

Assessing the Production Scale and Research and Extension Needs of U.S. Hard Cider Producers

Abstract

At CiderCON 2013 and 2014, we assessed the scale of current and projected production, as well as the research and Extension needs of cider apple growers and cider makers. Our findings show that cider producers are diverse in terms of geographic location, scale of operation, and experience. These stakeholders reported a great need for technical assistance from Extension professionals and were interested in having information delivered in a wide range of different platforms. We also found audience response devices to be effective at quickly gathering and analyzing data from a large number of participants.

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Introduction

Hard cider is fermented apple juice, typically between 4 and 10% alcohol content by volume. In the U.S., unfermented (and usually unfiltered) apple juice is referred to as "cider" or "sweet cider," but in many other countries, particularly in Europe, the fermented product is called "cider," and the unfermented product is called "apple juice." In this article, we use the term "cider" to refer to the fermented product. A similar product fermented from pear juice is called "perry."

In 2012, 5.2 million gallons of cider were produced in the U.S., compared to 0.8 million gallons in 2007, a nearly seven-fold increase (Alcohol and Tobacco Tax and Trade Bureau, 2013). Although cider accounts for only 1% of the total alcoholic beverage market in the U.S., the beverage currently has a more rapid growth rate than the microbrew beer industry (Tuttle, 2014). Some market analysts predict that the large growth trend for cider will continue well into the foreseeable future (Canadean, 2013). In January 2015, there were nearly 400 cideries operating in 39 states, most of which have been in operation for fewer than 6 years (Brown, 2015). This significant increase in cider production has created a need for the development of more research and Extension resources from land-grant universities. Needs assessments allow researchers and Extension educators to develop programming

and resources that are targeted to the specific needs of the stakeholder audience, in this case, cider apple growers and cider producers (Boone, Safrit, & Jones, 2002).

Based upon previously assessed needs of cider producers, researchers and Extension specialists have already started to publish research-based resources for the cider industry. These include a production guide (Moulton, Miles, King, & Zimmerman, 2010), complete and partial enterprise budgets for growing cider apples (Farris, Peck, & Groover, 2013; Galinato et al., 2014), cidery feasibility studies (Matson Consulting, 2012), websites (Miles, Moulton, King, & Foren, 2008; Peck, 2012), an eXtension article (Peck et al., 2014), and journal articles regarding cider apple mechanical harvest (Miles & King, 2014) and apple polyphenolics (Valois, Merwin, I.A., & Padilla-Zakour, 2006; Thompson-Witrick et al., 2014). Additionally, workshops, short courses, and other educational opportunities for hard cider producers are being held at several universities, including Washington State University, Cornell, and Virginia Tech. However, assessing the needs of the cider industry at a national scale has not occurred, nor has there been a coordinated effort to assess the effectiveness of the above-mentioned publications and educational programs.

In addition to the efforts from educators and researchers, the U.S. cider industry has been active in organizing itself to more effectively share resource information, lobby state and federal legislatures and agencies for more favorable regulations, generate interest from vendors and distributors, and fund scientific research for the cider industry (J. Kohn, personal communication, December 15, 2014). One primary venue for cider information sharing is CiderCON, an annual trade show and educational conference established by commercial cider producers in 2011 (<http://ciderconference.com>). In 2013, cider producers formed a national cider association (<http://ciderassociation.org>), and several regional and state associations have also formed, such as in the Pacific Northwest, the Great Lakes, Virginia, the Rocky Mountains, and Vermont.

In order to better understand the scale and scope of cider production in the U.S. and to ensure that university personnel are meeting the cider producers' needs, an audience response device survey was conducted at CiderCON in 2013 and 2014. The objectives of these surveys were to determine the geographic distribution and scale of current and projected production and the research needs of commercial cider apple growers and cider makers.

Methods

At the 2013 and 2014 CiderCON opening plenary sessions (7 and 6 February, respectively) in Chicago, IL, the authors conducted a needs assessment survey using audience response devices. Survey respondents included one representative from each existing or prospective orchard and/or cider company in attendance at the conference. In 2013, there were 64 respondents, and in 2014, there were 105 respondents. Each year, the needs assessment survey included a total of 14 multiple-choice questions. Survey questions were only slightly modified between 2013 and 2014, so that year-to-year trends could be monitored. The survey took 20 minutes to conduct.

