

Assessing Growers' Challenges and Needs to Improve Wine Grape Production in Pennsylvania

Abstract

Pennsylvania wine grape growers were surveyed to obtain information on factors affecting varietal selection, challenges to production, and their perceptions of canopy management practices. Our survey revealed that participants perceived site as a key factor in varietal selection decisions and winter injury as the greatest challenge for their economic sustainability. Other issues limiting production and profitability were disease control, frost injury, and labor cost and availability. Participants recognized the importance of canopy management practices for reaching optimum wine quality but had concerns over the shortage and cost of labor to implement them. Mechanization of canopy management likely would increase adoption.

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Introduction

Pennsylvania is the fifth largest grape producer in the United States (U.S. Department of Agriculture National Agricultural Statistics Service, 2015). Its wine industry generates an estimated \$979 million, benefiting federal, state, and local governments (through tax dollars) and the tourism industry (MKF Research, 2013). The number of in-state wineries grew from 60 in 2000 to 160 in 2011; however, growth has not been as rapid as in other eastern states (Dombrosky & Gajanan, 2013). The lower growth rate may be due in part to a shortage of in-state wine grapes that forces

Pennsylvania wineries to purchase grapes/grape juice from other states, a similar situation to that of Ohio (Brown, 2000). Increased production of wine made with Pennsylvania grapes could fuel the wine industry's growth and increase name recognition, as long as concerted efforts are made to link territorial branding strategies to local production (Patel-Campillo, DeLessio-Parson, Smith, Kelley, & Centinari, 2015).

Unsuitable varietal selection, temperature and precipitation extremes, disease and pest infestations, and labor shortages have been cited as limiting factors in the profitability of wine grape production in the eastern United States (Wolf, 2008). By defining the specific challenges growers in Pennsylvania face and knowing what factors affected their past production and management decisions or could affect future choices, Extension personnel would be in a position to develop effective recommendations for increasing in-state wine grape production. For instance, canopy management practices are crucial to improving vine productivity and fruit health and quality through modification of crop level and/or improvement of the fruit-zone micro-climate (Smart, 1985); however, some growers may not be able, or willing, to incorporate these production practices if the price they receive for their fruit does not cover the additional costs associated with implementation.

To aid in effectively addressing the needs of the Pennsylvania wine grape industry, the study reported here targeted Pennsylvania wine grape growers to obtain baseline information on (a) criteria that shape variety selection, (b) challenges that growers face and that may contribute to a shortage of in-state wine grapes, (c) vineyard management practices common in Pennsylvania, and (d) growers' perceptions of how important these practices are for producing healthy grapes and high-quality wine.

The survey described here can be used as a template for Extension personnel in other states to further understand their clientele's decision making process and needs.

Methodology

Data were collected through a 15-min Internet survey (March 27 through April 24, 2015) developed by our team and housed on SurveyMonkey.com. Survey questions were developed on the basis of what growers ask Extension personnel during regional visits, issues investigated by researchers in surrounding states, and articles focusing on cool-climate vineyard management. A link to the survey was sent to the 72 members of a Pennsylvania wine grape grower Extension electronic mailing list, with a reminder email sent 2 weeks later. The link to the survey also was promoted through an electronic newsletter to reach additional Pennsylvania growers. Forty-three participants clicked the link and responded to questions on the survey; 39 of the surveys were used in our analysis. A subset of participant responses describing their vineyards, issues they were experiencing, and knowledge and educational level are reported herein. All procedures were approved by the Office of Research Protections at The Pennsylvania State University (University Park, PA). Upon completion of the survey, each participant was entered into a raffle to win one of three \$25 gift certificates that could be redeemed toward any Penn State Extension wine or grape program fee.

Survey Results

Participant Demographics

Twenty-seven survey participants (69%) indicated the region where they grew grapes. The majority of the respondents (12) were from the Southeast region; the others were from the South Central region (8), Northwest region (5), Southwest region (1), and North Central region (1).

