

Needs Assessment of the Strawberry Industry in the State of Oregon

By

Shianne Howe¹ and Javier Fernandez-Salvador²

¹ Bioresource Research Interdisciplinary Program - OSU

² Assistant Professor of Practice, Berry Initiative - OSU

An Undergraduate Thesis Submitted to
Oregon State University

In partial fulfillment of
the requirements for the
degree of
Baccalaureate of Science in BioResource Research,
Water Resources Option

Special thanks to the legislature Berry Initiative Oregon Strawberry Commission for the funding allocated to this project and the growers participating in the survey.

7/ 31/2019

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Shianne Howe

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INTRODUCTION

Oregon is the number three producer of strawberries in the nation despite the fact that Oregon strawberry acreage dropped from 2,600 acres in 2005 to 2,000 acres in 2014 (Beeles, 2015; NASS, 2019, Losh, 2017). With over three billion pounds of berries grown nationally each year, strawberries are an important economic contributor to agriculture in the US (Grubinger, 2012). Nationally, strawberries have been on the rise in terms of production and value, increasing from 1.0 million tons valued at \$1.2 billion in 2002, to 1.5 million tons valued at \$2.4 billion in 2012 (Yue, 2014). There is a growing consumer demand for a year-round supply of fresh high-quality small fruits in North America (Ballington, 2008). North American production of strawberries represents more than 25% of world production, with over 1.3 million tons of fruit being produced every year (Ballington, 2008). However, the strawberry industry in Oregon has been in a period of transition over the past few years. Strawberry acreage planted and harvested, as well as yield and production, dropped from 115 cwt in 2005 to 91 cwt in 2014 while the value per harvested acre was up overall (Beeles, 2015). While there are vast amounts of information published on the strawberry industry in California and Florida (Samtani, 2019; Wu, 2012, Bertelsen, 1995), significantly less is known about the strawberry industry in Oregon. To address this, a needs assessment survey was created. In a pilot study, strawberry growers in the state of Oregon were interviewed regarding their individual practices, needs and challenges.

MATERIALS AND METHODS

The needs assessment survey of the strawberry industry in Oregon was conducted among strawberry growers located in Oregon's Willamette Valley from 15 Jan. 2019 to 10 Apr. 2019. Individual surveys lasted from 30 min to 1 h 30 min. Official lists of growers were requested and obtained from the Oregon Strawberry Commission and various outreach events by Oregon State

University Extension Service. Individual letters of introduction were first sent to the five grower commissioners on the Oregon Strawberry Commission, followed by telephone calls to determine their willingness to participate and availability for interviews. Once interviews with commissioners were completed, select growers were contacted through the same process. These growers were selected based on location and operation type to ensure that a variety of growers were included in the survey. After completing interviews with the 14 selected growers, commissioners included, a letter of introduction was distributed to the remaining contacts, asking them to complete an online survey (Qualtrics; Provo, Utah and Seattle, Washington, United States). All correspondence with growers was handled by the primary investigator and student researchers hired by Oregon State University for the purpose of the project. The respondents to the survey were owners and managers of the selected strawberry operations, and the types of operations included organic, conventional, fresh market, processed market and mixed market. A total of 17 growers participated out of the 89 contacted, 14 in person and 3 completing the survey online.

The survey contained 31 questions covering consent, contact information, acreage, certifications, Food Safety Modernization Act (FSMA) preparation, cultivars, planting, row management, irrigation, season extension, soil samples, tissue samples, nutrient management, weed management, pest management, yield, marketing, sales, use of Oregon State University extension materials, challenges to growers, and future research suggestions. The scope and questions of the survey were edited through a thorough review process with extension and research colleagues, growers and stakeholders. The survey was given through in-person and online formats. The questions for each version were the same, the only difference between the two versions being that the in-person format included an audio recording to ensure all details

were recorded correctly, and photographs were taken of strawberry fields. The survey obtained exempt status from the Institutional Review Board at Oregon State University.

We determined total acreage as well as the percentage of the acreage devoted to strawberries.

Total operation acreage in production and strawberry specific acreage was recorded for 2017 and 2018. From this information the average acreage and percentage of strawberry acreage was determined for all growers in the sample and by operation type.