The first question identified the general location or production scale (caucus) of the respondent:

Eastern Caucus = CT, DC, DE, MA, MD, ME, PA, NH, NJ, NY, RI, and VT; Western Caucus = AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, and WY; Southern caucus = AL, AR, FL, GA, KY, LA, MI, NC, OK, SC, TN, TX, VA, and WV; and Midwestern = IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, and WI.

Large-scale producers were defined independent of location as businesses that made more than 100,000 gallons (378,540 L) of cider in 2013 or more than 250,000 gallons (946,350 L) in 2014. The increase in volume from 100,000 to 250,000 gallons for the large-scale producer caucus was due to definition changes by the U.S. Association of Cider Makers (J. Kohn, personal communication, December 15, 2014). Three questions described the amount of cider produced (current and projected) of each respondent based upon the membership levels developed by the U.S. Association of Cider Makers (<http://www.ciderassociation.org/join>). Four questions described the source and quantity of the fruit produced (current and projected) for cider. Three questions pertained to the need for and willingness to participate in research. One question ascertained where respondents sought information, and two questions asked respondents to prioritize their research and information needs. For questions pertaining to production, respondents were asked to "select the best response," whereas for questions pertaining to information needs, respondents were asked to "select up to three" based on their priorities.

The survey was conducted using TurningPoint (Turning Technologies, Youngstown, OH), a PowerPoint-based, real-time, audience-response-device survey instrument. Each respondent was provided a clicker and asked to answer the questions that were projected on large screens in the conference room. Respondents were first trained in the use of the clickers with a sample question and given the opportunity to resolve technical issues before the actual survey began. Other attendees, such as vendors, media representatives, researchers, and support staff did not participate in the survey, but were able to see the responses to each question.

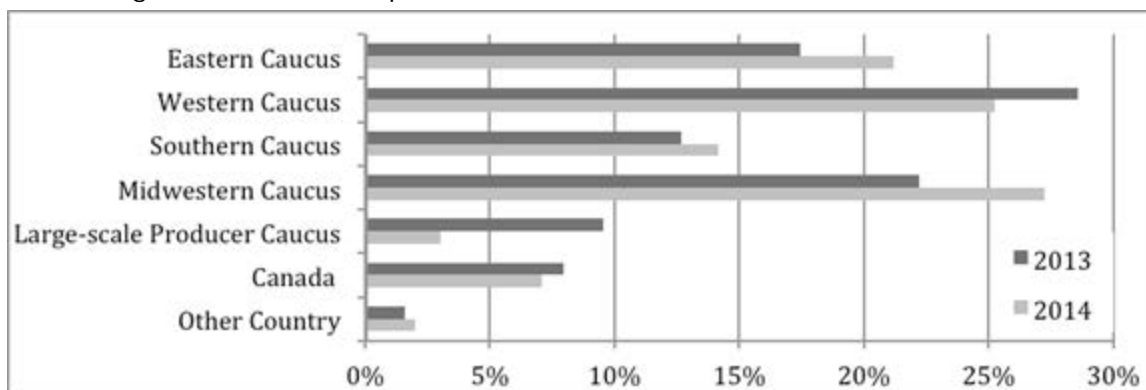
Results

Caucus Representation

Every caucus region was represented in both years at CiderCON, with the majority from the West in 2013 (29%) and the Midwest in 2014 (27%) (Figure 1). In 2013, 9% of the respondents indicated they were within the Large-scale Producer Caucus, and in 2014, representation fell to 3% in this category. The decrease in the number of respondents in the Large-scale Producer Caucus was most likely due to the increase in production volume for this caucus, from 100,000 in 2013 to 250,000 gallons in 2014, rather than a decline in the number of large-scale cider makers.

Figure 1.

