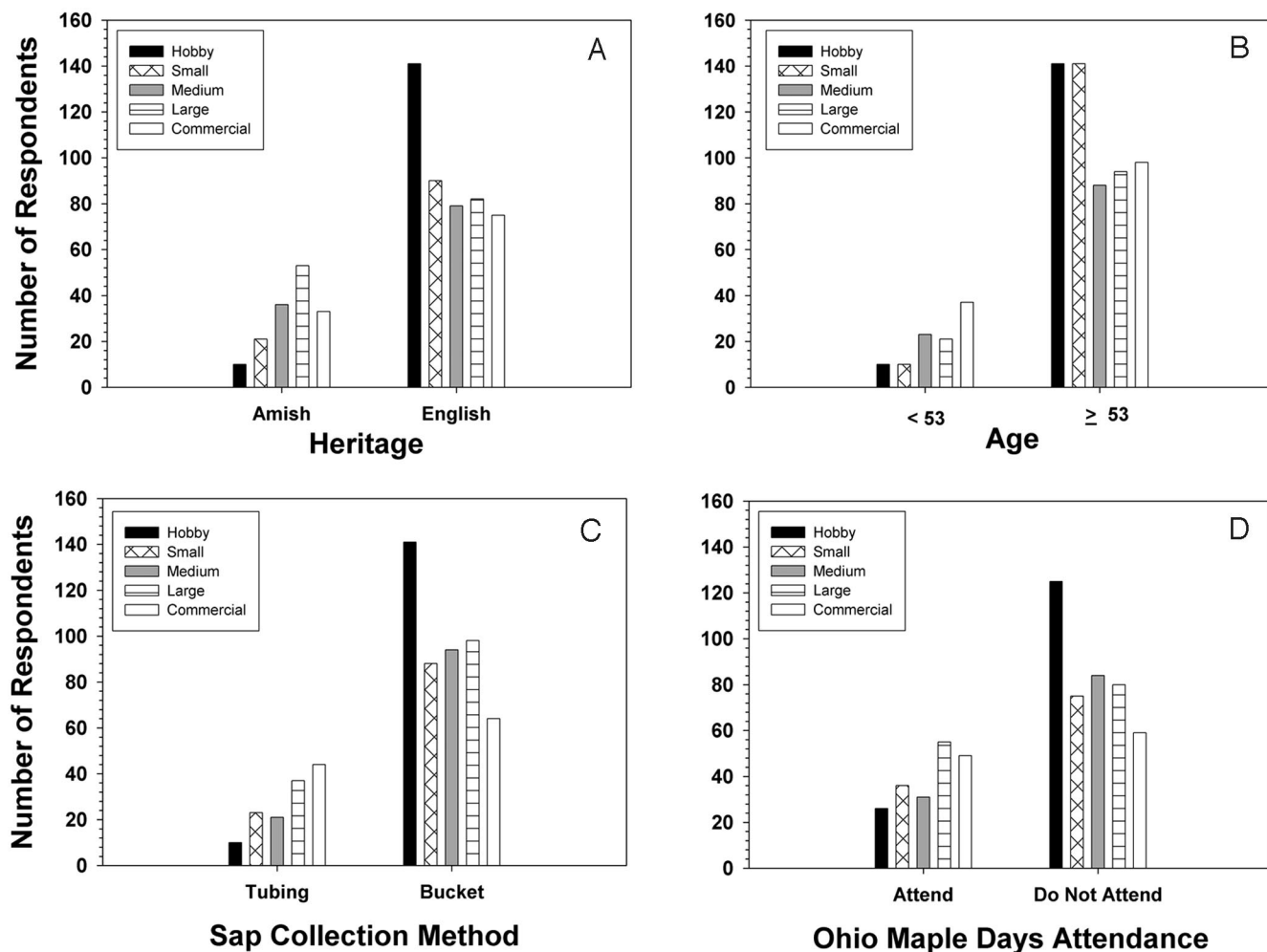


Figure 1. Association of producer (A) heritage and (B) age and (C) sap collection method with operation size for Ohio's maple industry; (D) operation size with attendance at Ohio Maple Days workshops.