The following additional information on the 39 survey participants was collected:

- Twenty-three participants reported owning a vineyard and a winery, whereas 13 were exclusively growers (i.e., not associated with a winery), and another three were growers working for a winery.
- The majority of participants (23) grew both *Vitis vinifera* and interspecific hybrid (abbreviated in the text as *vinifera* and hybrid, respectively) wine grape varieties, whereas a third of the respondents (13) were exclusively *vinifera* growers, and three respondents grew only hybrids. This finding may indicate that most growers prefer to moderate the potential for economic gain/loss by relying on a range of varietal sensitivity to weather and disease conditions.
- A large number of the participants (34) had owned or managed a vineyard for at least 6 years.
- The majority of growers (28) had no formal viticulture education. Respondents indicated that they most commonly accessed viticulture information through Penn State University Extension programs, online sources, and communication with other vineyard owners.
- Fifteen respondents managed a vineyard that was 5 ac or less, 16 respondents managed vineyards that were between 6 and 20 ac, and eight respondents managed vineyards larger than 20 acres. This finding reflects the small average vineyard size in Pennsylvania (Chien, 2011).

Variety Selection

Participants were asked to rate the importance that four factors played in selecting specific varieties to plant: (a) site (climate and soil characteristics), (b) ease of selling fruit to the winery and/or selling wine, (c) variety reliability (defined as a reliable crop producer), and (d) price obtained for fruit and/or wine.

The main factor that affected varieties grown in the past or could affect future selection was site (Table 1). Ease of selling fruit to the winery and/or selling wine was split across categories of importance for *vinifera* growers, whereas it was important to the majority (60%) of growers who grew both species (Table 1). Anecdotal evidence suggests that name recognition for wine made with certain hybrid grapes is lower than wine made with *vinifera* grapes; therefore, it is essential that growers select hybrid varieties that are in demand and sell easily. When asked to indicate importance of variety reliability, 85% of the participants who grew *vinifera* exclusively selected the "important" response category (Table 1). Independent of species grown, 39% of the respondents indicated that the price obtained for fruit and/or wine was the least important factor in variety selection (Table 1).

Table 1.
Key Factors That Influenced Variety Selection

Factors that have influenced or could influence choice of variety planted				
Type(s) of grape grown/response category	Site % (number)	Ease of selling fruit to the winery and/or selling wine % (number)	Variety reliability % (number)	Price obtained for fruit and/or wine % (number)
<i>V. vinifera</i>				
Least important	15 (2)	39 (5)	8 (1)	39 (5)
Important	31 (4)	23 (3)	85 (11)	54 (7)
Most important	54 (7)	39 (5)	8 (1)	8 (1)
<i>V. vinifera</i> and interspecific hybrids ^a				
Least important	4 (1)	20 (5)	32 (8)	39 (10)
Important	44 (10)	60 (15)	48 (12)	42 (11)
Most important	52 (12)	20 (5)	20 (5)	19 (5)
<p><i>Note.</i> Values are expressed as percentages; number of responses for each category is reported in parentheses. Percentage values are presented as whole numbers (rounded); therefore, the values within a column may not add up to 100.</p> <p>^aDue to small sample size, responses of participants growing exclusively hybrid varieties were grouped with those of growers growing <i>vinifera</i> and hybrid varieties.</p>				

Wine Grape Growers' Challenges

Participants responded to an open-ended question that asked them to list the most important challenges they faced. As participants were allowed to list more than one challenge, several issues were identified, and responses were combined into categories on the basis of common words and issues. The challenge most frequently reported (20 of 38 respondents) was winter injury, expressed as primary bud mortality greater than 15%. Survey data revealed that 100% of the growers in the Northwest, Southwest, and North Central regions experienced vine winter injury at least once in the last 5 years. Of participants with vineyards in the Southeast and South Central regions, 83% and 75%, respectively, reported vine winter injury at least once in the last 5 years. Other issues that were notable, but challenging to fewer growers, included disease pressure/control (reported by 14 respondents), frost injury (reported by 11 respondents), and labor cost and availability (reported by 10 respondents).