Growers were asked about their operation certification status and whether they felt prepared for the implementation of the Food Safety Modernization Act (FSMA). FSMA contains a produce rule that is intended to minimize the risk of a microbial contamination on farms and must be followed by growers. The produce rule contains sections pertaining to employee qualification and training, worker health and hygiene, water use, biological soil amendments from animals, wild and domesticated animals, equipment, buildings, and post-harvest activities (National Sustainable Agriculture Coalition). This information was then examined for all growers and by operation type. Percentages were taken from a table of counts for each data set. Growers were asked about where they sell their fruit and how they market the berries, as either fresh, processed or mixed market. A table of counts was created for sales methods and locations.

Cultivar selection, planting stock, planting season and nursery source for each grower was recorded. A table of counts for each data set was created and selection percentages were taken for all growers and by operation type.

A series of questions were devoted to row management techniques, including questions on planting design, irrigation, season extension, soil and tissue sampling. The mean, median,

minimum and maximum values were calculated for planting design questions, and percentages were found from a table of counts for the remaining data sets.

Information collected on pests included pest presence and growers ranking of pests by perceived negative impact of pests present. Types of pests examined were vegetative, insect, vertebrate, invertebrate and diseases. A table of counts for each data set was created for pest presence and then the rankings were compiled to determine the pests with the most negative impacts for the majority of growers.

The final block of the survey contained questions regarding their use of Oregon State University programming, future research suggestions and their greatest challenges to production. Growers were then asked to rate both their knowledge and understanding as well as the perceived importance of each challenge. Responses were sorted into categories and a table of counts was created.

RESULTS AND DISCUSSION

Data analysis on growers surveyed found that the average acres in production was 250, with strawberry acreage averaging 25.3 acres, 10.9% of total acreage, in 2018. Growers surveyed sold their fruit either directly (64.7%), to small retailers (23.5%), to a processor (41.2%), or wholesale (5.9%). Growers selling all of their strawberries to the processing market had the highest average strawberry acreage with 75.8 acres on average representing 13.5% of their total acreage in production, and growers selling all their strawberries to the fresh market had the smallest average strawberry acreage with 6.3 acres on average representing 6.8% of their total acreage in production.

35.3 % of the growers surveyed were certified as organic, with 43.98 acres of strawberries on average. Only 52.94% of growers had additional certifications outside of organic, 41.2% food safety (Good Agricultural Practices), 11.8% Salmon-Safe and 11.8% Food Alliance. Of those with additional certifications, 37.5% were organic and 62.5% were conventional. 28.6% of growers who sell all their strawberries to the fresh market had additional certification beyond organic, 14.3% food safety and 14.3% Salmon-Safe. 100% of growers who sell to the processed market had additional certifications beyond organic, 40% Food Alliance and 100% food safety. 50% of growers who sell to a mixed market of both fresh and processed had obtained certification outside of organic, 25% food safety and 25% Salmon-Safe. 86.7% of the growers considered themselves to be ready for the implementation of FSMA. The growers who did not consider themselves ready all sell to the fresh market, and cited unclear requirements as the main issue impeding preparedness.

Seascape was the most common of the 18 grower selected cultivars, Albion and Hood were the second most common of grower selections, followed by Tillamook. Seascape was the most popular cultivar for organic growers, Albion the most popular for conventional, Tillamook for the processed market, Albion and Seascape for mixed market growers, and Shuksan, Albion and Seascape were the most popular cultivars for fresh market growers. The variety types grown by all growers surveyed includes day-neutral (29.4%), June bearing (35.3%) and a combination of both day-neutral and June bearing (35.3%). The organic growers surveyed preferred day-neutral, with 80% day-neutrals and only 20% both day-neutral and June bearing. Conventional growers surveyed preferred June bearing, with 54.5% selecting only June bearing, 9.1% selecting day-neutral and 36.4% selecting both day-neutrals and June bearing. Growers selling their strawberries to fresh market seemed to favor a combination of both day-neutral and June bearing

varieties, with 57.4% of growers choosing to plant both varieties, 28.6% planting day-neutrals and 14.3% planting June bearing. Growers surveyed who sell their strawberries for processing exclusively grow June bearing varieties. Information on cultivar selection is summarized in

Table 1.