Attendance at the Ohio Maple Days workshops was significantly related to producer heritage, age, sap collection methods, and size of operation. English producers were more likely to attend Ohio Maple Days than Amish ( $X^2_{(1,n=620)} = 11.0$ ;  $P = 0.001$ ) with 35% of English respondents and 21% of Amish respondents reported participating. Producers who were more than 53 years old also were more likely to attend Ohio Maple Days than their younger counterparts ( $X^2_{(1,n=610)} = 9.2$ ;  $P = 0.002$ ); only 26.6% of respondents below the average producer age (less than 53 years of age) attended the workshops, and 38.1% of respondents greater than the average producer age (more than 53 years of age) reported attending. In terms of collection systems, producers with tubing collection systems were more likely to attend the workshops than producers using bucket collection systems ( $X^2_{(1,n=620)} = 29.8$ ;  $P < 0.001$ ). Finally, producers with larger operations (more than 250) were more likely to attend Ohio Maple Days than producers from smaller (less than 250 taps) operations ( $X^2_{(4,n=620)} = 30.2$ ;  $P < 0.001$ ). Only 31.5% of producers in the two smaller size categories (hobby and small retail-wholesale) attended Ohio Maple Days workshops, and 68.5% of producers within the three larger size categories (medium retail-wholesale, large retail-wholesale, and commercial) attended the workshops (Figure 1D).

## Discussion

Maple syrup production is a labor-intensive enterprise. Because most maple syrup operations in Ohio are family oriented businesses, many members of the extended family, multiple families, friends, and, in some instances, neighbors are involved (Whitney and Upmeyer 2004). This fact is reflected in the typical maple producer in Ohio who was a 53-year-old male, second-generation producer. Additionally, almost one-half (47%) of the producers indicated that a next generation was involved in their operation. We observed no association between producer age and sap collection method or producer age and operation size (based on the number of taps). This is not surprising because most maple syrup operations are small and, consequently, do not require more technologically advanced equipment. Despite this lack of association between producer age and sap collection method or producer age and operation size, there were significant associations among other demographic and production characteristics.

In particular, we observed significant differences related to cultural heritage. Over one-quarter of the maple producers in Ohio indicated they were Amish. Our analyses showed that Amish producers tend to be younger than their English counterparts and also

tend to have larger operations (more than 250 taps). Not surprisingly, Amish producers also tended to be less technologically advanced because they tended to use bucket collection systems rather than tubing collection systems and were less likely to attend the Ohio Maple Days workshops. Although there may be many reasons for these relationships, there are cultural aspects that can help explain these patterns. Ohio's Amish population has increased from 5 communities in the early 1900s to over 41 communities in 2003 with a total population of 52,000. Thirty-three of Ohio's 88 counties are home to 30% of all known Amish (Donnermeyer 2004). The result is generally large families and close-knit church networks that can help support more traditional, often less efficient maple syrup collection and production practices, such as the use of bucket collection systems. However, this is not to imply that all Amish operations are either traditional or inefficient. Some of Ohio's most progressive and modern maple operations are Amish owned and operated.

Amish also believe in separation from the world and that hardship in life is part of their religious beliefs and a factor that helps maintain community harmony (Schreiber 1962, Moore et al. 1999). This belief requires them to separate themselves from most non-Amish social, religious, and political activities. This separation also discourages participation with educational and government assistance programs (Stinner et al. 1989, Donnermeyer 1997). For example, two of the three annual Ohio Maple Days workshops are intentionally held in highly concentrated Amish communities to be within buggy travel distance, but a low percentage of the Amish producers attend the workshops. These results suggest that to reach effectively the Amish community, educational programming by OSU Extension and others with similar objectives may need to be coordinated within the Amish communities or church districts. Additional outreach activities also may be necessary, including sharing information in other formats (e.g., newsletters, newspapers, and Amish-based publications) and the distribution of fact sheets to current Amish participants for distribution to other producers in their communities and church districts.

