U.S. Highbush Blueberry Council: 2020 Technology & Innovation Research

Final Report

May 2020

blueberries
U.S. HIGHBUSH BLUEBERRY COUNCIL

LOYALTY RESEARCH CENTER®
RESEARCH • RELATIONSHIPS • RESULTS

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Key Findings

- The research is representative of the USHBC member population, reflecting different viewpoints by **role in the supply chain**, varying levels of **industry experience**, **geographic dispersion**, and **crop size**.

- At an industry level, the top three drivers of change are **changing consumer preferences**, **labor supply**, and **global competition**.

- At a farm level, while there have been enhancements to existing tools and processes, there is still a significant opportunity for *revolutionary* change in the industry.

    - **Drip irrigation / fertigation** and **optical sorting**, as examples, have relatively high levels of usage and perceived value. These two areas represent arguably the most **mainstream forms of technology** and **less of a need for disruptive innovation**.

    - **Insect trapping** and **mechanical harvesting**, both with relatively high usage but low value, represent two areas which are **more available to *larger* farms**. These two areas have been a **struggle to scale** and **identify cost efficiencies** to bring value to smaller farms. They are also the most areas **most in need of innovation**, as stated by respondents.

    - **Harvesting aids**, **satellite recognition**, and **blockchain** each have low familiarity and thus low usage and low value in the industry. This could mean the technology is unproven, but more so it is a **lack of education** on existing tools and a **lack of innovation inside of the industry** which is holding them back from more widespread adoption.

- Since historically most innovation has come from the farm level, this will likely require **more involvement and education from *outside* the industry** in order to achieve the degree of efficiency to address the macro-level industry challenges.

Research Objectives

The primary objective of this research was to identify and prioritize the challenges and opportunities for enhanced value from technology and innovation.

The secondary objectives of this research were to ...

- Identify challenges related to scouting, pruning, harvesting, packing, and other aspects of field operations which are inefficient and/or costly for growers.
- Evaluate existing solutions and their ability to reduce or eliminate inefficiencies.
- Assess new technologies to address unmet needs and inefficiencies.
- Explore differences in each of the aforementioned areas by region, grower size, and other forms of segmentation which may be meaningful and actionable for the committee.
- Establish the industry priorities across multiple time horizons and investment levels.

Methodology

Investigative Phase

- Loyalty Research Center ("LRC") initially reviewed background information on the history of the blueberry industry, the evolution of blueberry growers in North America, global environmental factors influencing the evolution the industry, and specifically the impact of technological innovations.
- LRC also interviewed members of the USHBC Innovation Committee in February 2020, to better understand the information requirements and desired research outcomes.
- The questionnaire was finalized with input from the staff in early March.

Assessment Phase

- LRC programmed and tested a mobile-optimized survey via the Qualtrics technology platform and provided a link USHBC/NABC for distribution to its member list.
- On March 16th, USHBC/NABC staff sent a pre-notification email to the member list and then hours later, sent the survey link provided by LRC.
  - Staff also sent 3 reminders over a three-week period.
  - The survey closed on April 14th.
- There were a total of **136** usable surveys from members.

Methodology

Overview of Statistical Analysis

- Based on information provided by USHBC/NAC on the quantity and representativeness of the useable surveys, LRC has established an estimated confidence interval for the results presented in this report: 95% ± 7%.

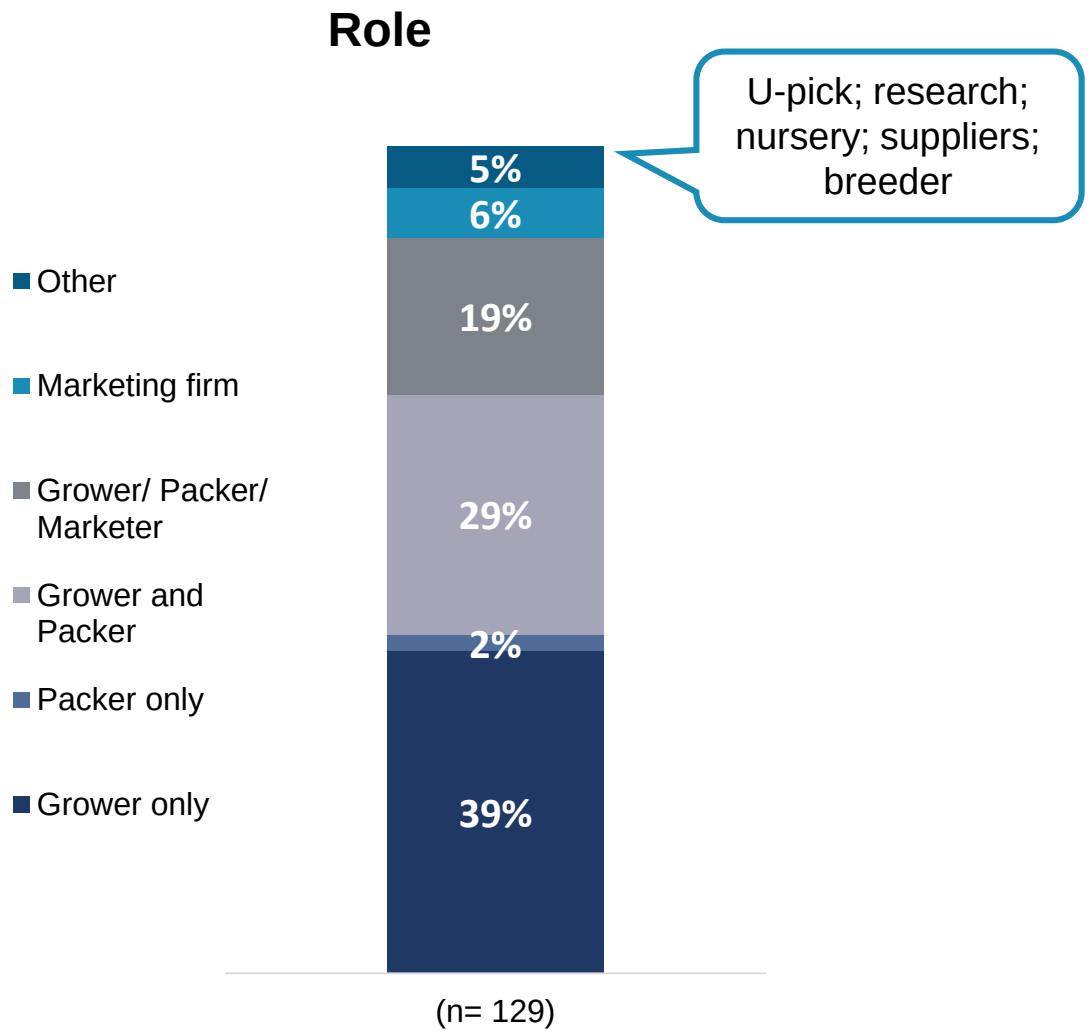
- 95% represents the accuracy of the results, while 7% represents the precision of the results. This means that if the survey were conducted 100 times, the aggregate percentage reported would be within 7%.

