

Impacts of COVID-19 on U.S. aquaculture, aquaponics, and allied businesses: Quarter 4 Results

October 1st to December 31st, 2020 survey

Authored by Jonathan van Senten, Assistant Professor and Extension Specialist Virginia Seafood AREC, Department of Agricultural and Applied Economics, Center for Coastal Studies Affiliate Faculty, Virginia Tech; Matthew A. Smith, Extension Specialist, The Ohio State University; Carole R. Engle, Engle-Stone Aquatic\$, LLC, Adjunct Faculty, Virginia Seafood AREC, Virginia Tech; Michael H. Schwarz, Extension Specialist, Virginia Seafood AREC, Virginia Tech; Charles Clark, Virginia Seafood AREC, Virginia Tech; Shannon Fluharty, Department of Agricultural and Applied Economics, Virginia Tech; Ganesh Kumar, Mississippi State University; Shraddha Hegde, Mississippi State University.

Introduction

In response to the coronavirus disease pandemic (COVID-19), a collaboration between The Ohio State University, Virginia Tech, and Engle-Stone Aquatic\$, LLC was initiated to assess the impacts of the pandemic on U.S. aquaculture, aquaponics, and allied industry. Over the course of this study, the team was expanded to include researchers at Mississippi State University. The first survey for this project was launched in March of 2020, at the conclusion of the 1st quarter of the year. A follow up survey was launched at the conclusion of every quarter of 2020; with the Q4 survey launching in early 2021. Reports from previous quarters can be found online at the Virginia Seafood AREC website (https://www.arec.vaes.vt.edu/arec/virginia-seafood/research/Impacts_of_COVID19.html). In response to U.S. government emergency relief measures, the survey was revised in the 2nd quarter of 2020 to capture the effects of these newly implemented measures. In addition, questions were added to the survey to investigate the changes being implemented by farms and businesses in response to their ongoing challenges. This fact sheet summarizes the Q4 results of this study, covering the period from October 1st to December 31st, 2020. The impacts reported by respondents over the course of the study can be broadly summarized as the disruption of traditional marketing channels resulting in lost sales, challenges with labor, and challenges with production. Results from the Q4 survey indicate that

aquaculture farms and businesses are still experiencing negative impacts from the pandemic.

Methods

Additional details on the methods for this study can be found in the Q1 report ([AAEC-218NP](#)) or peer reviewed publication ([van Senten, Engle, and Smith, 2020](#)). The data for this study was collected through an online survey, administered through Qualtrics. It should be noted that respondents self-selected for participation in the study; there was no sampling methodology employed. As a result, it is possible that responses are skewed towards those farms and businesses that have been more affected by the coronavirus (COVID-19) disease pandemic. Due to lower participation in the Q3 survey, prior to releasing the Q4 survey a short video was produced with the assistance of Virginia Sea Grant and support from industry associations and aquaculture producers. This video highlighted the importance of participating in the study and providing data that could be share with industry, association leadership, and state and federal agency personnel. This video was hosted on YouTube by Virginia Sea Grant and was disseminated via aquaculture-related mailing lists and social media. The Q4 survey was launched on January 4th, 2021 and closed on January 22nd, 2021. Survey responses were exported from Qualtrics for further analysis using Microsoft Excel.

Results

Characterization of Respondents

The Q4 survey closed with 211 recorded responses on January 22nd, 2021. Of those responses, 113 were 100% complete, and 120 being more than 50% complete. There were 71 responses that were less than 10% complete. Responses that were less than 50% complete were not used for this analysis. One response came from a university/educational institution and was excluded from the data used to develop this fact sheet. That meant that the number of usable responses provided by farms or allied businesses was 119, or approximately 4% of the U.S. aquaculture operations reported on the 2018 Census of Aquaculture (USDA, 2019). This represents fewer usable responses than the Q1 survey (537) and Q2 survey (150), but more useable responses than the Q3 survey (37). It is not atypical to see declining participation over the course of a longer study with repeated surveys. The exact reasons for the sharp decline in participation for the Q3 survey are unknown, but communications with industry suggest that survey fatigue and a sense of helplessness affected participation over the course of the study. It should be noted that during 2020 numerous other institutions, agencies, and other groups launched surveys targeted at industry in response to the pandemic. In addition, as some states around the country moved towards reopening, segments of the U.S. aquaculture industry reported increased business activities and sales. It is possible that also influenced participation. The response to the Q4 survey represents an improvement in participation after the decline for Q3. Amongst the 119 Q4 responses used for this analysis, 64% of represented mollusk farms or businesses. This was followed by 18% of respondents from the foodfish sector, 8% of respondents from the sportfish sector, 3% from the crustacean and tilapia sectors, 3% non-response, and 2% from the baitfish sector (Table 1).

The breakdown of foodfish respondents (n = 22) was 32% catfish producers, 23% tilapia, 18% trout, 23% “other”, and 5% hybrid-striped bass. The “other” category consisted of largemouth bass, sturgeon, yellow perch, and sturgeon producers. For sportfish

(n = 8), 50% of respondents were producers of warmwater sportfish, followed by 38% trout for sportfish, and 13% “other”.

Table 1. Primary product produced by Q4 respondents.

Category	Percentage
Mollusks	64%
Foodfish	18%
Sportfish (incl. trout)	8%
Crustaceans	3%
Ornamental fish	3%
No response	3%
Baitfish	2%
University/education	1%
Aquaponics	0%
Aquatic plants	0%
Seaweed	0%
Allied businesses	0%
Other	0%

Scale of farms/businesses

Respondents to the Q4 survey represented various scales of production (Table 2). Similar to Q2 of the study, nearly a quarter (27%) of Q4 respondents reported pre-COVID annual sales volume in excess of \$1 million. This was followed by 17% of respondents that were in the \$250,001 to \$500,000 scale, 14% of respondents in the \$100,001 to \$250,000, 10% in the \$50,001 to \$100,000 scale, and 8% in the \$25,001 to \$50,000 scale. Six percent of respondents chose not to answer this question. 10% of respondents were between the \$1,001 and \$25,000 scale of pre-COVID annual sales volume, and only 1% of respondents in the \$1 to \$1,000 scale. As was noted in previous quarterly reports covering the study results, it is possible that smaller aquaculture farms may not belong to the aquaculture associations and Extension contact lists that were used to distribute the survey. It is also possible that smaller farms had less time to respond or did not consider responding due to greater demands on their time dealing with the immediate needs of their farm or business.

Table 2. Scale of Q4 respondent farms/business.

Category	Percentage
> \$1 million	27%
\$250,001 - \$500,000	17%

\$100,001 - \$250,000	14%
\$50,001 - \$100,000	10%
\$25,001 - \$50,000	8%
\$500,001 - \$1 million	7%
No response	6%
\$5,001 - \$10,000	4%
\$10,001 - \$25,000	3%
\$1,001 - \$5,000	3%
\$1 - \$1,000	1%

Aquaculture Regions

A third (33%) of respondents (n = 119) were located in the Southern Aquaculture Region (SRAC), followed by 29% of responding farms located in the Northeastern Aquaculture Region (NRAC). The Western Aquaculture Region (WRAC) represented 23% of respondents, followed by the North Central Aquaculture Region with 10%. There were no responding farms from the Tropical and Sub-tropical Aquaculture Region. Five percent of respondents elected not to answer this question. Table 3 shows the percentage of responding farms to the Q4 survey based on respective aquaculture regions and the breakdown of the number of farms for each region as reported in the 2018 USDA Census of Aquaculture (USDA, 2019).

Table 3. Participation by aquaculture region in Q4.