Table 1

Cultivar	All growers (% of grower selections)	Conventional (% of grower selections)	Organic (% of grower selections)	Fresh market (% of grower selections)	Processed market (% of grower selections)	Mixed market (% of grower selections)
Seascape ⁻	13.5	10.7	23.5	13.3	0	18.2
Albion ⁻	11.5	17.9	11.8	13.3	0	18.2
Hood ⁺	11.5	14.3	5.9	10	20	9.1
Tillamook ⁺	9.6	3.6	5.9	3.3	30	9.1
Sweet Ann ⁻	7.8	3.6	17.6	10	0	9.1
Shuksan ⁺	7.8	10.7	5.9	13.3	0	0
Mary's Peak ⁺	5.8	10.7	5.9	6.7	0	9.1
Puget Crimson ⁺	5.8	3.6	5.9	6.7	0	9.1
Benton ⁺	5.8	7.1	0	6.7	10	0
Sweet Sunrise ⁺	3.8	0	0	3.3	10	9.1
Totem ⁺	3.8	7.1	0	0	20	0
Stella ⁺	1.9	3.6	0	0	0	9.1
Charm ⁺	1.9	0	0	0	10	0
San Andreas ⁻	1.9	0	5.9	3.3	0	0
Cabrillo ⁻	1.9	0	5.9	3.3	0	0
Malweina ⁺	1.9	3.6	0	3.3	0	0
12-216 (experimental cultivar)	1.9	0	5.9	3.3	0	0

+ June Bearing -Day Neutral

Spring was the most common planting season for all growers surveyed except organic growers. For organic growers, 60% planted in the fall, and 40% planted in the spring. Conventional growers surveyed planted over three seasons, with 9.1% planting in the winter, 81.8% planting in the spring, and 9.1% planting in the fall. Fresh market growers surveyed also planted over three seasons, with 14.3% planting in the winter, 57.1% planting in the spring, and 28.6% planting in the fall. Mixed market growers surveyed planted over two seasons, with 75% planting in the spring and 25% in the fall. Growers who sell their strawberries to the processed market were the only group surveyed that planted exclusively in one season, with 100% of planting occurring in the spring.

Overhead irrigation was the most common irrigation source for all growers surveyed, with 47.1% utilizing exclusively overhead, 23.5% utilizing drip lines and 29.4% utilizing a combination of both overhead and drip irrigation. Conventional growers surveyed irrigated with 63.6% overhead, 18.2% drip lines and 18.2% irrigated with a combination of both overhead and drip irrigation. Organic growers utilized a combination of overhead and drip irrigation (60%) or exclusively drip irrigation (40%). Both fresh and mixed market growers used all three methods of irrigation. For fresh market, 28.6% of growers utilized exclusively overhead, 28.6% utilized only drip irrigation, and 48.9% of growers utilized both methods of irrigation. Of mixed market growers, 25% only used overhead, 25% utilized exclusively drip irrigation, and 50% utilized both methods of irrigation. Growers surveyed who sell their strawberries to the processed market all exclusively utilized overhead irrigation.

While 68.8% of all growers surveyed did not utilize season extension, 12.5% utilized high tunnels, 6.3% utilized low tunnels, 6.3% utilized floating row covers, and 6.3% utilized straw for season extension. Of the organic growers surveyed, 80% did not utilize season extension and

20% utilized floating row covers. For conventional growers surveyed, 63.6% did not use season extension, 18.2% utilized high tunnels, 9.1% utilized low tunnels, and 9.1% utilized straw. Of fresh market growers, 71.4% of growers did not utilize season extension, 14.3% utilized high tunnels, and 14.3% utilized straw for season extension. Of the growers surveyed who sell all their fruit to the processed market, none of them utilized any methods of season extension.

Of the growers surveyed, 94% performed a soil sample test. Most samples were taken in the spring (43.8%), followed by fall (25%) then winter and summer (12.5% each). Tissue samples were not performed by 81.3% of growers, but other growers performed them in both the spring (12.5%) and summer (12.5%). Growers surveyed used varying planting designs (Table 2).

Table 2

Grower Category	Plastic mulch (%)	Raised bed only (%)	Matted row only (flat ground as %)	Both Raised bed and Matted row (%)
All Growers	50	37.5	43.8	18.7
Conventional	36.4	18.2	45.5	36.3
Organic	80	80	20	0
Fresh Market	57.1	57.1	28.6	14.3
Processed Market	0	0	100	0
Mixed Market	75	50	0	50

Hand weeding was the most common vegetative pest management used by growers, with 82.4% of all growers surveyed, 100% of both organic and mixed market growers. Other weed management methods reported include cover cropping (35.3% of all growers), herbicide (9% of all growers), mulch (52.9% of all growers), and mechanical cultivation (52.9% of all growers). Growers reported slugs and spotted wing drosophila as the number one insect pests with the most negative impact, followed by lygus bugs and mites (Figure 1). Deer were ranked as the number one vertebrate pest, followed by both moles and voles (Figure 2). Botrytis was the number one reported disease with the most negative impacts, followed by anthracnose, black root rot, and powdery mildew (Figure 3).