Percentage of CiderCON Respondents in Each U.S. Association of Cider Makers' Caucus

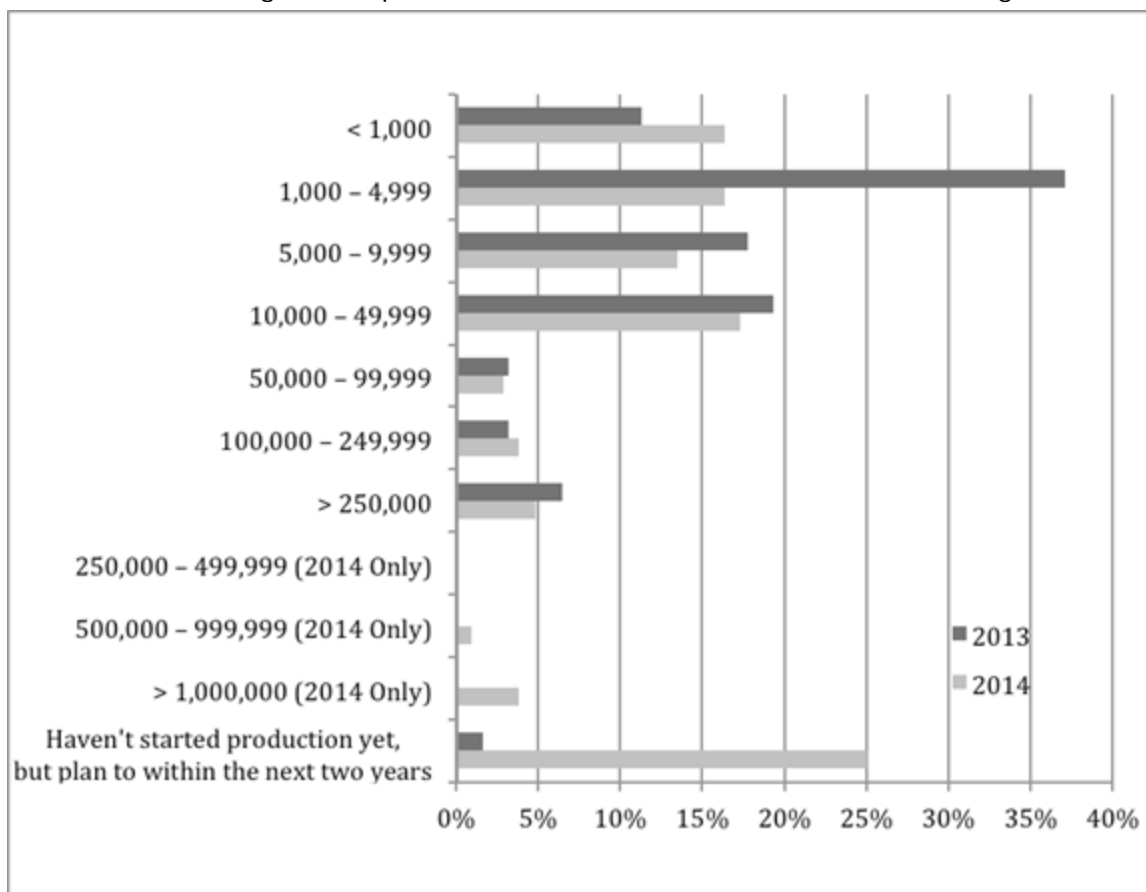


Note: Caucuses were defined by the U.S. Association of Cider Makers based on the location of the production facility and the volume of cider produced.

Cider Production

The majority of respondents (37%) produced 1,000-4,999 gallons of cider in 2012, while production was similar (14-17% respondents) for the four production categories under 50,000 gallons in 2013 (Figure 2). Production did not change between survey years for the categories greater than 50,000 gallons, and 5-6% of respondents produced greater than 250,000 gallons each year. Only 2% of respondents had not yet started production in 2012, while 25% indicated they had not started in 2013. These individuals potentially represent new cider apple growers or cideries that will start production over the next several years. At the 2015 CiderCON meeting, a survey question will be added to determine how many of those who responded "not yet in production" in 2013 began cider production in 2014.