Region	Percentage of USDA census reporting farms	Percentage of Q4 survey respondents
Southern	59%	33%
Northeast	18%	29%
Western	12%	23%
North Central	9%	10%
Tropical and Sub-tropical	2%	0%

Key Findings

Eighty-three percent of Q4 respondents (n = 119) indicated that their farm or business had been impacted by the coronavirus disease pandemic. Eight percent of respondents indicated that their farm or business had not been impacted, and 4% of respondents were uncertain whether their farm or business had been impacted or not. Of those respondents who reported being uncertain about

whether their farm had been impacted by the coronavirus (COVID-19) pandemic, 36% had expected their farm or business would “definitely” be impacted in 2020. Twenty-nine percent had expected that their farm would “probably” be and another 29% had expected that their farm would “probably not” be impacted in 2020. Only 7% of respondents had expected that their farm would “definitely not” be impacted by the pandemic in 2020. Unlike previous quarters of the survey, Q4 also asked this question to be forward looking into 2021. Sixty-eight percent of responding farms (n=119) indicated that they “definitely” expected their farm to be affected by the pandemic in 2021. This was followed by 19% that indicated “probably yes”, 7% “probably not”, 5% “no response”, and 1% “definitely not”. This indicates that a majority of Q4 respondents expect effects and impacts from the coronavirus disease (COVID-19) pandemic to continue on their farms and businesses into 2021 and provides evidence of longer term consequences as were discussed in previous quarterly reports from this study.

83% of Q4 respondents indicated that their farm or business had been impacted by the coronavirus disease pandemic.

Forty-seven percent of respondents (n = 97) indicated that their farm or business would survive the next 3 months without any external intervention. An equivalent 47% indicated that “maybe” their farm or business would survive 3 months without external intervention. Five percent of Q4 respondents indicated that their farm or business would **not** survive 3 months without external intervention. This may seem like an improvement over the beginning of this study, when 34% of Q1 respondents (n = 458) indicated that their farm or business would survive and 13% indicated their farm would **not** survive for 3 months without any external intervention. However, it should be noted that this study has no mechanism to capture the farms or businesses that have ceased operations over the course of 2020. Increasing the period of time in

question to 6 months, 21% of respondents said their farm or business would **not** survive without external intervention (n = 119), 45% said “maybe”, and 34% indicated their farm or business would survive 6 months without intervention. Extending this timeframe further, to 12 months, 34% percent of respondents (n = 119) indicated that their business would **not** survive without external intervention, 45% responded “maybe”, and 21% responded that their farm or business would survive without external intervention. These responses indicate that there are still short-term vulnerabilities that could force aquaculture farms to cease operations in 2021. As noted previously, this study did not attempt to capture farms that had gone out of business or ceased operating in 2020. It is possible that respondents to previous quarter surveys have permanently closed and therefore did not participate in the Q4 survey.

Lost Sales

Throughout the study, lost sales due to disruptions in marketing channels were the major impact reported by respondents. In the Q4 survey 42% of respondents (n = 100) indicated that private contracts had been cancelled during Q4 of 2020. Twenty-eight percent responded that contracts had been delayed, followed by 27% that did not respond to this question and 3% that indicated new contracts had been made. No respondents indicated that contracts had been reinstated during Q4 of 2020. As for government contracts, 64% of respondents (n = 100) did not respond to this question, while 20% indicated contracts had been delayed, 11% contracts cancelled, 1% contracts reinstated, and 4% new contracts made.

81% of Q4 respondents reported that their farm or business had experienced lost sales in Q4 due to the coronavirus disease pandemic.

Respondents (n = 88) also shared a range of values for lost sales in Q4 (Table 4), with 18% indicating that they had lost between \$50,001 and \$100,000 or between \$10,001 and \$25,000 in sales during Q4.

That was followed by 15% of respondents that had lost between \$100,001 and \$250,000, 11% between \$25,001 and \$50,000, and 8% between \$250,001 and \$500,000 in sales. Three percent of respondents could not estimate the level of lost sales in Q4, and 5% did not respond to this question.

Table 4. Value of lost sales during Q4.

Category	Percentage
\$50,001 - \$100,000	18%
\$10,001 - \$25,000	18%
\$100,0001 - \$250,000	15%
\$25,001 - \$50,000	11%
\$250,001 - \$500,000	8%
\$500,001 - \$1 million	7%
\$1,001 - \$5,000	7%
No response	5%
\$5,001 - \$10,000	3%
Cannot estimate at this time	3%
Greater than \$1 million	2%
\$1 - \$1,000	2%

Respondents also indicated some degree of lost sales in Q4 of 2020 to international markets, with 16% of respondents (n = 89) reporting lost sales to export markets. The majority of respondents (79%) indicated they had not lost sales to export markets.

Looking forward to 2021, 75% respondents (n = 106) indicated that they expect to experience lost sales in the 1st quarter (January, February, March) of 2021. Of those respondents (n = 76), 18% expected the level of lost sales to be between \$25,001 and \$50,000. Others (16%) expected to lose between \$10,001 and \$25,000, 15% between \$100,001 and \$250,000, and 10% between \$250,001 and \$500,000 or \$5,001 and \$10,000. Only a few respondents expected to experience lost sales in Q1 of 2021 in excess of \$1 million (3%), while others were unable to estimate the value (9%). Asked further about international export markets, 68% of respondents (n = 76) indicated they expected no changes in sales to international export markets for Q1 of 2021.

Some respondents (n = 10) did indicate that they had experienced increased demand for products in Q4 of 2020, although 30% of respondents were unable to estimate the value of increased sales for Q4 at the time of completing the survey. Another 30% indicated that they had experienced between \$50,001

and \$100,000 in increased sales, followed by 10% that indicated between \$100,001 and \$250,000, between \$10,001 and \$25,000, and between \$5,001 and \$10,000. Similarly, a few respondents (n = 8) expected to see increased demand for products in Q1 of 2021. Of those who expected to see increased demand, 38% could not estimate the level of increased sales at this time, while another 38% expected increased sales between \$10,001 and \$25,000.

When asked about the availability of cash on hand to cover operating expenses, 37% of respondents (n = 97) indicated that they had sufficient cash on hand to cover 1 to 3 months of operation. This was followed by 23% of respondents who indicated having enough cash on hand for 4 to 6 months of operations. Seven percent of Q4 respondents indicated they had no cash on hand for business operations, while 15% of respondents reported less than 1 month of cash on hand. It is worth noting that the Q4 survey was open for a period of 3 weeks for data collection, meaning that respondents who completed the survey shortly after it was distributed may have already exhausted their cash on hand by the time this fact sheet was prepared. Three percent of respondents did not answer this question.

Labor

The second major impact noted throughout this study were the effects of the coronavirus disease (COVID-19) pandemic and the loss of farm revenue on labor. Forty-five percent of Q4 respondents (n = 110) indicated that they had experienced challenges related to labor as a result of the pandemic. Twenty-three percent of Q4 respondents (n = 100) had terminated employees during the fourth quarter, although half (50%) of respondents indicated no change in labor. It should be noted that some larger producers indicated there were layoffs or furloughs during the 4th quarter in one division of the company, but that there had been hires in another division as the company shifted resources. Shifting resources to another division resulted in no net change in total labor force, but still created impacts and challenges within specific divisions. Furthermore, 21% of respondents indicated that their farm or business would “have to soon” lay off additional employees. Only 4% of Q4 respondents indicated that they had hired additional employees.

When asked about the number of employees that had been terminated during Q4, the majority (74%) of respondents (n = 23) indicated that between 1 and 3 employees had been terminated. Seventeen percent of respondents indicated the number of employees terminated during Q4 was between 4 and 6, followed by 4% who indicated between 7 and 10 employees. Four percent of respondents indicated that greater than 20 employees were terminated during Q4, but none specified an exact number.

45% of Q4 respondents reported challenges with labor due to the coronavirus disease pandemic.

Respondents (n = 21) were asked how long before their farm or business had to make a decision about terminating additional employees, with a third (33%) of respondents indicating between 1 and 3 weeks. Again, it should be noted that the data collection period for the Q4 survey was 3 weeks (January 4th to January 22nd, 2021), meaning that respondents who completed the survey early may have already terminated additional employees by the time this report was prepared. Ten percent of Q4 respondents indicated that they had less than one week to make a decision about terminating employees; while another 10% had more than 10 weeks to make a decision. These respondents (n = 21) were asked how many employees this would affect, with 76% stating between 1 and 3 employees.

Respondents who had hired additional employees during Q4 of 2020 (n = 4) were asked how many additional employees their farm or business had hired, with 75% having hired between 1 and 3 additional employees, and 25% having hired between 16 and 20 additional employees.