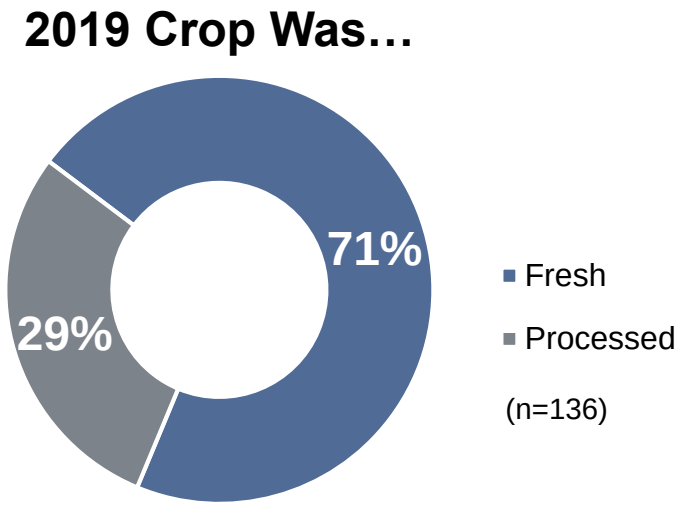
Deployment

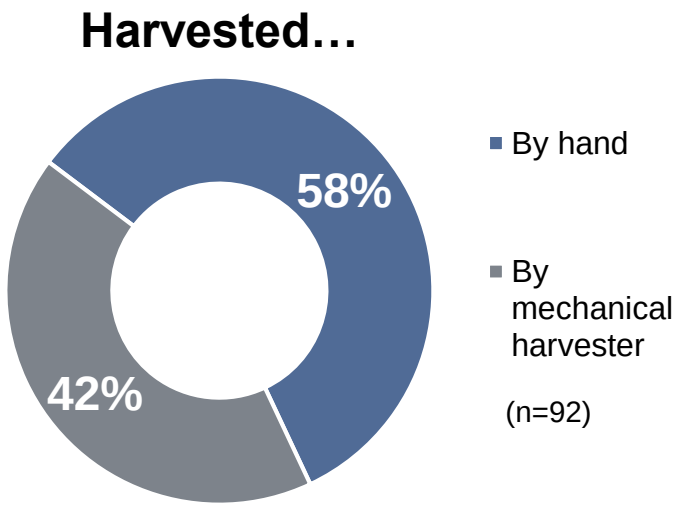
- LRC conducted a working session (“reality check”) of the results with the USHBC and Qanopy project teams in early May 2020.
- Qanopy’s team will then be responsible for any further deployment of the information, including any final set of recommendations.

Respondent Mix

Respondent Mix



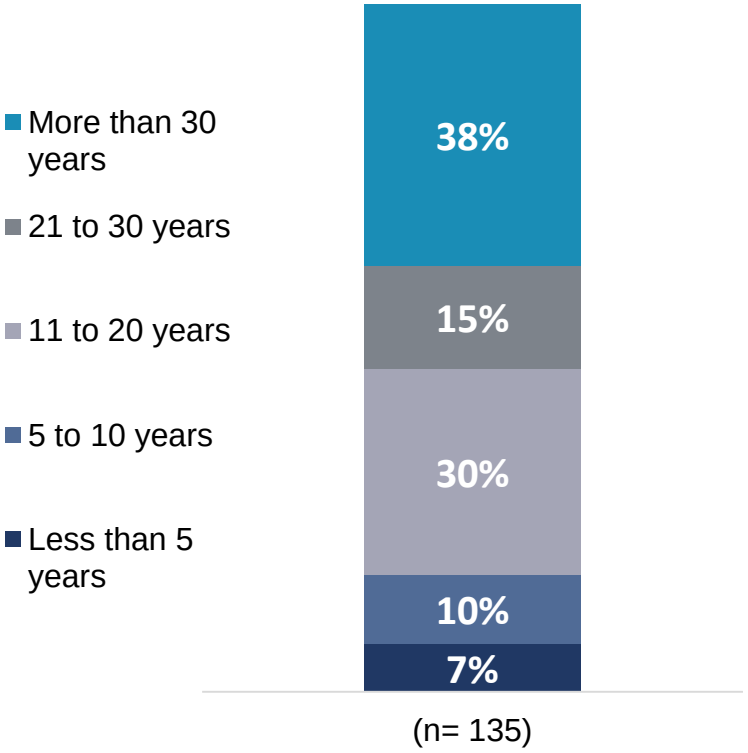




A1. Which of the following describes your organization's role in the supply chain?
A10. What percentage of your 2019 annual crop was marketed as…?
C7. What percentage of your 2019 annual crop was harvested…?

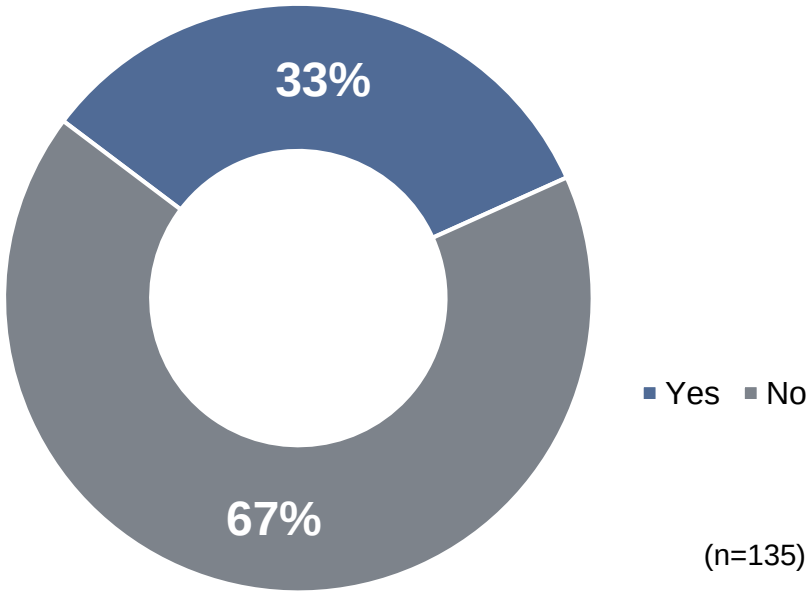
Respondent Mix

Respondent Tenure in Industry



(n= 135)

Grower Co-Op

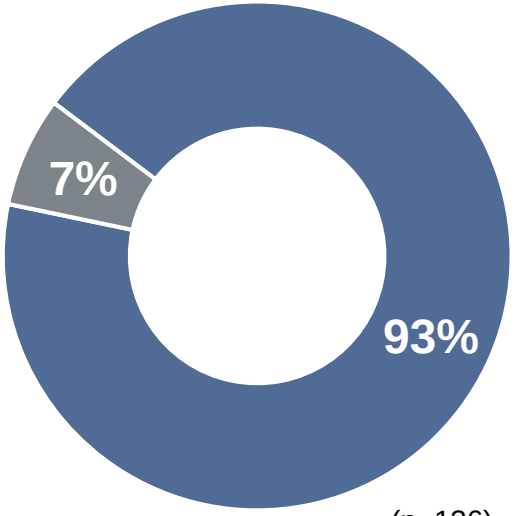


(n=135)

A2. For how long have you personally been involved in the blueberry industry?
A6. Do you belong to a grower cooperative?