Figure 2.
Percentage of Respondents in Each Cider Production Volume Range



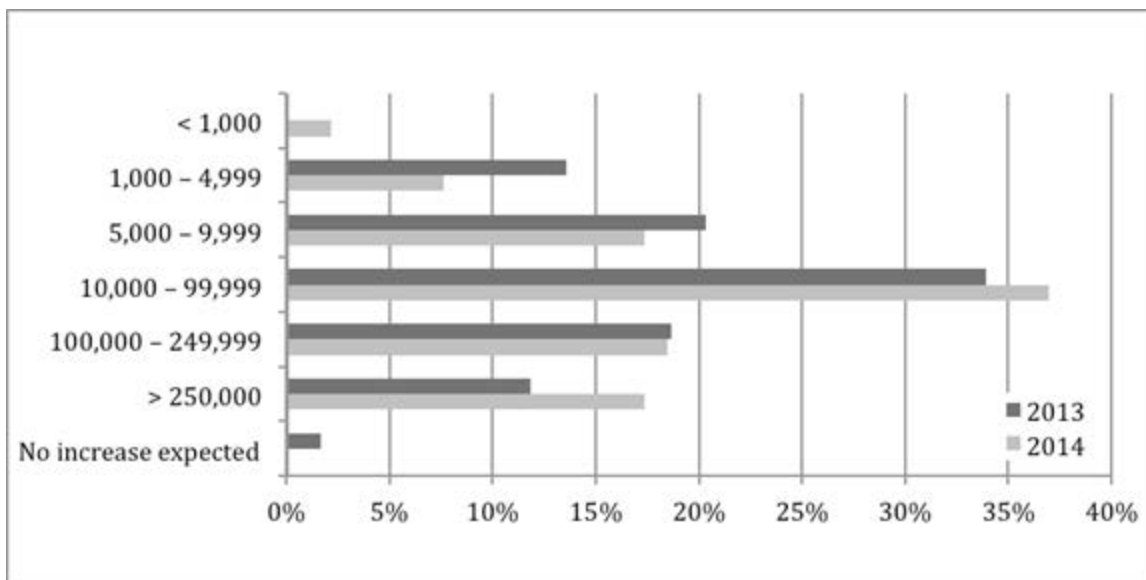
Note: Ranges are in gallons and are based upon the membership levels developed by the U.S. Association of Cider Makers (<http://www.ciderassociation.org/join>). (1 gal = 3.8 L). In 2014, percentage of respondents in the category '> 250,000' is a sum of the respondents in the 3 categories '250,000 - 499,999', '500,000 - 999,999' and '> 1,000,000'.

All but one respondent in 2013 projected an increase in cider production over the next 5 years, and in

both years the majority of respondents (34% in 2013; 37% in 2014) projected an increase of 10,000 to 99,999 gallons (Figure 3). For both years, the number of respondents who projected an increase in production of greater than 250,000 gallons was approximately equal to or greater than those who projected an increase of up to 5,000 gallons. The majority of respondents in both years (70%) produced cider and/or perry as 75 to 100% of their total beverage production.

Figure 3.

Percentage of Respondents in Each Category for Their Projected Increase in Volume (gallons) of Cider Produced Over the Next 5 Years



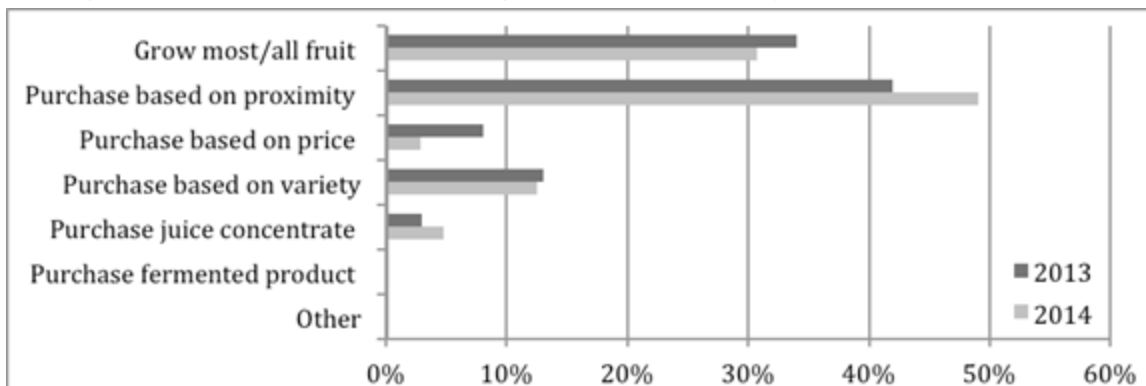
Note: Ranges are in gallons and are based upon the membership levels developed by the U.S. Association of Cider Makers (<http://www.ciderassociation.org/join>). (1 gal = 3.8 L).