When asked about employees missing work due to the coronavirus (COVID-19) disease pandemic in Q4, 56% of respondents (n = 100) indicated that their farm or business did have employees miss work, while 43% of respondents did **not** experience employees that had missed work. Of those respondents who did have employees miss

work (n = 56), 32% indicated that employees had missed in excess of 14 days. That was followed by 29% reporting that employees had missed between 11 and 14 days of work, and 21% reporting between 7 and 10 days of work missed. Only 5% of respondents indicated employees had missed between 1 and 3 days of work.

Challenges to the farm/business

Production

Forty-two percent of respondents (n = 110) indicated that they had experienced challenges with production during Q4 that were not related to labor. That was followed by 41% of respondents that reported increased costs of production. With regard to production activities, 37% of respondents (n = 46) reported challenges with production inputs such as feed, chemicals, therapeutants, etc. Thirty-nine percent of respondents indicated challenges with repair, construction, maintenance, consulting, and engineering services, while a third (33%) of respondents indicated challenges with financial services. Fifteen percent of Q4 respondents could not identify specific challenges at the time they completed the survey.

Twenty-one percent of respondents (n = 110) were unable to pay bills or cover liabilities. When asked further about missed loan or bill payments, 32% of respondents (n = 22) declined to provide a response. Likewise, 32% indicated that they had missed between \$10,001 and \$100,000 in payments, and 14% had missed less than \$5,000 in payments. Twenty-three percent could not estimate the value of missed payments or bills at the time of completing the Q4 survey.

21% of Q4 respondents were unable to pay bills or cover liabilities.

When asked about forward-looking expectations for challenges at the farm or business for Q1 of 2021, 35% of respondents (n = 106) indicated they expected to experience challenges with production

inputs. Forty-four percent of respondents expected challenges with increased costs of production. Twenty percent of respondents also indicated they expected to be unable to pay bills or loans in Q1 of 2021.

Responding farms and businesses also reported impacts on production due to challenges created by holding market-ready products. Q4 respondents (n = 96) reported various time periods that their farm or business could hold market-ready product before it would interfere with new production, with 38% reporting they could hold market ready product for 1 to 3 months. Twelve percent of respondents could hold market-ready products for less than 1 month before it would interfere with future production; with 2% responding they could hold product for only 1 – 7 days. Six percent of responding farms and businesses could hold market-ready product for more than 10 months before it becomes an issue for new production.

Marketing of products

Survey participants were also asked about the effects of holding market-ready product on the price, the quality, and quantities of product sold. The majority (75%) of respondents (n = 96) indicated that holding product would make it less marketable. Of those respondents (n = 72), 71% indicated that holding market-ready product would result in a reduced price, 67% indicated that holding product would reduce the quality of products, and 67% indicated that holding product would result in a lower quantity sold (impacts on revenues). These types of challenges have been reported by respondents throughout the course of this study and are an example of the compounding effects of the pandemic that can result in longer term consequences for aquaculture producers.

Marketing channels

When asked about their primary marketing channels before the effects of the coronavirus disease (COVID-19) pandemic, respondents (n = 103) indicated a variety of marketing channels (Table 5). Forty-one percent of Q4 respondents primarily sold their products through a distributor before the pandemic. This was followed by 16% that sold primarily to restaurants, and 14% that sold primarily to a processor, 10% that sold direct to consumers,

and 8% that sold primarily to other aquaculture or aquaponics businesses.

Table 5. Primary marketing channel for Q4 respondents.

Category	Percentage
Distributor	41%
Restaurants	16%
Processor	14%
Direct to consumer	10%
Other aquaculture /aquaponics	8%
Other	5%
No response	5%
Grocery store / supermarket	3%

As a result of communications with industry, starting in the 2nd quarter of 2020 respondents were also asked about adaptations or changes in their marketing channel in response to the pandemic. That was carried forward to the Q4 survey, to which 38% of respondents indicated that they had implemented or attempted to implement a new marketing channel (n = 103). For the respondents that did implement or attempted to implement direct to consumer sales (n = 25), 64% had initiated curbside pickup services. That was followed by 52% who had implemented online sales, and 52% who had implemented home delivery services. Only 8% of respondents opened or attempted to open a retail outlet. Several respondents also indicated setting up drop off/pick up locations, setting up small kiosks by roadways, or participating in farmers’ markets and food hubs. Forty-one percent of respondents (n = 103) indicated that they had not implemented or attempted to implement a new marketing channel during Q4 of 2020.

Relief and assistance programs

While relief and assistance programs were not designed to make farms whole for their losses, it cannot be overstated that these mechanisms provided critical aid and assistance for producers in a time of great need. Respondents were asked whether they had applied for various assistance and relief programs that had been available during Q4 of 2020, whether they had received assistance from those programs, and whether that assistance had been helpful to them or not. Over half (51%) of Q4 respondents (n = 105) had applied for the USDA

Coronavirus Food Assistance Program (CFAP). This was followed by 37% of respondents who had applied for the Paycheck Protection Program (PPP), and 26% of respondents who had applied for Economic Injury Disaster Loans (EIDL). Twenty-one percent of Q4 respondents had applied for Small Business Administration (SBA) loans, and 13% had applied for NOAA CARES Section 12005. Seventeen percent of respondents had not applied for assistance, and 13% had used private bank loans or personal credit during Q4.

51% of Q4 respondents had applied for USDA CFAP; of those, 81% indicated they had received support from USDA CFAP.

For those respondents who indicated having applied for loans and relief programs, most had received the support that was requested (Table 6). Some respondents (n = 8) did indicate that they had applied but not yet received assistance, while others (n = 7) had been declined or denied assistance.

When asked whether these assistance programs had been helpful to their business, likewise a majority of respondents to each category indicated “yes”; with percentages ranging from 82% to 100% for the various programs.

Table 6. Assistance received by Q4 respondents

Category	(n =)	Percentage
Private bank loans / line of credit	14	79%
Small Business Administration loans (SBA)	22	55%
Paycheck Protection Program loans (PPP)	39	90%
Economic Injury Disaster Loans (EIDL)	27	78%
Unemployment benefits	13	85%
NOAA CARES Section 12005	14	43%
USDA CFAP	54	81%
Other Federal program	6	33%
Other State program	11	82%
Other Local program	4	75%

Farm or business has applied but not yet received	77	10%
Farm or business applications have been denied / declined	77	9%

A majority (61%) of Q4 respondents (n = 105) indicated that federal assistance would increase the likelihood for their farm or business to survive. This was followed by 37% of respondents who indicated that state assistance would increase their likelihood of survival, 16% who indicated local assistance would help, and 16% who indicated assistance from associations. Only 10% of Q4 respondents indicated that there were no types of assistance that would help their farm or business to survive.

Discussion and Conclusion

The results from the Q4 survey close out an eventful and complicated year for the U.S. aquaculture and aquaponics sectors and their allied businesses. Q4 findings clearly demonstrate that the industry was still experiencing negative impacts from the coronavirus disease (COVID-19) pandemic at the end of 2020. Many of these effects and impacts were similar to the trends captured in previous quarterly surveys. The Q4 responses also indicate that there are longer-term effects and secondary impacts materializing for the industry as the pandemic continues. While many Q4 respondents were successful in obtaining assistance and relief, it is unclear whether these measures will be sufficient to address the continuing impacts and resulting consequences for producers during 2021. The forward-looking responses to the Q4 survey indicate that producers continue to expect disruptions of traditional marketing channels, increased costs of production, challenges obtaining services and inputs, and challenges with cash on hand to cover operating expenses resulting in missed or delayed loan and bill payments. Responses provided by Q4 respondents reveal that producers are investing and adapting to new market conditions, adopting innovative strategies, and developing new services in an attempt to recover sales. However, lost revenue continues to be a significant challenge for respondents during Q4 of 2020. Likewise, the challenges reported by respondents regarding labor impacts and production effects point to challenges for the future supply of aquaculture and aquaponics products.