Respondent Mix
Geographic Dispersion

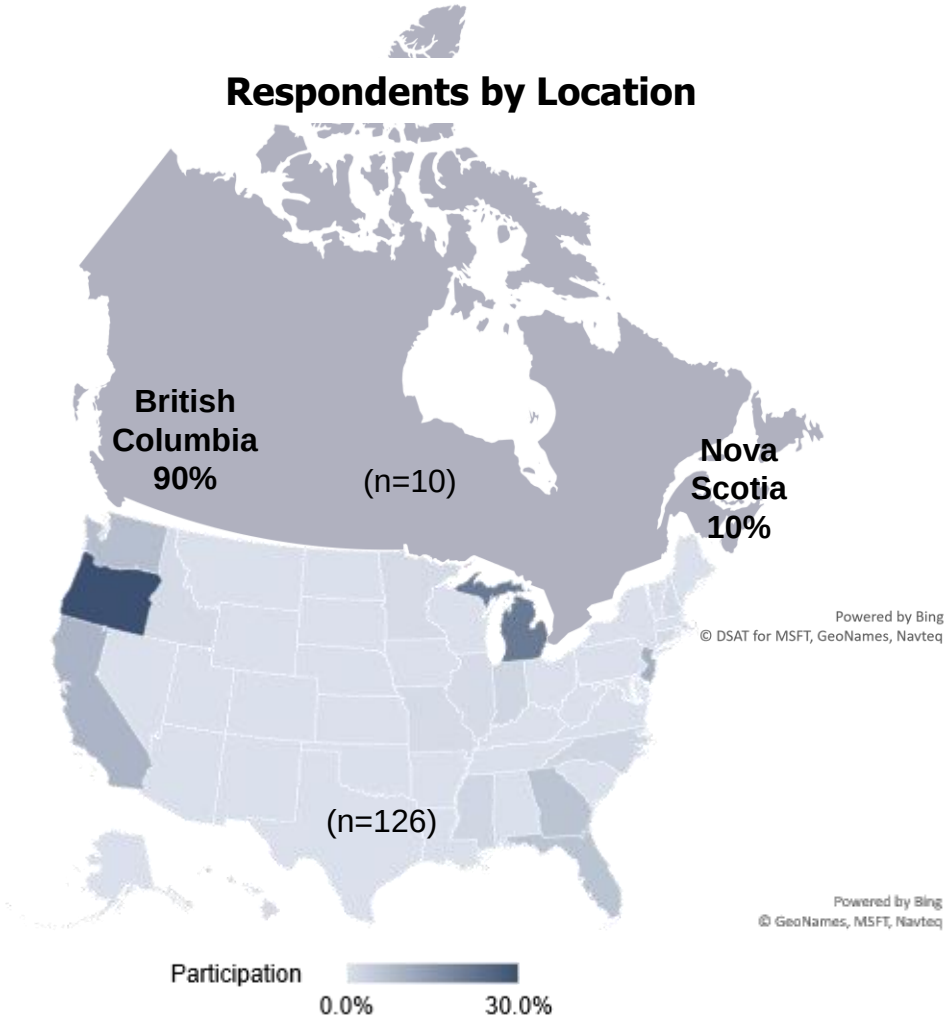
Majority of Crop Location



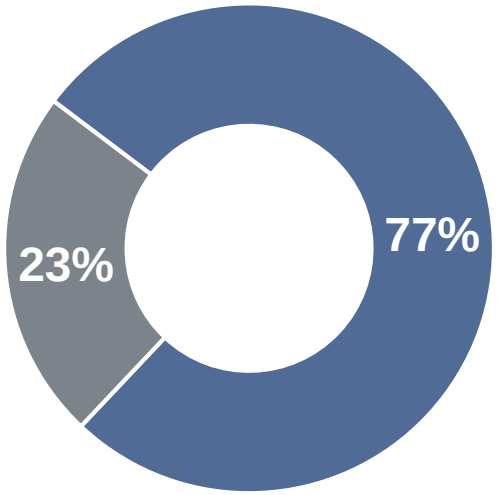
(n=136)

■ United States ■ Canada

Respondents by Location



Single vs. Multiple Locations



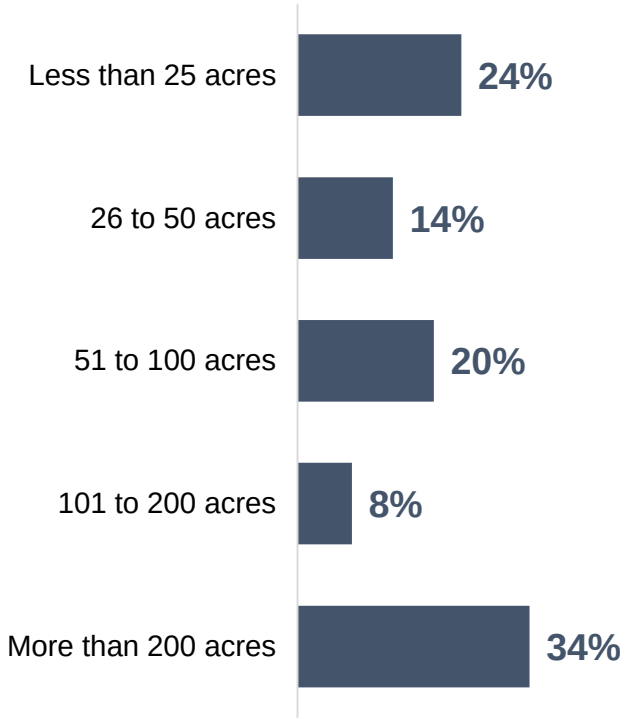
(n=135)

■ Yes, it is only located in this state/ province
■ No, it spread across multiple states/ provinces

A3. Where is the majority of your crop located?
A4A. In which state is your crop primarily located?
A4B. In which province is your crop primarily located?
A5. As a follow up, is your crop located entirely in this state/province, or is it spread across multiple states/provinces?