Figure 1

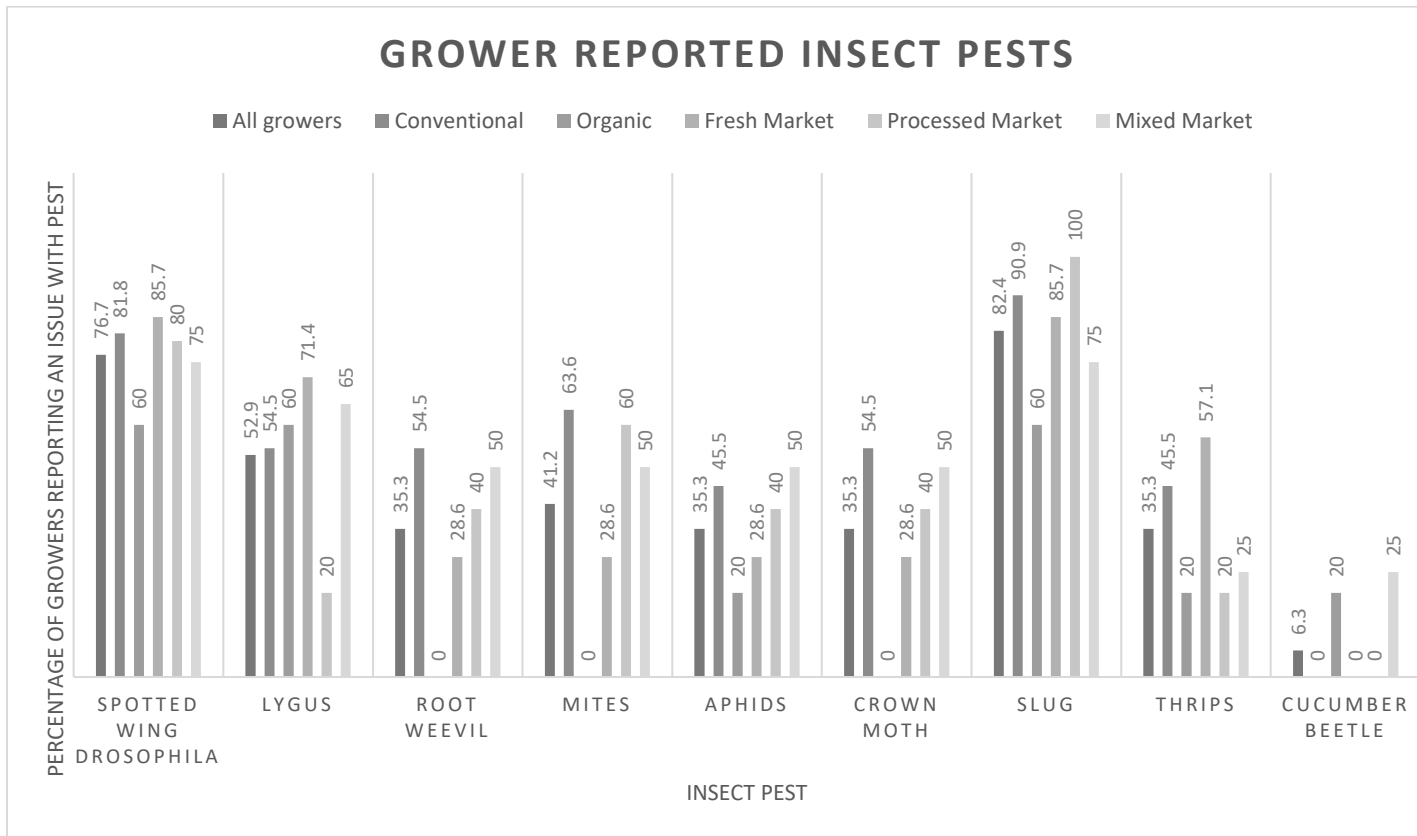


Figure 2