- 83% had been impacted by COVID-19 during Q4
- 42% had private orders/contracts cancelled in Q4
- 23% had terminated employees in Q4
- 81% had experienced lost sales in Q4
- 7% had no cash available to cover operating expenses in Q4
- 15% had less than 1 month of cash available to cover operating expenses in Q4
- 47% would survive 3 months without external intervention
- 51% applied for USDA CFAP, 37% for PPP, 26% for EIDL, 13% for NOAA CARES, 13% for a private loan or personal line of credit, and 12% applied for unemployment benefits.
- 61% indicated that Federal assistance would help their farm or business to survive, and 37% indicated that state assistance would help their farm or business to survive.

References

National Marine Fisheries Service. 2018. "Fisheries of the United States, 2017". U.S. Department of Commerce, NOAA Current Fishery Statistics No. 2017 Available at: <https://www.fisheries.noaa.gov/resource/document/fisheries-united-states-2017-report>. (last accessed, April 12th, 2020)

United States Department of Agriculture. 2019. 2018 Census of Aquaculture. National Agricultural Statistics Service, USDA, Washington, District of Columbia, USA. Accessed April 2020 at: https://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Census_of_Aquaculture/index.php. (last accessed, April 12th, 2020)

van Senten, J., Smith, M.A., and Engle, C.R. 2020. Impacts of COVID-19 on U.S. aquaculture, aquaponics, and allied businesses: Quarter 1 Results. AAEC-218NP. Available at: https://www.pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/AAEC/aec-218/AAEC-218.pdf

van Senten, J., Engle, C.R., and Smith, M.A. 2020. Effects of COVID-19 on U.S. Aquaculture Farms. Applied Economic Perspectives and Policy. Available at: <https://onlinelibrary.wiley.com/doi/full/10.1002/app.13140>

Additional Resources

van Senten, J., C.R. Engle, and M. Smith. 2020. Impacts of COVID-19 on U.S. aquaculture, aquaponics, and allied businesses. Journal of the World Aquaculture Society 51(3):571-573.

A summary of the Q4 survey results may be found in the Appendix document to this fact sheet, titled: "Summary of COVID-19 impacts on U.S. aquaculture, aquaponics, and allied businesses: Quarter 4 Results".

All study results and disaggregated reports are/will be published online and available at: https://www.arec.vaes.vt.edu/arec/virginia-seafood/research/Impacts_of_COVID19.html

Indicia and Publication Number

Visit Virginia Cooperative Extension: ext.vt.edu

Virginia Cooperative Extension programs and employment are open to all, regardless of age, color, disability, gender, gender identity, gender expression, national origin, political affiliation, race, religion, sexual orientation, genetic information, veteran status, or any other basis protected by law. An equal opportunity/affirmative action employer. Issued in furtherance of Cooperative Extension work, Virginia Polytechnic Institute and State University, Virginia State University, and the U.S. Department of Agriculture cooperating. Edwin J. Jones, Director, Virginia Cooperative Extension, Virginia Tech, Blacksburg; M. Ray McKinnie, Administrator, 1890 Extension Program, Virginia State University, Petersburg.

2021

VCE-AAEC-__NP
VSG-21-__

Appendix

Summary of COVID-19 impacts on U.S. aquaculture, aquaponics, and allied businesses:

Quarter 4 Results

Jonathan van Senten, Virginia Tech

Matthew A. Smith, The Ohio State University

Carole R. Engle, Engle-Stone Aquatics, LLC, Virginia Tech

Michael H. Schwarz, Virginia Tech

Charles Clark, Virginia Tech

Shannon Fluharty, Virginia Tech

Ganesh Kumar, Mississippi State

Shraddha Hegde, Mississippi State



Contents

Q1. What is the primary product that your farm or allied business produces?.....	6
Q1.1. Please indicate which is the major species of foodfish raised by your farm or business:	7
Q1.2 Please indicate which is the major species of sportfish raised by your farm or business:.....	7
Q2. Please indicate the scale of your farm or business by annual sales volume before the effects of coronavirus disease (COVID-19):.....	8
Q3. Please provide the average price and approximate inventory of the primary product (market-sized) on your farm or business for the following periods of time:	9
Q3.1. Please provide the volume of the primary product (market-sized) sold by your farm at the market price and the volume sold at a reduced price due to being out-of-size for the following periods of time:	9
Q4. In which USDA defined Aquaculture Region is your farm or business located?	10
Q5. Has your farm or allied business been impacted, either positively or negatively, by the coronavirus disease (COVID-19) in the period of time between October 1st 2020 and December 31st 2020?.....	11
Q5.1. Does your farm or allied business expect to be affected, either positively or negatively, by the coronavirus disease (COVID-19) in 2020?	11
Q6. Have there been changes in government (state or federal) contracts in the period of time between October 1st 2020 and December 31st 2020 because of the coronavirus disease (COVID-19)?.....	12
Q7. Have there been changes in private contracts in the period of time between October 1st 2020 and December 31st 2020 because of the coronavirus disease (COVID-19)?.....	13
Q8. Please indicate what types of changes in employment have occurred in the period of time between October 1st 2020 and December 31st 2020 due to the coronavirus disease (COVID-19)?	13
Q8.1. Are any of the employees that your farm or business had to, or will have to, lay off due to the coronavirus disease (COVID-19) designated as "Short-Time" or "Shared-Work" employees?.....	14
Q8.2. How many employees has your farm or business had to lay off in the period of time between October 1st 2020 and December 31st 2020 in response to the coronavirus disease (COVID-19)?.....	14
Q8.3. How many weeks before your farm or business will have to make a decision to lay off employees, in response to the coronavirus disease (COVID-19)?	15
Q8.4. How many employees do you estimate your farm or business will have to lay off in response to the coronavirus disease (COVID-19)?	15
Q8.5 How many additional employees has your farm or allied business hired in the period of time between October 1st 2020 and December 31st 2020 in response to the coronavirus disease (COVID-19)?.....	16
Q9. Has your farm or business had any employees miss work due to the coronavirus disease (COVID-19) in the period of time between October 1st 2020 and December 31st 2020?	16
Q9.1. In total, approximately how many days have any employees in your farm or business missed work due to the coronavirus disease (COVID-19) in the period of time between October 1st 2020 and December 31st 2020?	17
Q10. Does your farm or business make use of H2A or H2B workers?.....	17
Q10.1. Has your farm or business been able to secure H2A and H2B workers during the coronavirus disease (COVID-19) pandemic in the period of time between October 1st 2020 and December 31st 2020?	18
Q10.2. Is your farm or business currently at risk of losing H2A or H2B workers due to the coronavirus disease (COVID-19) pandemic?	18

[Q11. Has your farm or business experienced any of the following as a result of the coronavirus disease \(COVID-19\) in the period of time between October 1st 2020 and December 31st 2020? Please select all that apply.](#) 19

[Q11.1. Has your farm or business experienced lost sales to international or export markets \(outside of the United States\), as a result of the coronavirus disease \(COVID-19\) in the period of time between October 1st 2020 and December 31st 2020?](#) 19

[Q11.2. If your farm or business has experienced lost sales as a result of the coronavirus disease \(COVID-19\) in the period of time between October 1st 2020 and December 31st 2020? Please estimate the value of lost sales:](#) 20

[Q11.3. If your farm or business has experienced production challenges \(not related to labor\) as a result of the coronavirus disease \(COVID-19\) in the period of time between October 1st 2020 and December 31st 2020, can those challenges be specified? Please select all that apply.](#) 21

[Q11.6. If your farm or business has experienced increased demand for products as a result of the coronavirus disease \(COVID-19\) in the period of time between October 1st 2020 and December 31st 2020? Please estimate the value of those effects on sales:](#) 22

[Q11.8. If your farm or allied business has experienced missed bill or loan payments as a result of the coronavirus disease \(COVID-19\) in the period of time between October 1st 2020 and December 31st 2020? Please estimate the value of those missed payments:](#) 23

[Q12. Does your farm or business expect to experience any of the following as a result of the coronavirus disease \(COVID-19\) in the 1st Quarter of 2021 \(January, February, March\)? Please select all that apply.](#)..... 24

[Q12.1. Does your farm or allied business expect to experience changes in sales to international or export markets \(outside of the United States\), as a result of the coronavirus disease \(COVID-19\), in the 1st Quarter of 2021 \(January, February, March\)?](#) 24