Cider Fruit and/or Juice Procurement.

There was little change over the 2 years in cider fruit and/or juice procurement (Figure 4). Averaged over the 2 years, the majority of respondents (46%) purchased fruit and/or juice based on local or regional proximity, while 33% of respondents grew most or all of their own fruit.

Figure 4.

Percentage of Respondents in Each Category for Their Primary Method Used to Procure Apples

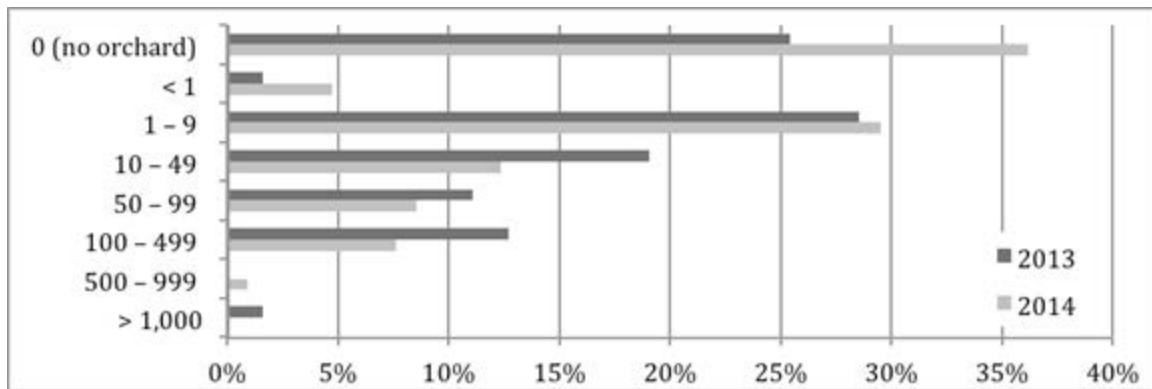


Cider Apple Production

A large number of respondents did not own, lease, or rent an orchard either year (30% on average) (Figure 5). Of those respondents who did own, lease, or rent an orchard, the majority in both years had between 1 and 9 orchard-acres (29% on average). The next greatest response category was 10 to 49 acres (15% on average), while a similar number responded in the 50 to 99 and 100 to 499 categories both years (10% on average). One respondent in 2013 responded to the 500 to 999 category, and one in 2014 responded to the category greater than 1,000 acres.

Figure 5.

Percentage of Respondents in Each Category for the Number of Orchard-Acres Owned, Leased, and/or Rented, Including All Bearing and Non-bearing Orchards and Those Not Used for Hard Cider



Note: 1 acres = 0.4 hectares.

A significant number of respondents in both years (31% on average) did not grow specialty cider apples, while the majority of those who did grow specialty cider apples (39% on average) had 1 to 9 acres (Figure 6). Specialized cider apple cultivars encompass a large number of quality attributes, but tannins are the compounds that are most often cited as being important for producing ciders that are representative of traditional European styles (Barker & Burroughs, 1953). Several respondents had less than 1 acre (8% on average) or 10 to 49 acres (10% on average), while a few respondents had 50 to 99 acres (2% on average). One respondent in 2014 had 100 to 499 acres of specialty cider apples, while no respondents in either year had greater than 500 acres. The majority of respondents planned to increase their acreage of specialty cider apples by 1 to 9 acres (36% on average) or by 10 to 49 acres (34% on average) (Figure 7). In each year, one respondent planned a very large increase in specialty cider acreage (500 to 999 acres in 2013, greater than 1,000 acres in 2014), while 8% of respondents did not plan any increase. No respondents expected to decrease their acreage of specialty cider apples in either year of the survey.

Figure 6.