Results suggest that both Amish and English producers would benefit from additional educational programming related to the latest technological advances to help improve sap collection efficiency. As noted, 78% of all Ohio sugaring operations use bucket systems and only 22% currently use the more efficient tubing collection systems (although English producers are more likely to using tubing systems). A properly constructed and maintained tubing collection system has been shown to significantly increase sap production (Walters 1982, Coons et al. 1987, Chapeskie et al. 2006) and benefit sugarbush health (Coons et al. 1987, Houston et al. 1989, Heiligmann et al. 2006a). The economic and ecological value and use of tubing sap collection systems may be an important production practice that needs to be more strongly emphasized in Ohio and similar states where bucket collection systems are the norm. Such programming should focus on the benefits of tubing to sugarbush health, its reduced labor requirements, and the increased production potential. Future OSU Extension programming should address these issues and expand efforts on the economic and marketing aspects of the maple industry.

### Implications for Management and Education

Our results indicate that the size of an operation and the age of the producer are important determinants of participation in educational programming such as the Ohio Maple Days workshops. Pro-

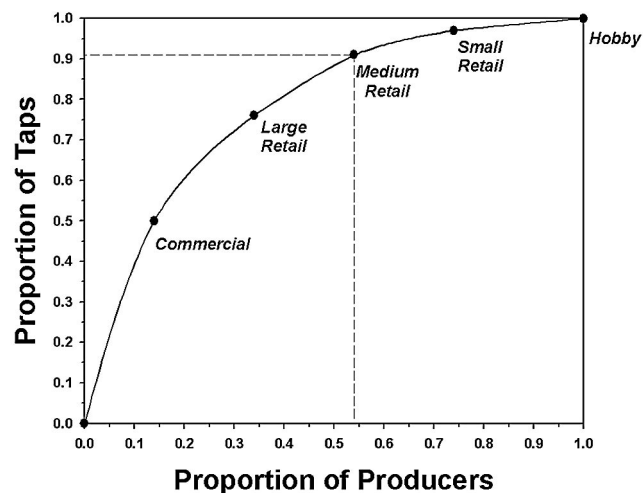


Figure 2. Proportion of taps and producers reached through current Ohio Maple Days workshops organized by the OSU Extension.

ducers with larger (more than 250 taps) tubing collection operations are more likely to attend as are English producers. However, there is still a large segment of Ohio's maple syrup industry (both Amish and English) that does not participate in educational programming. Analysis shows that Extension programming is reaching the larger operations (more than 250 taps), which represent approximately 90% of the taps in the state (Figure 2). However, this only represents 54% of the producer population, suggesting the need to promote more effectively educational programs to smaller producers. In addition, strategies for targeting younger producers also seem warranted, especially given that many producers involve a younger generation in their operations.

Although there may be many reasons we have been less successful in reaching smaller producers (less than 250 taps), three can be suggested. First, maple sugaring in Ohio is a part-time business and smaller producers are less likely to take time off from their primary employment to attend educational programs. Second, although many small producers will attend a workshop promoted as a "hobby and small producer" workshop, many may perceive that Ohio Maple Days workshops are "geared" to the larger, commercial producers, and therefore, not address their needs. Third, as noted earlier, many producers are protective of their privacy and do not want anyone, especially a group associated or perceived to be associated with the government, to know the scope of their business. Increasing participation among these producers will be challenging, but most certainly involves targeting them directly in both the advertising of and the content of the programs.

Three other strategies to meet the needs of maple-producing communities are suggested by this study. As discussed, to effectively serve the Amish, educational programming may need to be coordinated within the Amish communities or church districts. Additionally, to reach most effectively many of the younger producers of the web-based information generation, workshop information and publications should be made available electronically. Finally, although maple producers express and exhibit a strong interest in programs addressing the technical aspects of maple product production, and to a lesser extent sugarbush management, generally, they have far less interest in or enthusiasm for programs devoted to economics or marketing topics. Creative, effective ways need to be developed to

provide attractive programs in those areas that will provide producers with the information necessary to make pricing and processing decisions appropriate to their operations, which will contribute to their achieving their entrepreneurial goals.

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