[Q12.2. Does your farm or business expect to experience lost sales as a result of the coronavirus disease \(COVID-19\) in the 1st Quarter of 2021 \(January, February, March\)? Please estimate the value of lost sales:](#) 25

[Q12.3. Does your farm or business expect to experience production challenges \(not related to labor\) as a result of the coronavirus disease \(COVID-19\) in the 1st Quarter of 2021 \(January, February, March\), can those challenges be specified? Please select all that apply.](#)..... 26

[Q12.6. Does your farm or business expect to experience increased demand for products as a result of the coronavirus disease \(COVID-19\) in the 1st Quarter of 2021 \(January, February, March\)? Please estimate the value of those effects on sales:](#)..... 27

[Q12.8. If your farm or allied business expects to miss bill or loan payments as a result of the coronavirus disease \(COVID-19\) in the 1st Quarter of 2021 \(January, February, March\)? Please estimate the value of those missed payments:](#)..... 28

[Q13. Without external intervention \(for example, governmental assistance\), will your farm or business survive in the next 3 \(three\) months?](#)..... 29

[Q14. Without external intervention \(for example, governmental assistance\), will your farm or business survive in the next 6 \(six\) months?](#) 29

[Q15. Without external intervention \(for example, governmental assistance\), will your farm or business survive in the next 12 \(twelve\) months?](#) 30

[Q16. How would you describe the current availability of cash on hand for your farm or allied business, including financial assistance or loans? Please select how long a period the current cash on hand will cover:](#) 30

[Q17. Will holding market ready product, as a result of the coronavirus disease \(COVID-19\), make it less marketable?](#) 31

<u>Q17.1. Will holding market ready product, as a result of the coronavirus disease (COVID-19), result in: Please select all that apply.</u>	31
<u>Q18. How long can your farm or allied business hold market ready product, as a result of the coronavirus disease (COVID-19), before it becomes an issue for new crops or planting?</u>	32
<u>Q19. Please indicate if your farm or allied business has applied for loans or financial assistance from any of the following programs in the period of time between October 1st 2020 and December 31st 2020: (please select all that apply).</u>	33
<u>Q19.1. Please indicate if your farm or allied business has received loans or financial assistance from any of the following programs that you applied for: (please select all that apply)</u>	34
<u>Q19.2. Please indicate if loans or financial assistance received by your farm or allied business has been helpful?</u>	35
<u>Q20. Are there specific steps or types of assistance that would increase the likelihood for your farm or business to survive? Please select all that apply.</u>	35
<u>Q21. Would assistance with any of the following be helpful to your farm or business right now? Please select all that apply.</u>	36
<u>Q22. Are there any existing programs that your aquaculture, aquaponics, or allied business does not currently qualify for, that would increase the likelihood of survival of your farm or business?</u>	36
<u>Q23. How did your farm or allied business primarily market or sell aquaculture / aquaponics products before the effects of the coronavirus disease pandemic (COVID-19)?</u>	37
<u>Q23.1. Did your farm or allied business implement or attempt to implement a new marketing or sales channel in the period of time between October 1st 2020 and December 31st 2020 because of coronavirus disease (COVID-19)?</u>	38
<u>Q23.2. What percent of sales from your farm or allied business in the period of time between October 1st 2020 and December 31st 2020 went through a new marketing channel?</u>	38
<u>Q23.3. If your farm or allied business implemented or attempted to implement a "Direct to consumer / end user" marketing channel, please specify the method(s) from the options below: (please select all that apply)?</u>	39

Overview

On March 23rd, 2020 Virginia Tech Seafood AREC and The Ohio State University Extension initiated an online survey of the U.S. aquaculture, aquaponics, and allied businesses. This survey was designed to capture and quantify the effects of the coronavirus disease (COVID-19) on the aquaculture, aquaponics, and allied industries. The survey was administered quarterly for the duration of 2020 in order to capture the evolving effects of the coronavirus disease pandemic (COVID-19) on the industry. The Quarter 4 survey closed on January 22nd, 2021 at 11:59 pm eastern standard time.

Methods

Data for this study was collected through a survey, which was developed in Qualtrics so that it could be rapidly distributed online and through social media to aquaculture, aquaponics, and allied businesses around the U.S. The survey underwent a review by aquaculture and aquaponics experts prior to being submitted to the Virginia Tech Institutional Review Board for a human subjects research determination. Having been granted an exemption by the IRB, the survey was pre-tested with several aquaculture producers. The survey was intended for commercial aquaculture, aquaponics, and allied businesses; with distribution of the survey occurring through e-mail and social media. The National Aquaculture Association (NAA), USDA NIFA Cooperative Extension, National Sea Grant Extension, multiple industry associations, and other stakeholders assisted in distribution of the survey. Given the urgency to gather exploratory information on how U.S. aquaculture was being affected, a non-probability, self-selection method was used. The survey was distributed quarterly throughout 2020, to capture the evolving effects of coronavirus disease (COVID-19) on the industry. The fourth quarter survey was launched on January 4th, 2021 and closed on January 22nd, 2021. Results were summarized using Microsoft Excel software.

Response Rate

At the time of closing the survey had a total of 211 responses. Seventy-one of the recorded responses were less than 10% complete. Another 20 responses were less than 20% complete. A total of 120 recorded responses were more than 50% complete, with 113 of those responses being 100% complete. Blank responses and responses with less than 50% completion rate were removed from the dataset. For each question summarized in this document the total number of respondents is denoted ($n = _$). Discounting the number of “university/education” ($n = 1$) respondents that responded to the survey, the number of farms that participated (119) is roughly equal to 4% of the total number of U.S. farms recorded in the 2018 Census of Aquaculture (USDA, 2019). This response is higher than the Q3 survey, which had an approximate response rate of 1%, but lower than the Q1 and Q2 surveys (18% and 8%, respectively).

No Response

The survey made use of skip and display logic, in order to minimize the number of questions presented to participants that were not relevant based on previous answers. As a result, the “No response” category presented in this report is a count of the number of participants presented with the question who proceeded without answering that question.