Percentage of Respondents in Each Category for the Number of Acres That Have Been Planted With Specialized Hard Cider Cultivars or Planted Specifically to Produce Hard Cider

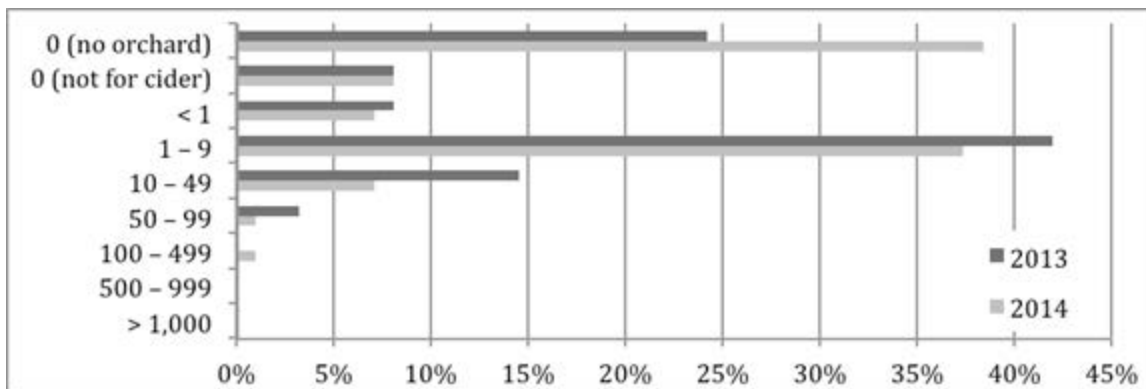
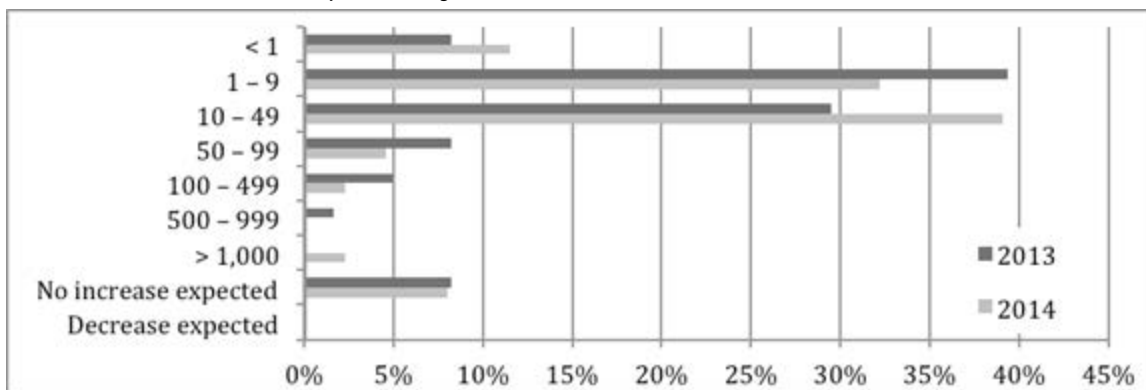


Figure 7.

Percentage of Respondents in Each Category for Their Projected Increase in the Acres of Apple Orchards Planted Specifically for Hard Cider Production Over the Next 5 Years



Research Needs

Averaged over the 2 years, 89% of respondents indicated they would like more research on cider and/or perry production by university scientists, 91% were willing to participate in research experiments in their orchard or cidery, and 57% were willing to fund research that targeted their needs, while 27% were unsure if they would contribute to research funding. Prioritization of research needs was essentially equivalent for all categories both years, and in general, there was a slightly greater priority placed on cider making than on cider apple production. Respondents prioritized research needs (each respondent could select up to three) as: fermentation management (18%), final product quality evaluation (15%), storage and packaging techniques (13%), cultivar and rootstock trials (13%), cider orchard management (11%), juice quality improvement (11%), and economic feasibility and consumer preference studies (8%).

No single research priority was identified in the needs assessment survey, suggesting there is a great need within the emerging cider industry for research on many different subjects. Similar to the wine industry, a multi-disciplinary approach is likely going to be necessary in order to serve the diverse needs of the cider industry. This will include horticulture, plant pathology, entomology, food science, agricultural economics, and other disciplines related to apple fruit production. National efforts should focus on developing teams of inter-disciplinary researchers and educators who will use their existing expertise to quickly develop resources for this rapidly growing industry.