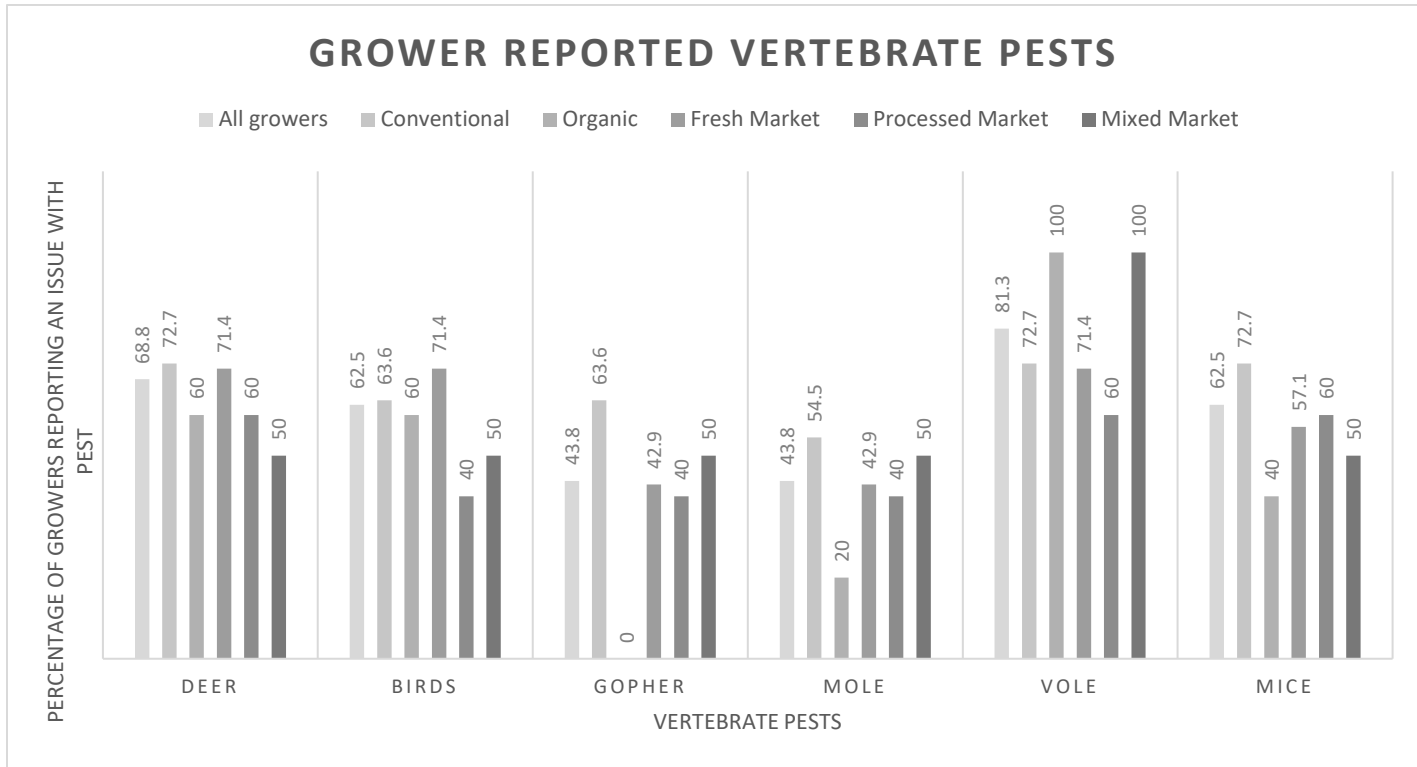
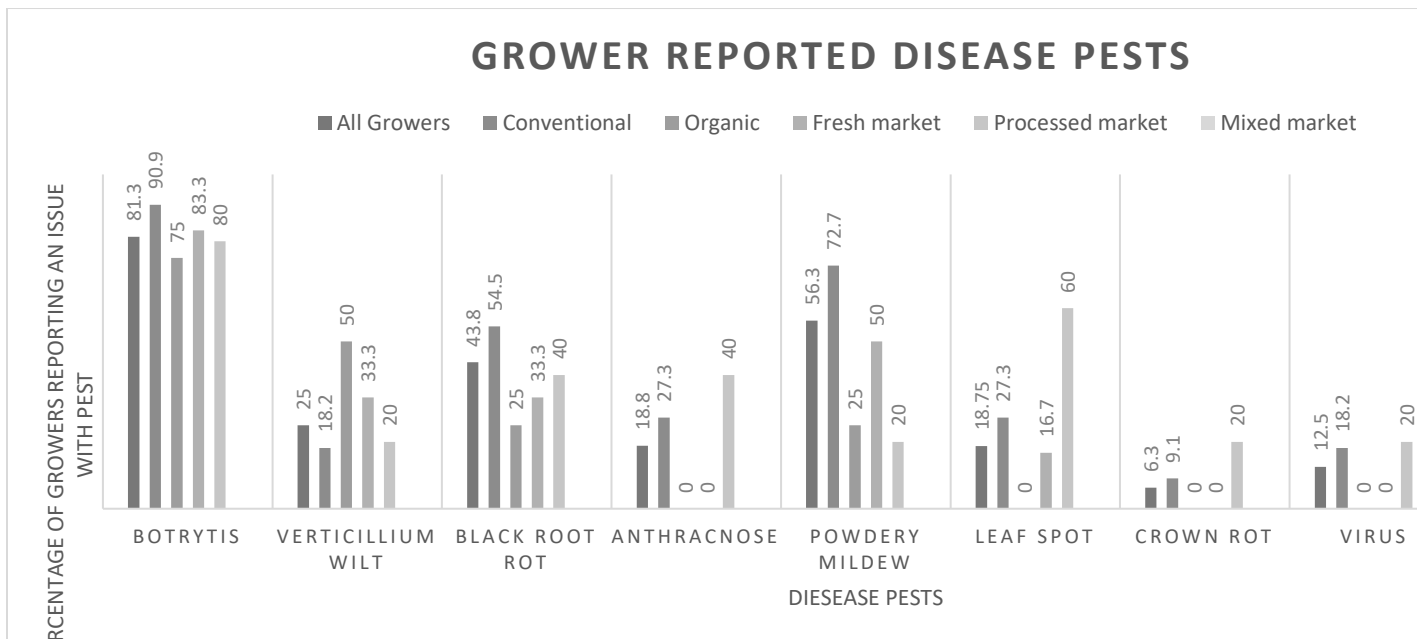