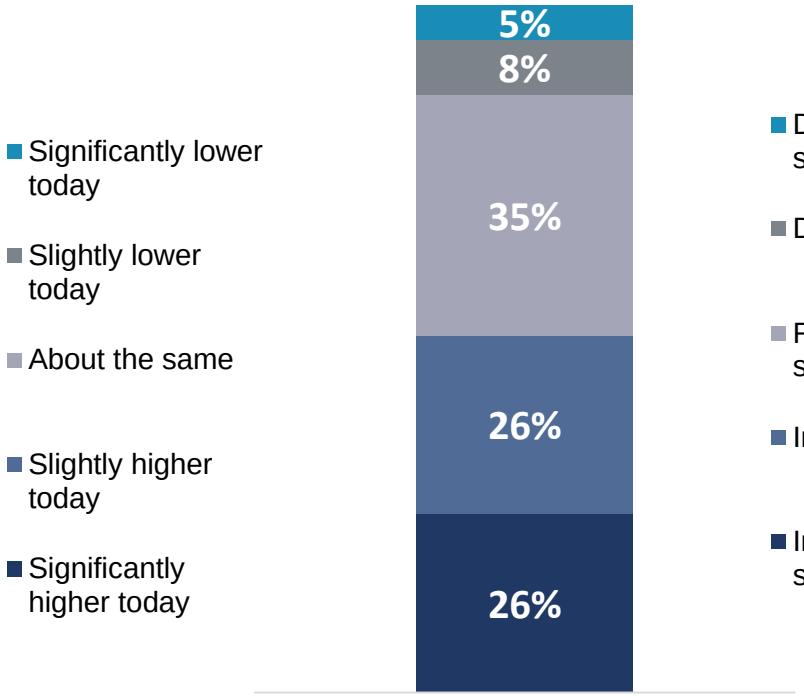
Respondent Mix

Total Blueberry Acreage



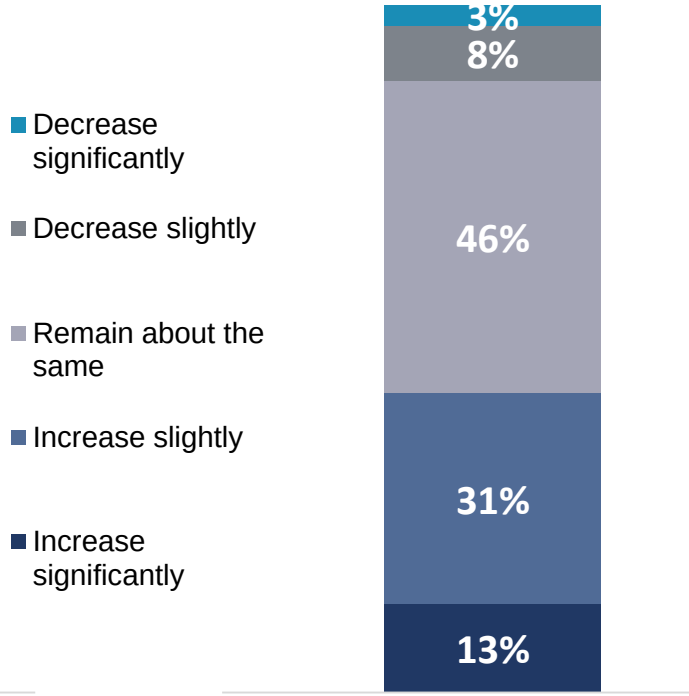
(n=136)

Compared to 5 Years Ago



(n= 136)

Over the Next 5 Years



(n= 134)

A7. Which of the following ranges describes the size of your total blueberry farm acreage?
A8. Compared to 5 years ago, would you say that your total blueberry acreage is…?
A9. Over the next 5 years, do you anticipate your total blueberry acreage to…?

Industry Challenges

Macroenvironmental Factors

How Industry Issues are Driving the Need for Technology & Innovation

Five distinct segments emerged in terms of the importance of issues facing the industry.

	Total Respondents (n=136)	Consumer / Economy (n=47; 35%)	Labor Supply (n=46; 34%)	Global Competition (n=28; 21%)	Other (n=8; 6%)	Government Regulation (n=7; 5%)
Global competition	21	10	15	**60**	5	1
Labor supply	20	11	**39**	12	4	14
Government regulations	12	9	10	11	4	**69**
U.S. economy	8	**14**	6	2	0	5
Changing consumer preferences	7	**15**	3	1	0	4
Lack of / Speed of technological innovation	7	9	8	3	3	2
Genetics / Genetic modification	6	10	7	1	1	1
Other	6	2	1	3	**79**	1
U.S. dollar currency exchange rate	5	6	5	3	2	0
Climate / Climate change	5	9	3	3	2	4
Global economy	3	4	3	1	0	0

Imports; consumer demand; pesticide use; marketing

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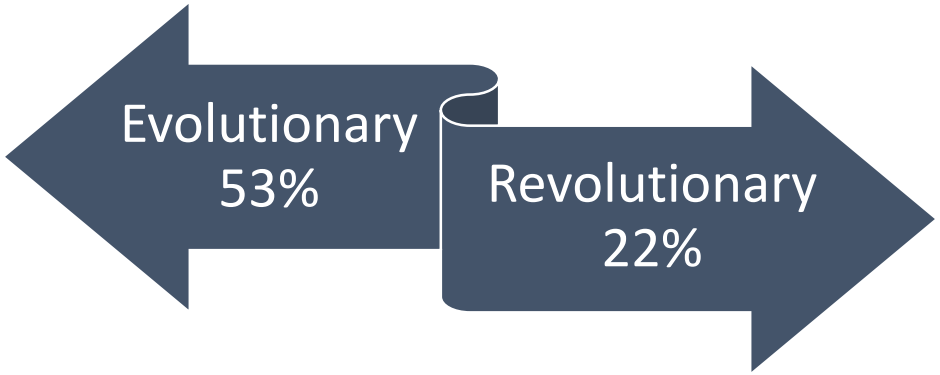
B1. From an industry perspective, how would you weight the importance of the following issues? *Please allocate 100 points across the following issues, giving more points to the more important issues. If there is only one issue of utmost importance, place all 100 points on that issue. Otherwise, please distribute accordingly.*

Industry Challenges

View of Industry's Integration of Technology

Evolutionary group tends to be…
Grower only
Less than 10 years of industry experience
Concentrated in Oregon
More than 200 acres
Has grown significantly over past 5 years
Plans to continue to grow over next 5 years
Heavier emphasis on processed



25% selected a middle / neutral option suggesting some of both

(n=134)

Revolutionary group tends to be…
Grower/Packer/Marketer
More than 30 years of industry experience
Concentrated in New Jersey
Less than 200 acres
Stayed about the same over past 5 years
Plans to remain about the same size over the next 5 years
Heavier emphasis on fresh

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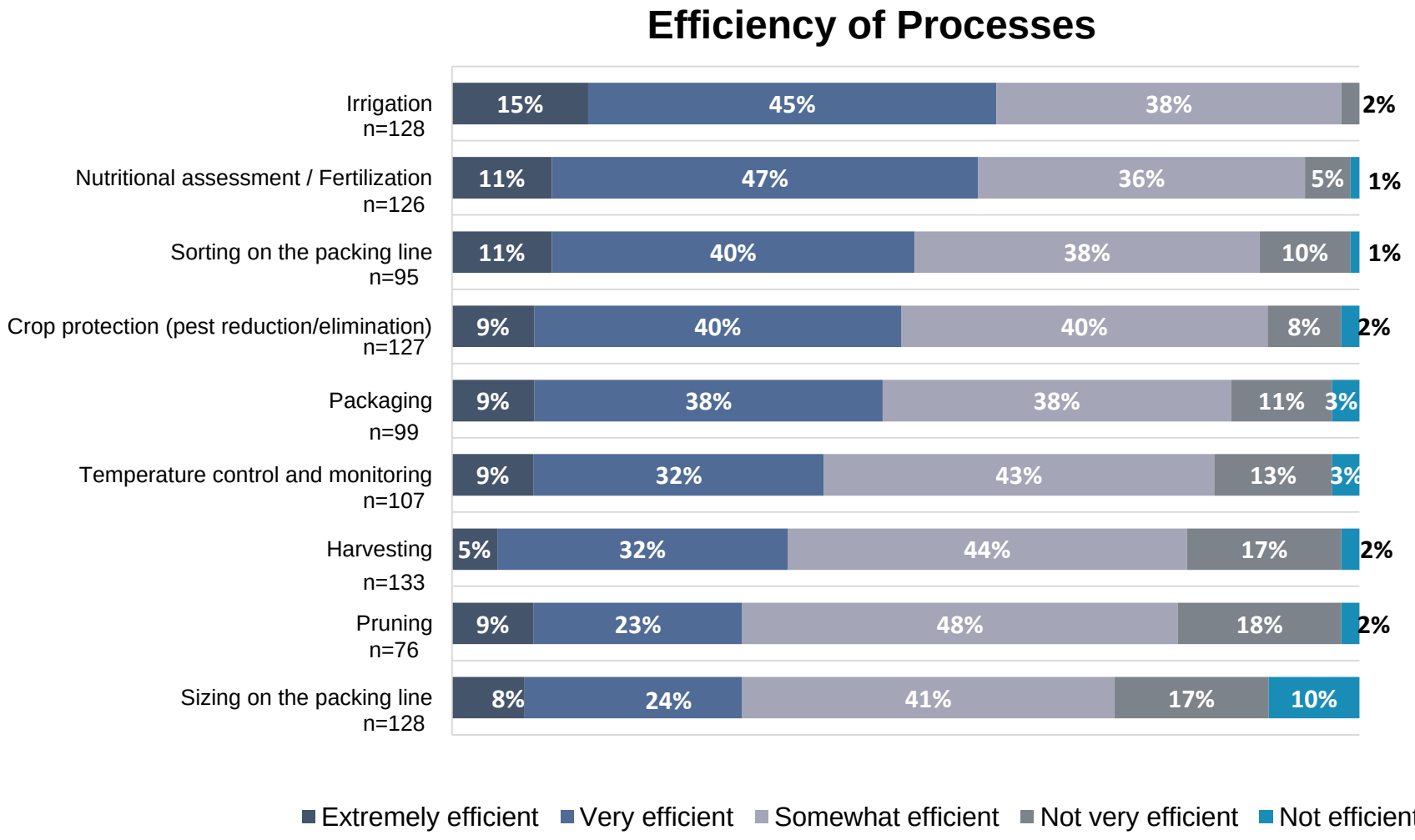
B3. Historically speaking, when it comes to the integration of technology into the blueberry supply chain, to what extent would you say the industry has been **evolutionary** (smaller advances) or **revolutionary** (significant advances)?