Follow-up questions asked participants to indicate the extent of winter injury that grapevines sustained during the 2013/2014 winter, which was one of the harshest for Pennsylvania grape growers. Independent of region, the most extensive damage was observed in *vinifera* varieties, which are known to be more cold-sensitive than hybrid varieties. In the Northwest, Southwest, and North Central regions combined, level of injury in *vinifera* varieties ranged from 95% to 100% (Table 2). Respondents indicated that vines were dead or needed trunk replacement, resulting in production loss of one or multiple seasons (i.e., up to 3 to 4 years). Damage was less extensive in the Southeast and South Central regions (Table 2). Of all the participants, growers from the South Central region appeared to be the least affected by cold injury.

Table 2.

Extent of Cold Damage (Expressed as Percentage of Vines with Cold Injury Symptoms) Reported by Participants, Segmented by Region Where Vineyard Is Located

Type of grape grown/percentage of vines with cold injury symptoms	Region where vineyard is located		
	Southeast % (number)	South Central % (number)	Northwest/Southwest/North Central ^a % (number)
<i>V. vinifera</i>			
0–5%	18 (2)	50 (4) ^b	0
6–20%	18 (2)	25 (2)	0
21–40%	0	13 (1)	0
41–60%	9 (1)	0	0
>60%	55 (6)	13 (1)	100 (7)
Interspecific hybrids			
0–5%	73 (8)	75 (6)	0
6–20%	18 (2)	25 (2)	43 (3)
21–40%	9 (1)	0	0
41–60%	0	0	29 (2)
>60%	0	0	29 (2)

Note. Values are expressed as percentages; number of responses for each category is reported in parentheses. Percentage values are presented as whole numbers (rounded); therefore, the values within a column may not add up to 100.

^aDue to low number of participants and similarity of answers, responses for growers from the Northwest, Southwest, and North Central regions were combined.

Canopy Management Practices: Use and Perceived

Importance

Growers were asked to rate labor costs and perceived importance of canopy management practices. In general, the majority of growers (28 respondents) considered all management practices important, although the perception of the importance of each specific practice and its associated costs varied in relation to the species grown (Tables 3, 4). This circumstance may be explained by the specific species needs and different trellis systems used.

Table 3.

Participant Responses to the Question "How Important Is It for You to Implement the Following Canopy Management Practices to Reach Optimum Grape Maturity and Wine Quality?"

Type(s) of grape grown/response category	Canopy management practices				
	Shoot hedging % (number)	Shoot positioning % (number)	Shoot thinning % (number)	Cluster-zone leaf removal % (number)	Cluster thinning % (number)
<i>V. vinifera</i>					
Unimportant	0	0	0	0	0
Neither unimportant nor important	0	8 (1)	8 (1)	0	8 (1)
Important	100 (13)	92 (12)	92 (12)	100 (13)	92 (12)
<i>V. vinifera</i> and interspecific hybrids ^a					
Unimportant	8 (2)	15 (4)	8 (2)	12 (3)	4 (1)
Neither unimportant nor important	4 (1)	8 (2)	20 (5)	8 (2)	32 (8)
Important	88 (22)	77 (20)	72 (18)	80 (20)	64 (16)
<p><i>Note.</i> Values are expressed as percentages; number of responses for each category is reported in parentheses.</p> <p>^aDue to small sample size responses of participants growing exclusively hybrid varieties were grouped with those of growers growing <i>vinifera</i> and hybrid varieties.</p>					

The majority of the participants listed shoot hedging as being least expensive in terms of labor costs (Table 4). This practice is well suited for mechanical application, resulting in reduced labor costs. Seventy-nine percent of the participants who grew both species indicated that cluster-zone leaf removal was the most expensive canopy management practice, whereas only 16% of *vinifera* growers rated this practice as being the most expensive (Table 4). As previously stated, different trellis system used for hybrid and *vinifera* varieties may affect labor costs associated with specific

practices.