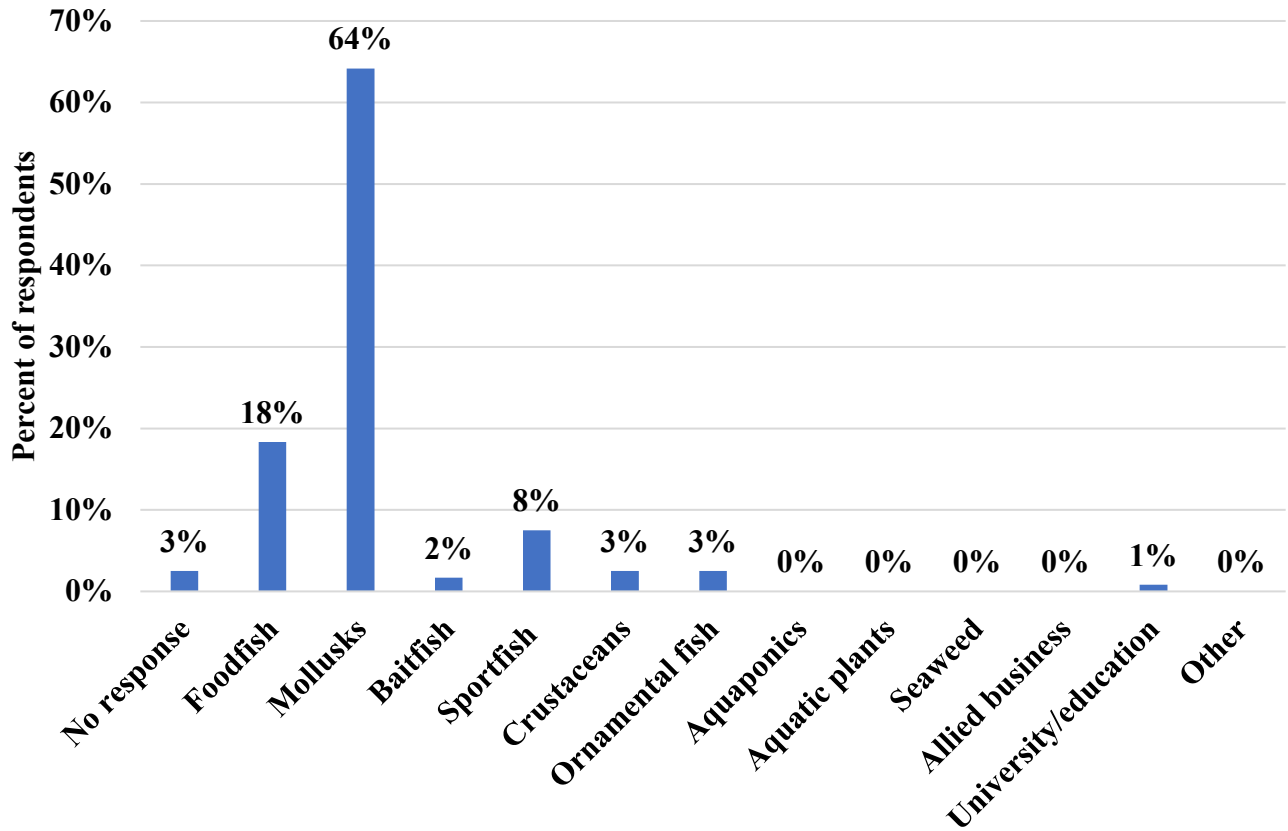
Survey results for each question

The number of respondents to each question presented in this summary is denoted as (n =).

Q1. What is the primary product that your farm or allied business produces?

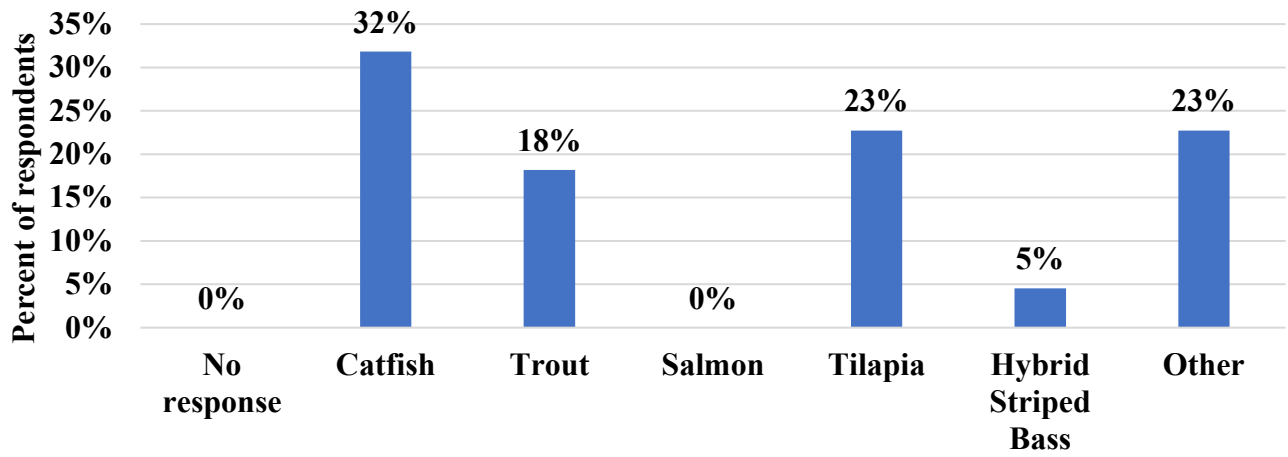
(n = 120)

• No response	:	3%
• Foodfish	:	18%
• Mollusks (oysters, clams, mussels, etc.)	:	64%
• Baitfish	:	2%
• Sportfish / recreational fish, including trout	:	8%
• Crustaceans (crawfish, soft crab, shrimp, etc.)	:	3%
• Ornamental fish (aquarium or water garden)	:	3%
• Aquaponics	:	0%
• Aquatic plants	:	0%
• Seaweed	:	0%
• Allied business (equipment, chemicals, etc.)	:	0%
• University or other research / education organization	:	1%
• Other	:	0%



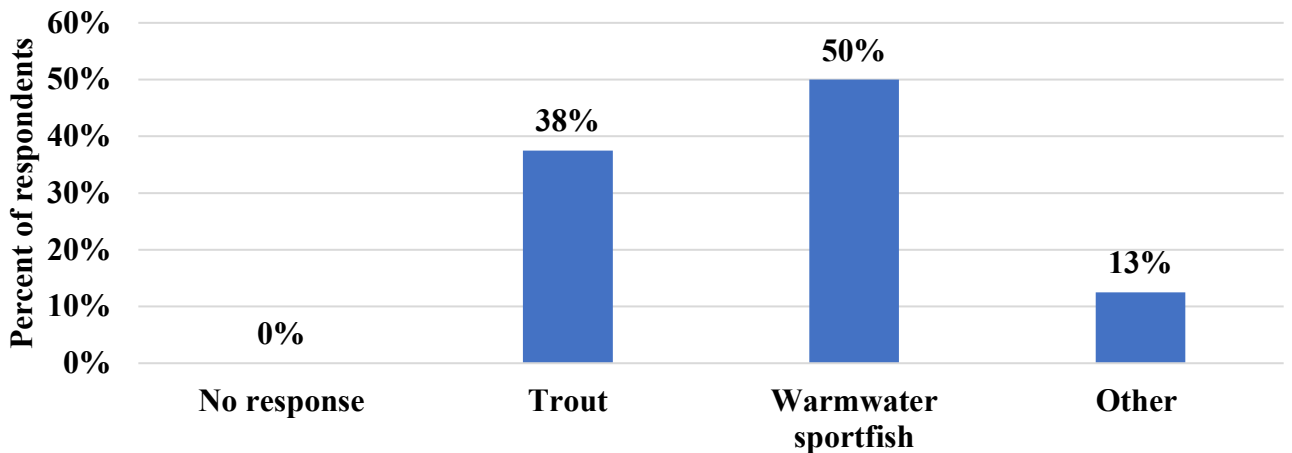
Q1.1. Please indicate which is the major species of foodfish raised by your farm or business:
(n = 22)

- No response : 0%
- Catfish : 32%
- Trout : 18%
- Salmon : 0%
- Tilapia : 23%
- Hybrid Striped Bass : 5%
- Other : 23%



Q1.2 Please indicate which is the major species of sportfish raised by your farm or business:
(n = 8)