Industry Challenges

Efficiency of Current Processes



The view of "Somewhat efficient" for most existing processes is likely what is contributing to the stronger sense of Evolutionary change rather than Revolutionary change.

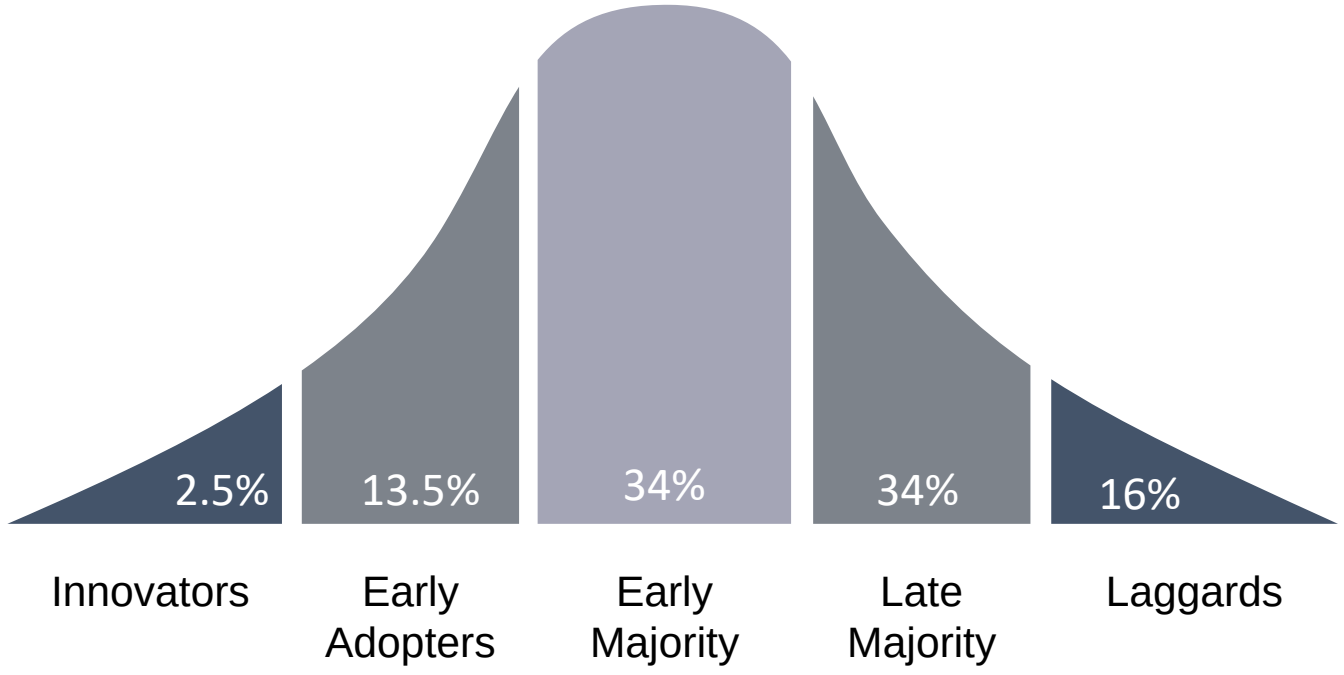
B2. When you think about your blueberry crop, how efficient would you say your processes are in each of the following areas? *By efficiency, we mean maximizing production while reducing costs.*

Current Market Solutions

Current Market Solutions

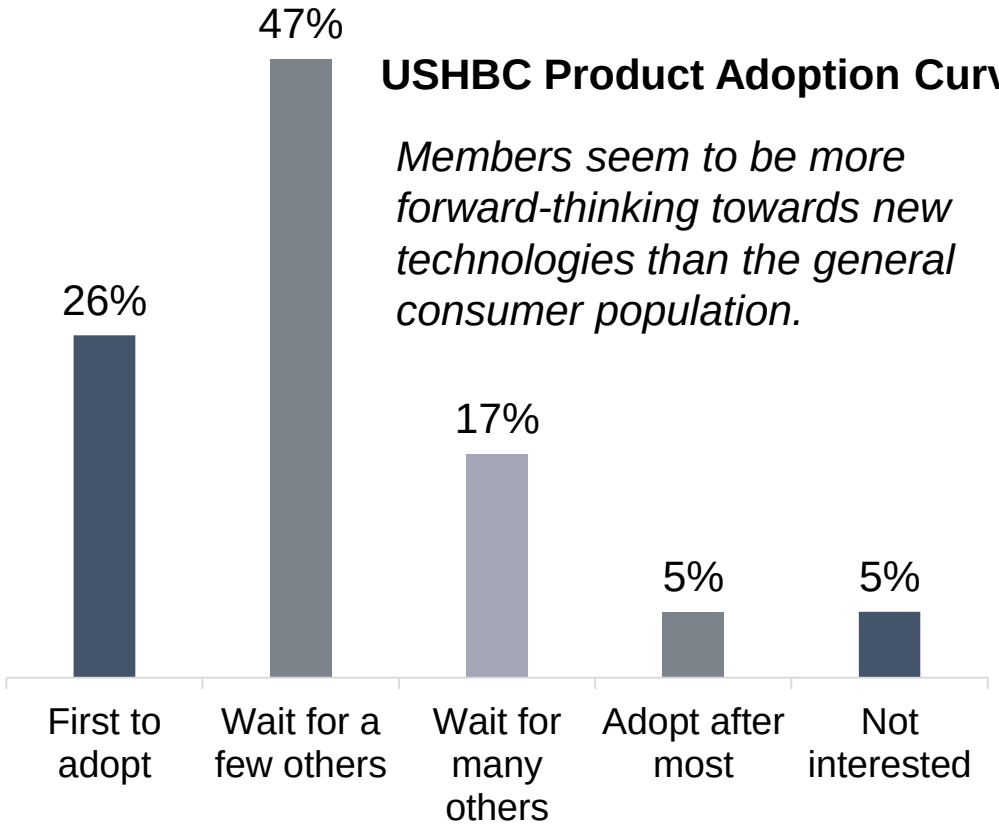
Willingness to Adopt

Typical Product Adoption Curve



USHBC Product Adoption Curve

Members seem to be more forward-thinking towards new technologies than the general consumer population.