Participants also responded to questions related to cluster-zone leaf removal. Our data show the following circumstances:

- Cluster-zone leaf removal was perceived as a practice important for reducing pesticide applied to control fungal disease by 25 respondents.
- Of all the participants who applied leaf removal (24 respondents), the majority (18 respondents) practiced it by hand, two respondents practiced it by machine, and four practiced it by both hand and machine.
- Among participants who did not apply leaf removal, half (4 respondents) indicated that it is time consuming and labor intensive, and the other half would consider leaf removal only if it were done by machine.

Table 4.

Labor Costs Associated with Canopy Management Practices Rated from Most Expensive to Least Expensive

Type(s) of grape grown/response category	Canopy management practices				
	Shoot hedging % (number)	Shoot positioning % (number)	Shoot thinning % (number)	Cluster-zone leaf removal % (number)	Cluster thinning % (number)
<i>V. vinifera</i>					
Least expensive	64 (7)	25 (3)	36 (4) b	42 (5)	50 (6)
Expensive	0	17 (2)	27 (3)	42 (5)	25 (3)
Most expensive	36 (4)	58 (7)	36 (4)	17 (2)	25 (3)
<i>V. vinifera</i> and interspecific hybrids ^a					
Least expensive	69 (9)	62 (8)	31 (4)	14 (2)	31 (4)
Expensive	8 (1)	8 (1)	62 (8)	7 (1)	8 (1)
Most expensive	23 (3)	31 (4)	8 (1)	79 (11)	62 (8)
<p><i>Note.</i> Values are expressed as percentages; number of responses for each category is reported in parentheses. Percentage values are presented as whole numbers (rounded); therefore, the values within a column may not add up to 100.</p> <p>^aDue to small sample size responses of participants growing exclusively hybrid varieties were grouped with those of growers growing <i>vinifera</i> and hybrid varieties.</p>					

Conclusions and Implications

Stakeholders' input is essential for identifying priority areas that need to be addressed through regional or statewide Extension educational programs. Moreover, research, especially that which is sponsored by funds from the Pennsylvania wine grape industry, must be designed to answer stakeholder questions and concerns identified in surveys in an effort to help growers be economically sustainable.

Survey results indicate that site selection was the most important factor in determining varieties grown and that winter injury was the challenge most frequently reported by participants. These findings identify important sources of production-limiting factors of cold-climate viticulture in Pennsylvania. To meet the needs of the state's wine grape growers, it is imperative that Extension personnel supply growers with education and information that will guide them through the variety selection process, including information on genotype cold tolerance. Moreover, educational resources on how to manage cold-injured vines will be critical for promoting vine health and production recovery. It was also evident that economic factors shape growers' decisions related to species selection. Therefore, Extension personnel need to investigate marketing opportunities for varieties newly released or new to Pennsylvania.

Since labor cost and availability was identified as an economic challenge by 26% of the participants, Extension and research efforts could focus on promoting the mechanization of canopy management practices, such as cluster-zone leaf removal, which is pivotal for obtaining healthy and high-quality fruit. Such efforts may increase grower adoption of canopy management practices.

Although survey participants were from Pennsylvania, it is important to point out that wine grape growers in surrounding states experience similar issues. The eastern United States is geographically diverse, but many of the grape-producing areas in the region experience similar macroclimate conditions (Wolf, 2008). Issues such as damaging winter and late spring temperatures or high disease pressure are experienced, although at different levels, by many wine grape growers in the region. Therefore, Extension personnel, especially those in the Mid-Atlantic and Northeast regions, could use the data discussed herein to help prepare publications and presentations and use limited resources (i.e., personnel and budgeted funds) more efficiently.

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