Figure 3



Growers were asked to name their top three production related challenges. Of the growers surveyed, 70.6% stated that labor was a major challenge, both in terms of availability and cost. This was by far the biggest challenge for growers. Pests were another challenge for growers, with 17.6% of growers stating weeds to be a challenge, 17.6% noting insect pests, and 17.6% responded that disease pests were a challenge. Pricing, competition, and market were another issue, with 17.6% of growers listing these as challenges. 17.6% of growers also listed cultivar fertility to be a challenge. Other responses included yields, crop establishment, and weather and climate. In terms of research priorities, 41.2% of the growers surveyed stated breeding and cultivar development to be the most important research priority. 23.5% of growers stated fertility research to be a priority, and another 23.5% mentioned disease research.

The strawberry industry in Oregon is in a period of transition, as new challenges such as labor and a changing climate face the industry. There has been a large amount of focus on the two states producing a larger share of the nation's strawberries, California and Florida, leaving a knowledge gap for the strawberry industry in Oregon.

In this pilot needs assessment survey, we gathered information on management techniques, certification status, cultivar selections, sales, challenges and research requests to better understand the Oregon strawberry industry from the grower's perspective. We were able to examine both the collective group of growers surveyed, but also smaller groups of growers separated by certification, organic or conventional, and by which market they sell their berries to, fresh, processed or mixed market.

The largest challenge facing the Oregon strawberry industry from the perspective of the growers surveyed was labor. In further discussions with individual growers, this concern could be traced in some cases to a population of laborers who are aging out of the industry, as well as price

competition between growers for the labor available. Labor is also the largest challenge facing the strawberry industry in California and the third largest concern for growers in the Florida strawberry industry behind Mexican competition and government regulation (Samtani, 2019).

The Oregon strawberry industry produces fruit in late spring through early fall for some growers providing optimum conditions for fruit quality, most notably flavor and fruit color. California can produce strawberries year-round but does not benefit from the climate enhancement Oregon strawberries receive. Florida is limited to an even shorter season as the industry is largely confined to winter months, which is the same target market as the strawberry industry in Mexico (Wu, 2012).

Limitations of this study are the potential response bias and sample size. While all growers who were hand selected contributed to the survey data set, there was a very limited response from the growers who were contacted to complete the survey online. This led to a smaller sample size than anticipated and makes it impossible to perform statistical analysis or generalize the results of the needs assessment survey to the greater population of strawberry growers in Oregon.

The results of this pilot survey will provide a foundation for future research on strawberry production in the state, fill in the gaps in industry statistics and state-specific production practices, and allow for more programming that aligns with growers' needs and challenges. With the completion of this needs assessment survey there is now a clearer picture as to both how the industry operates and what the largest challenges facing the industry are from the perspective of the growers in the industry. With this new information we are better able to support growers as they begin to change with the industry through more targeted research and extension events.

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