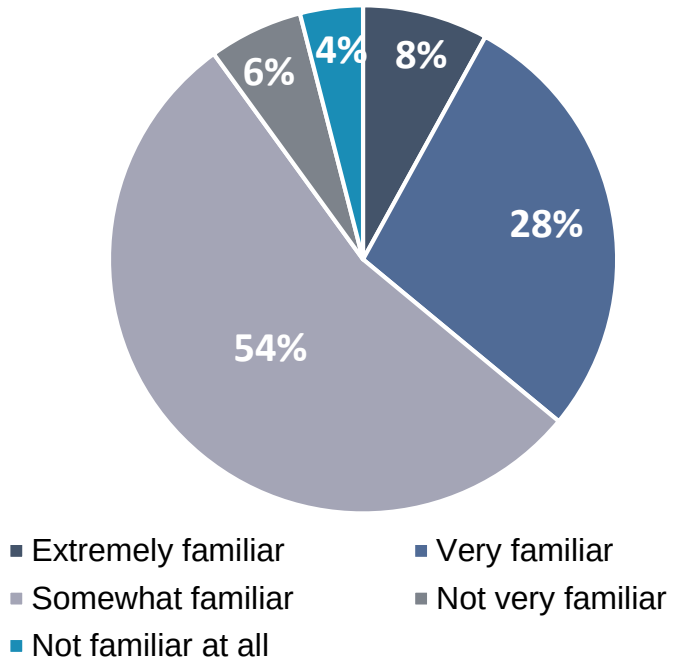
C4.In general, how would you describe your organization's willingness to adopt new technologies to maximize the efficiency of your role in the blueberry supply chain?

Current Market Solutions

Familiarity with Technology Usage

Least familiar group tends to be…
Grower only
Crop of less than 25 acres
Crop size about the same or smaller compared to 5 years ago
Crop size will remain about the same or smaller over next 5 years
Crop located in only one state/province
Do not belong to a grower co-op

Familiarity with Technological Efficiencies



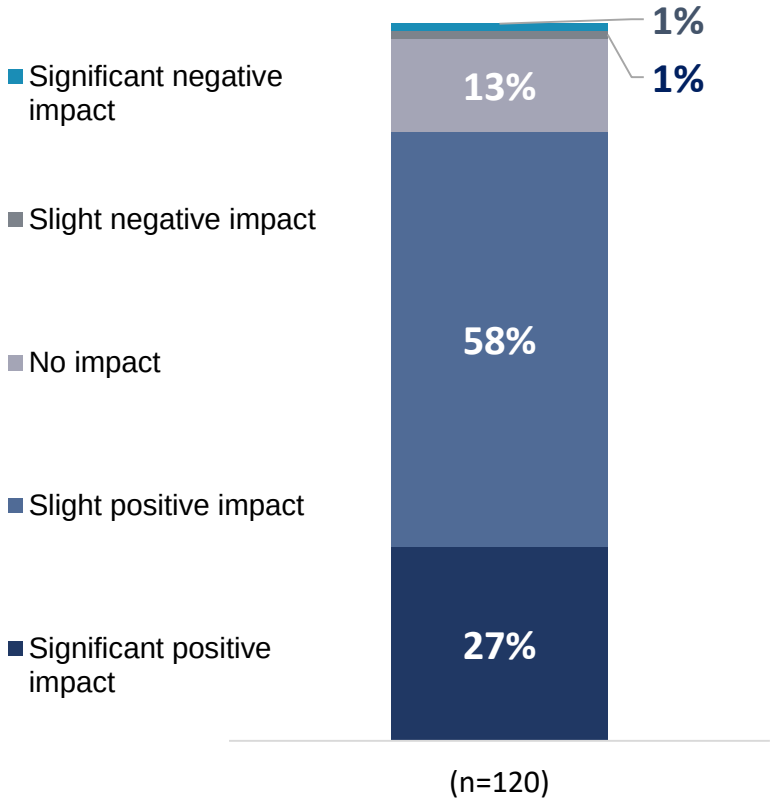
Most familiar group tends to be…
Grower / Packer / Marketer
Crop of more than 200 acres
Crop size significantly larger compared to 5 years ago
Crop size will continue to increase over the next 5 years
Crop located in multiple states/provinces
Belong to a grower co-op

C1. In general, how familiar are you on the uses of technology in maximizing efficiencies in the blueberry supply chain? Again by efficiency, we mean maximizing production while reducing costs.

Current Market Solutions

Impact on Supply Chain Efficiencies

Impact of Efficiencies over Past 5 Years



Examples of Efficiencies

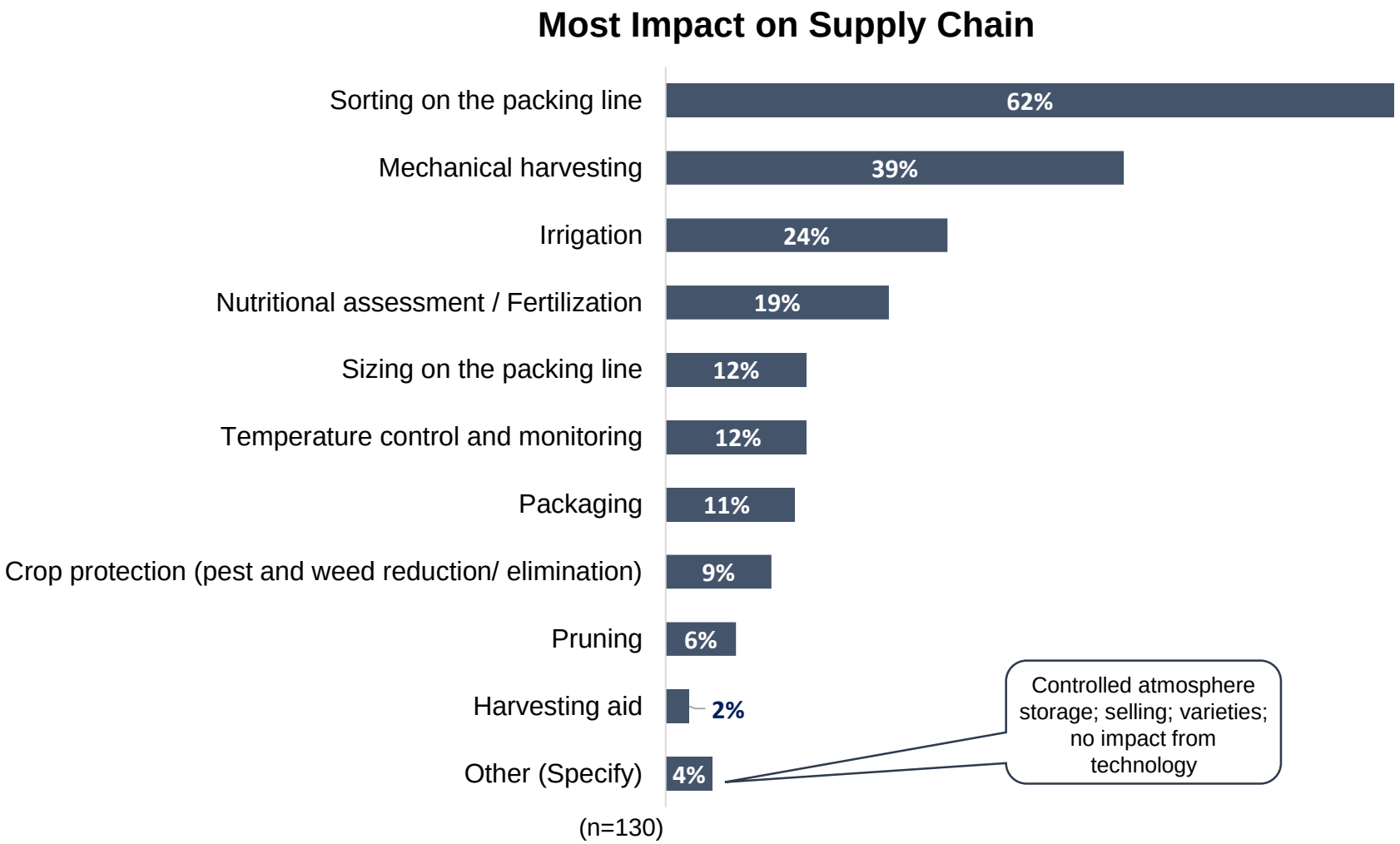
Positive Themes	Sample Comment	% Mentions
Color / Soft sorters	*"The new optical sorting machines improved the way we pack for specific markets at a reduced cost. We are now able to maximize income and minimize waste and costs."*	47%
Mechanical harvesters	*"Harvesting – still beating berries off the bush, but improved padding has made some positive impact on quality."*	24%
Extended shelf life / better quality	*"Optical sorting has increased quality and shipping/shelf life."*	12% (n=99)