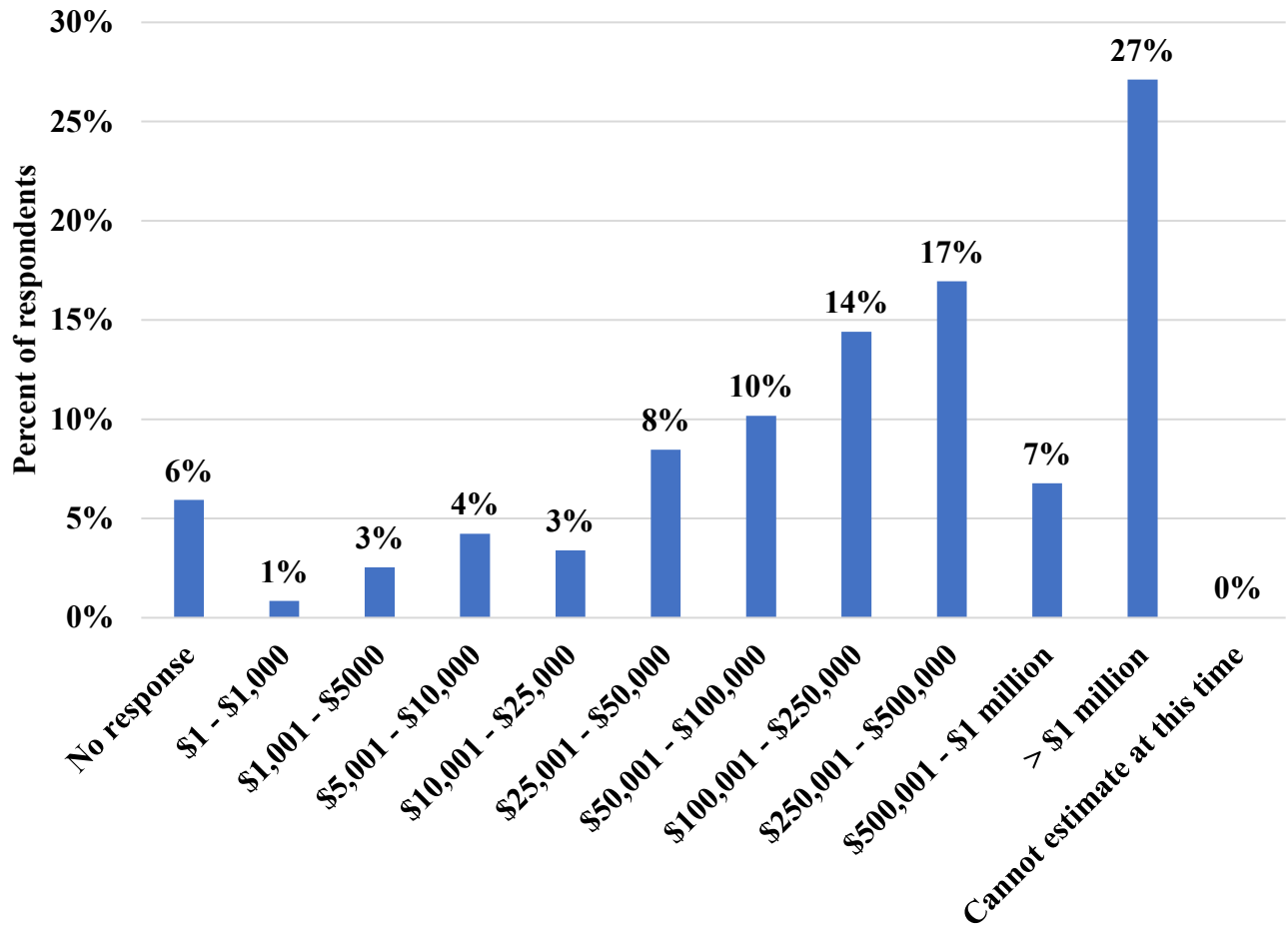
- No response : 0%
- Trout : 38%
- Warmwater sportfish : 50%
- Other : 13%



Q2. Please indicate the scale of your farm or business by annual sales volume before the effects of coronavirus disease (COVID-19):

(n = 119)

- No response : 6%
- \$1 - \$1,000 : 1%
- \$1,001 - \$5,000 : 3%
- \$5,001 - \$10,000 : 4%
- \$10,001 - \$25,000 : 3%
- \$25,001 - \$50,000 : 8%
- \$50,001 - \$100,000 : 10%
- \$100,001 - \$250,000 : 14%
- \$250,001 - \$500,000 : 17%
- \$500,001 - \$ 1million : 7%
- Greater than \$1 million : 27%
- Cannot estimate at this time : 0%



Q3. Please provide the average price and approximate inventory of the primary product (market-sized) on your farm or business for the following periods of time:

(n = N/A)

To expedite sharing this report with stakeholders, these responses are being temporarily withheld for further analysis of the data.

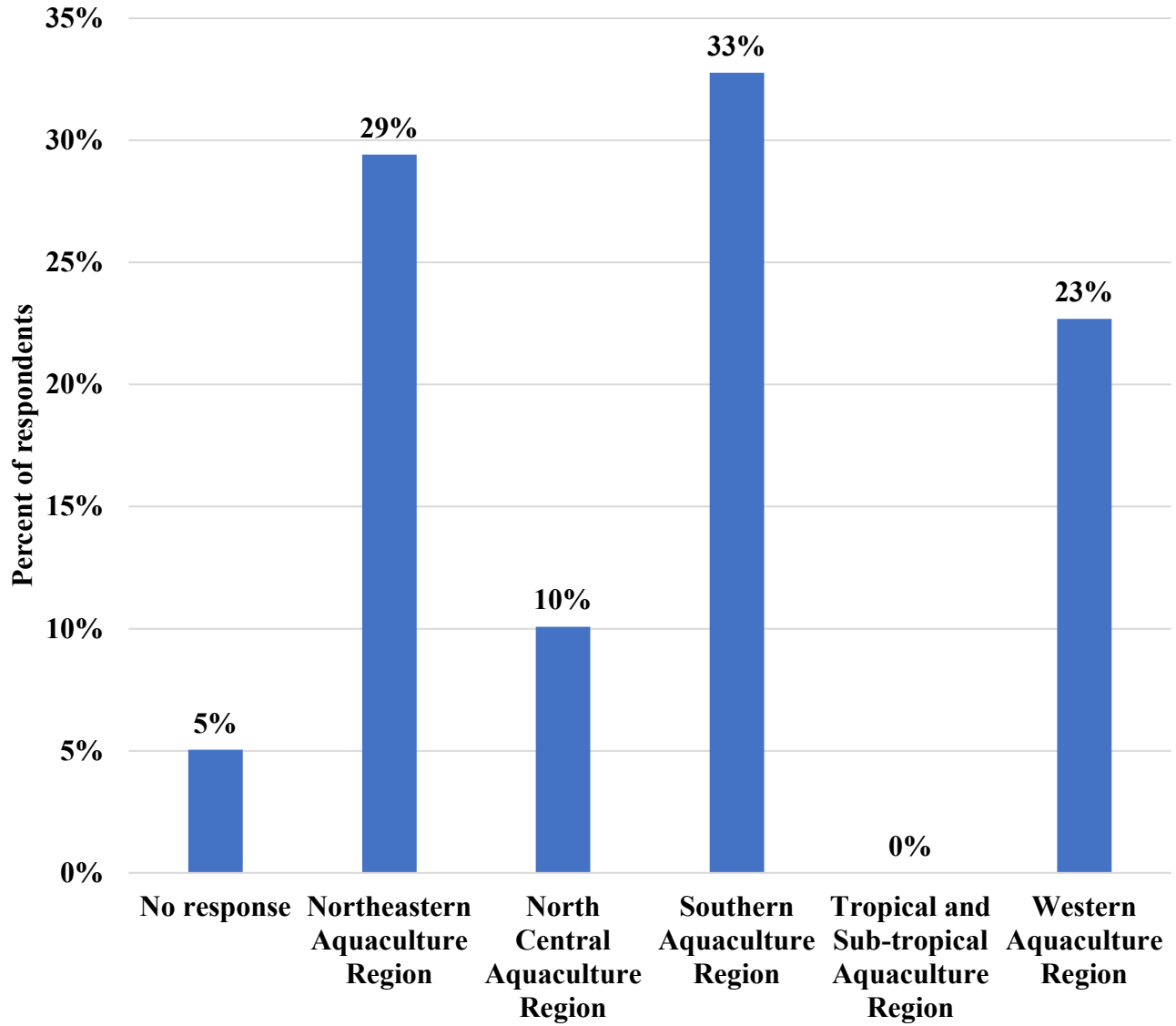
Q3.1. Please provide the volume of the primary product (market-sized) sold by your farm at the market price and the volume sold at a reduced price due to being out-of-size for the following periods of time:

(n = N/A)

To expedite sharing this report with stakeholders, these responses are being temporarily withheld for further analysis of the data.