Information Access

When seeking technical information about growing apples or making cider, the majority of respondents searched the internet (25% on average) or contacted a colleague (24% on average). On average over both years, 16% referred to their reference books, 11% contacted a university specialist, 10% posed questions to list serves, and 6% contacted a private consultant. On average over both years, respondents felt their businesses would benefit most from workshops on cider fermentation (26%), workshops on growing apples (16%), printed university information (13%), visits with university/Extension specialists (18%), university websites (17%), and private consultants (11%).

The survey participants showed a tendency to find information by searching the Internet or contacting a colleague, yet in both years the majority of respondents stated they wanted more workshops on cider production. While some land-grant universities are conducting some training workshops for potential and current commercial cider producers, many more educational opportunities are needed to address the diverse needs of this emerging industry. No single method stood out as being the best for reaching this stakeholder group, but in both years survey respondents indicated a slight preference for online resources and websites over printed materials. They also indicated they would benefit from more site visits from Extension specialists. These results again suggest that a multi-pronged approach is necessary.

Discussion

Implications for Extension and Outreach

Although participants in the needs assessment survey represent a self-selected group who attended CiderCON in 2013 and/or 2014, respondents accounted for approximately 20% of the U.S. cider makers, and thus, the data provides a snapshot of U.S. cider producers' current and projected scale of production as well as their research and Extension needs (Brown, 2015). Based on survey results, the cider industry will continue to expand in every region of the U.S. This finding supports those of recent marketing reports (Canadean, 2013; Alcohol and Tobacco Tax and Trade Bureau, 2013).

While a large amount of the overall growth of the cider market is due to large-scale producers such as multi-national beer companies, our results show there are a significant number of small- and medium-scale producers starting new cider businesses. Additionally, many of the new small-scale producers are projecting a rapid increase in the volume of cider they produce. Research and Extension programs will have to address the diverse needs and knowledge base that are part of the expanding cider industry. With limited resources, programs may have to decide if their efforts are best used by focusing on the few large-scale cider producers or the larger number of small- to medium-scale producers.

Thirty percent of those surveyed had no apple orchards, and less than one-third were growing the apples that were used in their ciders. Few operations reported to have plantings of cider apples that would meet their own needs, and most had fewer than 10 acres. This raises a concern, which has been widely reported in the mass media, that as the cider industry expands, there is a lack of specialized apples available for hard cider producers (Nassauer, 2014). Tannin concentration ranges are 75-90% lower in most commercially available apples (culinary cultivars) compared with specialty

cider apples (bittersharp and bittersweet) (Valois et al., 2006; Thompson-Witrick, 2014). While tannins impart important quality attributes to cider, these compounds are not desirable in culinary cultivars or for apples destined to other processing uses because they are unpleasant to consume prior to fermentation.

As the cider industry expands, a large number of producers who have minimal prior experience growing apples are expected to enter the market. Existing Extension information on general apple production will benefit these growers; however, new information specific to cider apples is needed, such as cultivar suitability for each region. Additionally, new information specific to cider production and small-scale fermentation will be needed as the cider industry continues to expand. Some of this information can be obtained from resources developed for wine making, but grape and apple chemistry is different enough that resources specific to the cider industry will be necessary (Spanos & Wrolstad, 1992).

Use of Audience Response Devices at a Large National Conference

A further finding of this needs assessment survey was the use of Turning Point's audience response device as an effective and relatively easy method to obtain a significant dataset from a large audience in a short amount of time with minimal need for instruction. This is similar to findings by Carlson (2014), who surveyed farmers in Minnesota, and Parmer, Parmer, and Struempfer (2012), who surveyed third graders in Alabama. Furthermore, respondents as well as all other conference participants appeared to enjoy the survey exercise, because it provided real-time information about the demographics of the cider industry. This survey technique is readily adaptable to other crops, products, and venues.

Acknowledgments

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References

Alcohol and Tobacco Tax and Trade Bureau (TTB). (2013). *Report of wine premises operations, 2007-2012*. TTB 5120.17.