Negative Themes	Sample Comment	% Mentions
Automated packing	*"Integrating our mechanical harvesting with temperature control systems to a fully automated packing facility that can fresh pack high quality machine harvested fruit."*	50%
Affordability	*"A small grower/packer has difficulty in being able to purchase the latest technologies."*	50%
Controlled atmosphere storage	*"Integrating our mechanical harvesting with temperature control systems to a fully automated packing facility that can fresh pack high quality machine harvested fruit."*	50% (n=2)

C2. Over past five years, to what extent have technology and innovation had an impact on efficiencies in the blueberry supply chain, from grower to consumer?
C2A. Please describe an example of how technology and innovation has had a [RESPONSE FROM C2] on the supply chain? *Be as descriptive as possible in terms of the solution and the impact.*

Current Market Solutions

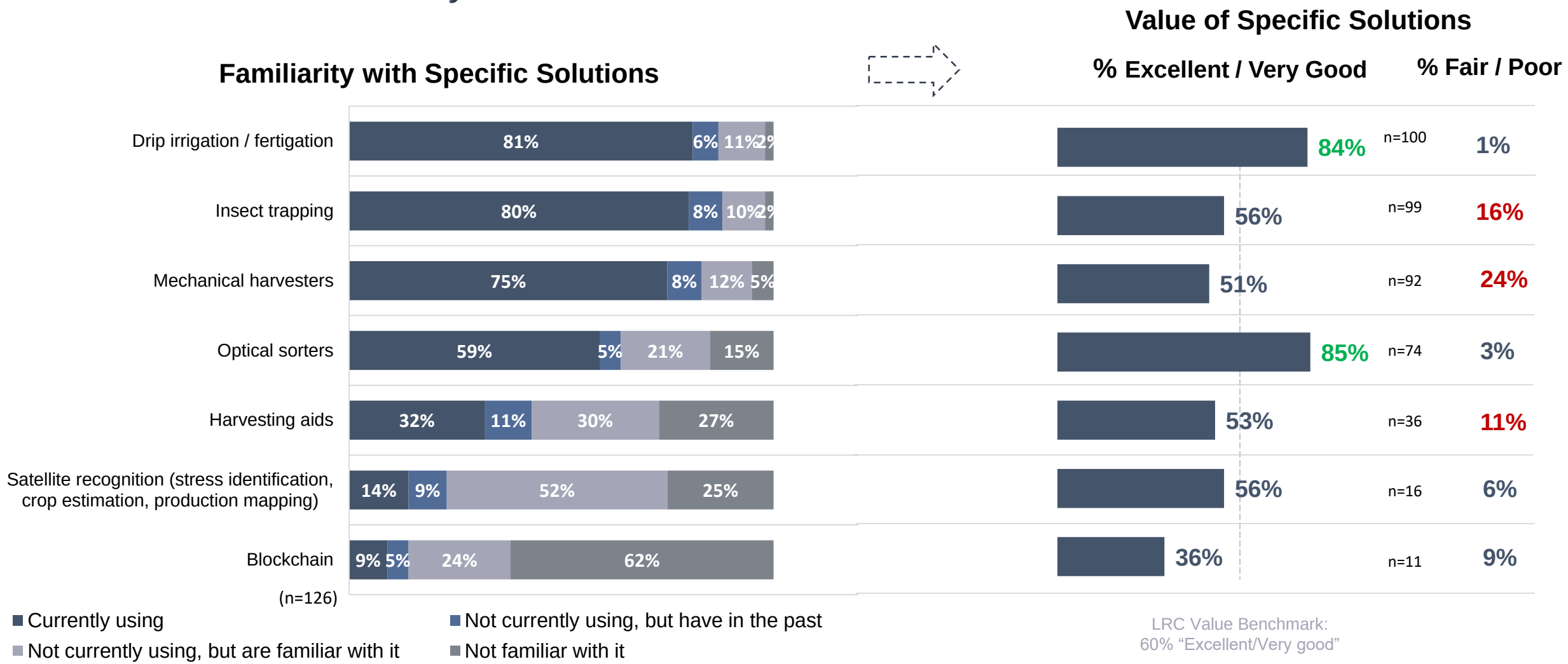
Most Impactful Advances in Technology & Innovation



C3. In what two parts of the supply chain would you say technology and innovation has had the most impact? *Please select two response options.*

Current Market Solutions

Overall Value Today



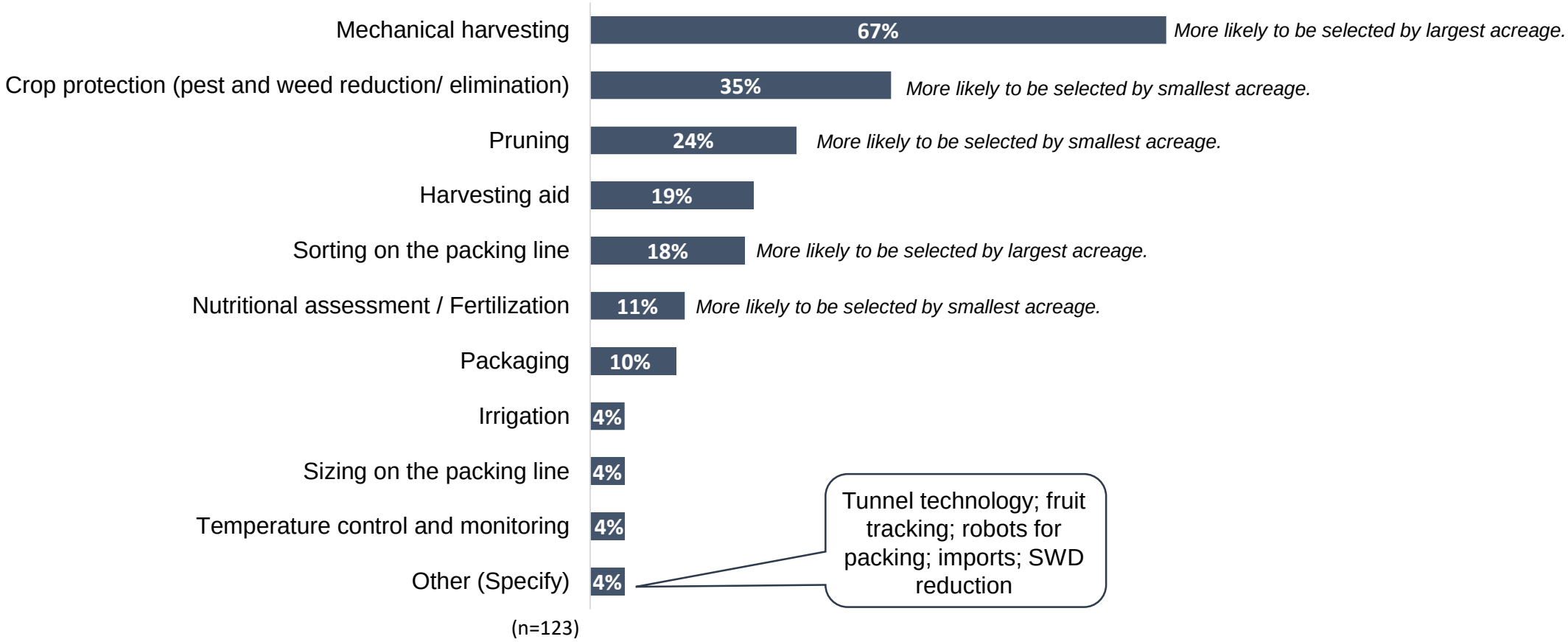
C5. How familiar are you with each of the following solutions?
C6. When considering the implementation cost compared to the return on investment, how would you rate the **overall value** of each of these solutions today?

Future Market Solutions

Future Market Solutions

Areas Where Technology and Innovation is Needed Most

Supply Chain Areas Technology Most Needed



D1. In what two parts of the supply chain would you say technology and innovation is needed most over the next 5 years? *Please select two response options.*

Future Market Solutions

How to Enhance Existing Solutions

Theme	Sample Comment	% Mentions
Mechanical harvesting / pruning	*"Machine harvesting system that does not cause fruit to become bruised and optical sorting system that can truly distinguish non-bruised blueberries from those that bruised. In addition, algorithm must be developed to sort fruit with no bruise, 1 to 10% of flesh with internal bruise damage, 6 to 10% with internal damage and so on. This allows fruit to be packaged for immediate sales, within 1 week of harvest, and those that can be cold stored for prolonged storage for distribution to distant markets."*	39%
Pest control / weeds	*"SWD control other than spraying broad spectrum pesticides. Also something other than netting the field."*	21%
Reduce labor needs	*"Anything to do with labor efficiencies that are reasonably priced where savings can be realized in a fairly short period of time."*	10%
Robotics / Drones	*"Drones and field robots like burro to map fields down to the plant and have attachments to prune/weed/aid in harvest."*	7%

(n=88)

D2. What aspects of technology would further enhance existing solutions at any point in the supply chain? *Please describe what types of enhancements would be most beneficial.*

Future Market Solutions

"Big Ideas" / Revolutionary Change

Theme	Sample Comment	% Mentions
Robotics / Drones	*"Robotics applied to harvest (like in strawberries). Automatization in greenhouses and irrigation. Usage of drones for monitoring and sprayings. Mechanical harvesters. Wireless plantation monitoring systems combined with automatic irrigation systems. Monitoring systems combined with cellular phones."*	32%
Machine / Optical harvesting	*"I think that from the harvesting for fresh point of view, the Easy Harvester type of system, using the principles for low damage to fruit and modified hand harvesting, that can also be used in tunnels, is really the way forward, particularly when it is motorized for easy propulsion."*	22%
Pest control	*"Pest trapping and monitoring can also use wireless monitoring which frees up management for other tasks."*	8%

(n=72)

D3. *Now, please provide examples of "big ideas" you've seen or heard about (either inside or outside of the blueberry industry) that could have significant impact on the blueberry industry. Please be as specific as possible, providing references to information sources, innovative firms, or subject matter experts if you can recall them.*

Appendix

Segment Insights

	Consumer	Global Comp	Labor Supply	Other	Gov't Regulation
Role	Grower	Grower	Grower/packer	Grower	Grower
Time in Industry	30+ years	0 – 20 years	11 – 20 years	11 – 20 years	30+ years
States	Oregon	Michigan	Oregon	California, Florida	New Jersey
Grower co-op	No	Mix	No	No	No
Acreage	Mix	Mid-sized (26 – 200 acres)	Large (200+ acres)	Mid-sized (26 – 200 acres)	Small (<25 acres)
Change in Acreage (Past 5 Years)	Stayed about the same	Higher today	Higher today	Higher today	Lower today
Change in Acreage (Next 5 Years)	Same to slight increase	Increase	Same to slight increase	Remain about the same	Remain about the same
Industry Changes	Evolutionary	Balanced	Balanced	Evolutionary	Balanced
Least efficient Areas	Pruning, sizing, temp control, packaging	Sizing	Pruning, harvesting, sizing	Sizing, temp control	Pruning, nutritional, crop protection, sorting, temp control, packaging
Most Needed Tech Innovation	Mechanical harvesting, pruning, crop protection	Mechanical harvesting, crop protection	Mechanical harvesting, crop protection, sorting	Crop protection, mechanical harvesting, harvesting aid	Crop protection, pruning

**The findings highlighted on this slide are not intended to generalize the segment, but rather to provide direction as to where there are greater concentrations of certain member types. While some factors may be related, each is intended to be mutually-exclusive of the others.*

Post-Survey Best Practices

- LRC typically recommends a working session with a small group of staff to “reality check” the findings, determine if any additional analyses are necessary to frame (or re-frame) the story, and work towards a more concise final presentation.

- Final presentations can be to a variety of audiences:
  - An executive-level or senior-staff level internal presentation (combination of strategic and tactical discussions);
  - Full staff (high-level summary of findings and/or deep dives into departments’ areas of interest)
  - Board of Directors/Trustees (a more strategic discussion);
  - Other association partners (strategic planning facilitators, marketing/communication/PR agencies, technology firms).

- Regardless of the final presentation structure, LRC recommends three pieces of communication be sent within 6 weeks of that final presentation:
  - High level summary of findings to all association staff – here’s what we learned, what we plan to do with it in the near-term and the long-term, and how you can be involved.
  - High level summary of findings to all members - thank you for participating, here’s what we learned (good, bad and ugly!), what we plan to do with the information, and when/how it may affect you.
  - Personal thank you to all participants – occasionally association clients will share a full executive summary report with this audience as a ‘thank you’ for their time in taking the survey.

- LRC and its clients then work to establish an ongoing communication and monitoring cadence to ensure change efforts are progressing and are making a measurable impact on members.