Barker, B. T. P., & Burroughs, L. F. (1953). *Cider apple varieties then and now: a survey of vintage-quality trials*, p. 45-55. In: T. Wallace and R.W. Marsh (eds.). *Science and fruit*. University of Bristol,

England.

- Boone, E. J., Safrit, R. D., & Jones, J. (2002). *Developing programs in adult education: A conceptual modeling program*. Waveland Press, Inc. Long Grove, IL.
- Brown, D. (2015). *Cider producer survey 2014*. Retrieved from: https://cydermarket.com/Cider_Producer_Survey_2014.html
- Canadean. (2013). *Cider market insights—United States of America. 2013 cycle*. The Canadean Group, London.
- Carlson, B. M. (2014). Using turning point to conduct an Extension needs assessment. *Journal of Extension* [On-line], 52(1) Article 1TOT3. Available at: <http://www.joe.org/joe/2014february/tt3.php>
- Farris, J., Peck, G., & Groover, G. (2013). *Assessing the economic feasibility of growing specialized apple cultivars for sale to commercial hard cider producers*. Virginia Cooperative Extension publication AREC-46-P. 15 p.
- Galinato, S. P., Gallardo, K., & Miles, C. (2014). *Cost estimates of establishing a cider orchard in western Washington*. Washington State University Extension publication FS141E, 6 p.
- Matson Consulting. (2012). *Feasibility study for a small farm cidery in Nelson County, VA*. Matson Consulting, Aiken, SC. 154 p. Retrieved from: <http://www.arec.vaes.vt.edu/alson-h-smith/treefruit/horticulture/hard-cider/matson-study.pdf>.
- Miles, C. A., & King, J. (2014). Yield, labor, and fruit and juice quality characteristics of machine and hand-harvested 'Brown Snout' specialty cider apple. *HortTechnology* 24(5), 519-526.
- Miles, C., Moulton, G., King, J., & Foren A. (2008). WSU fruit horticulture program. Retrieved from: <http://maritimefruit.wsu.edu/>.
- Moulton, G., Miles, C., King, J., & Zimmerman, A. (2010). *Hard cider production and orchard management*. Washington State University Extension publication PNW621. 40 p.
- Parmer, S. M., Parmer, G., & Struempfer, B. (2012). Testing a new generation: Implementing clickers as an Extension data collection tool. *Journal of Extension* [On-line], 50(5) Article 5TOT5. Available at: <http://www.joe.org/joe/2012october/tt5.php>
- Peck, G. (2012). *Hard cider production in Virginia*. Retrieved from: <http://www.arec.vaes.vt.edu/alson-h-smith/treefruit/horticulture/hard-cider/>.
- Peck, G., Miles, C., King, J., Bradshaw, T., Rothwell, N., & Merwin, I. (2014). An introduction to hard cider in the U.S. *eXtension*. Retrieved from: <http://www.extension.org/pages/70601/an-introduction-to-hard-cider-in-the-us#.U438Wibn-Ul>.
- Nassauer, S. (2014). The real apple shortage: The demand for higher-end hard cider has producers searching for not-so-common apple varieties. *The Wall Street Journal*. 6 May 2014.
- Spanos, G. A., & Wrolstad R. E. (1992). Phenolics of apple, pear, and white grape juices and their changes with processing and storage—A review. *Journal of Agricultural and Food Chemistry*, (40),

1478-1487.

Thompson-Witrick, K. A, Goodrich, K. M., Neilson, A. P., Hurley, E. K., Peck, G. M., & Stewart, A. S. (2014). Characterization of the polyphenol composition of 20 cultivars of cider, processing, and dessert apples (*Malus X domestica* Borkh.) grown in Virginia. *Journal of Agricultural and Food Chemistry*, (62), 10181-10191.

Tuttle, B. (2014). Fastest-growing alcoholic beverage category? It's not craft beer. *Time Magazine*. 20 Apr 2014.

Valois, S., Merwin, I. A., & Padilla-Zakour, O .I. (2006). Characterization of fermented cider apple varieties grown in upstate New York. *Journal of the American Pomological Society*, (60), 113-128.

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