Q4. In which USDA defined Aquaculture Region is your farm or business located?
 (n = 119)

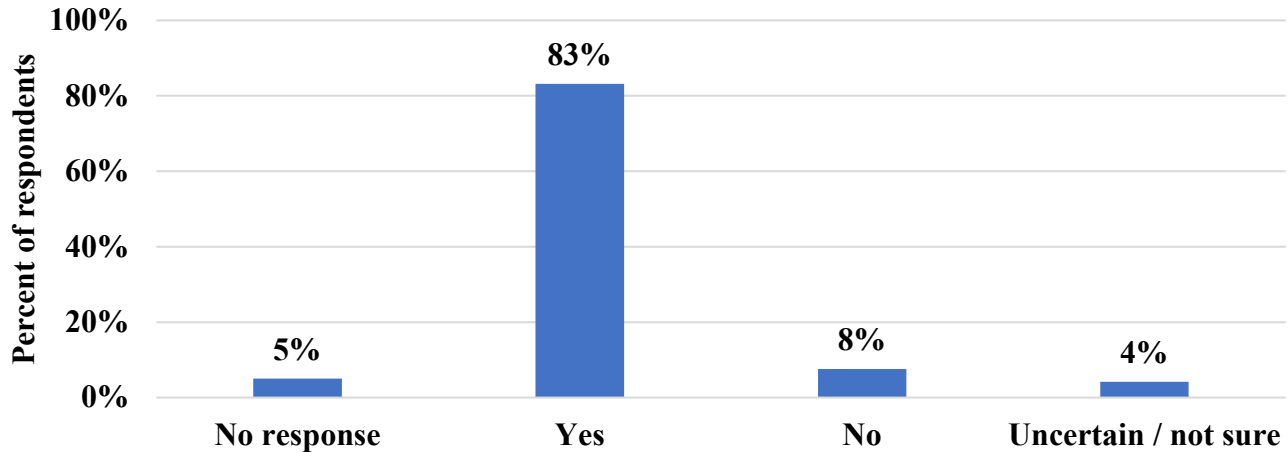
- No response : 5%
- Northeastern Aquaculture Region : 29%
- North Central Aquaculture Region : 10%
- Southern Aquaculture Region : 33%
- Tropical and Sub-Tropical Aquaculture Region : 0%
- Western Aquaculture Region : 23%



Q5. Has your farm or allied business been impacted, either positively or negatively, by the coronavirus disease (COVID-19) in the period of time between October 1st 2020 and December 31st 2020?

(n = 119)

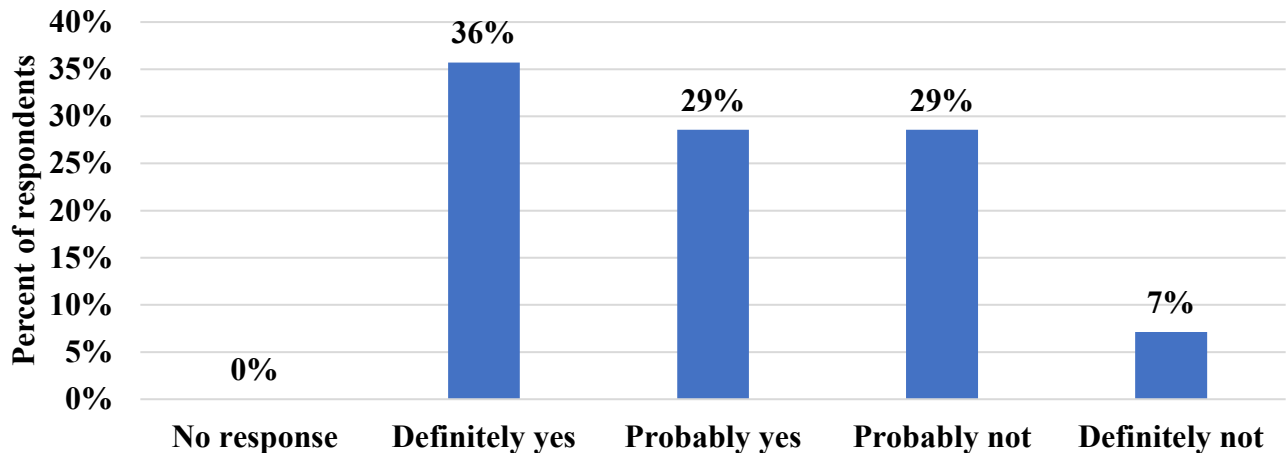
- No response : 5%
- Yes : 83%
- No : 8%
- Uncertain/not sure : 4%



Q5.1. Did your farm or allied business expect to be affected, either positively or negatively, by the coronavirus disease (COVID-19) in 2020?

(n = 14)

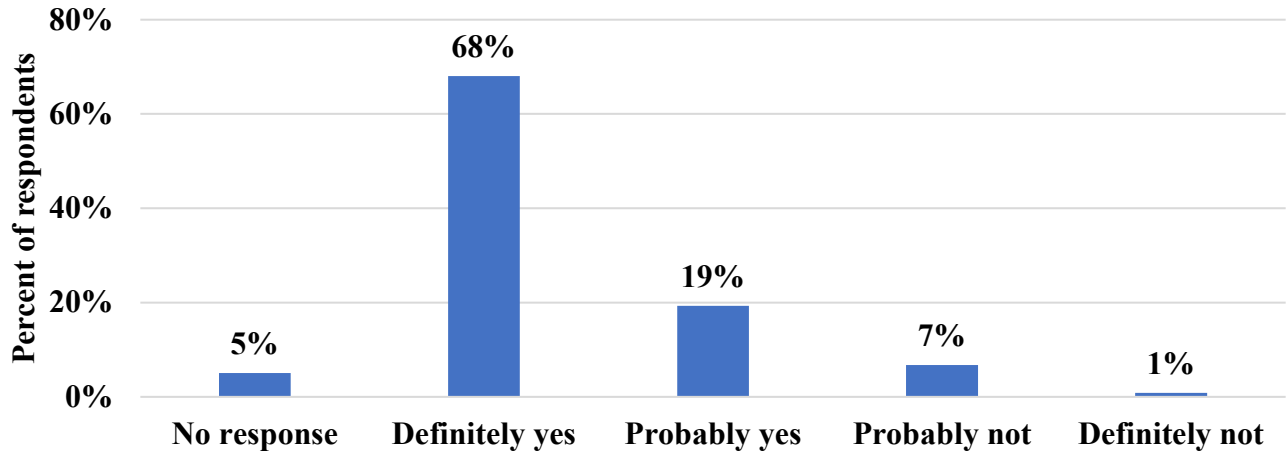
- No response : 0%
- Definitely yes : 36%
- Probably yes : 29%
- Probably not : 29%
- Definitely not : 7%



Q5.2. Does your farm or allied business expect to be affected, either positively or negatively, by the coronavirus disease (COVID-19) in 2021?

(n = 119)

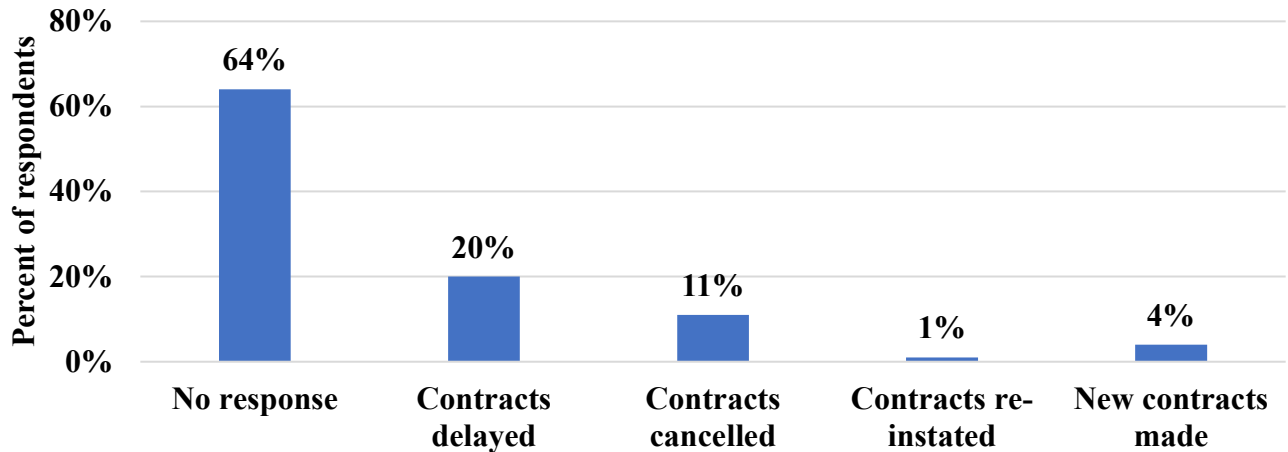
- No response : 5%
- Definitely yes : 68%
- Probably yes : 19%
- Probably not : 7%
- Definitely not : 1%



Q6. Have there been changes in government (state or federal) contracts in the period of time between October 1st 2020 and December 31st 2020 because of the coronavirus disease (COVID-19)?

(n = 100)

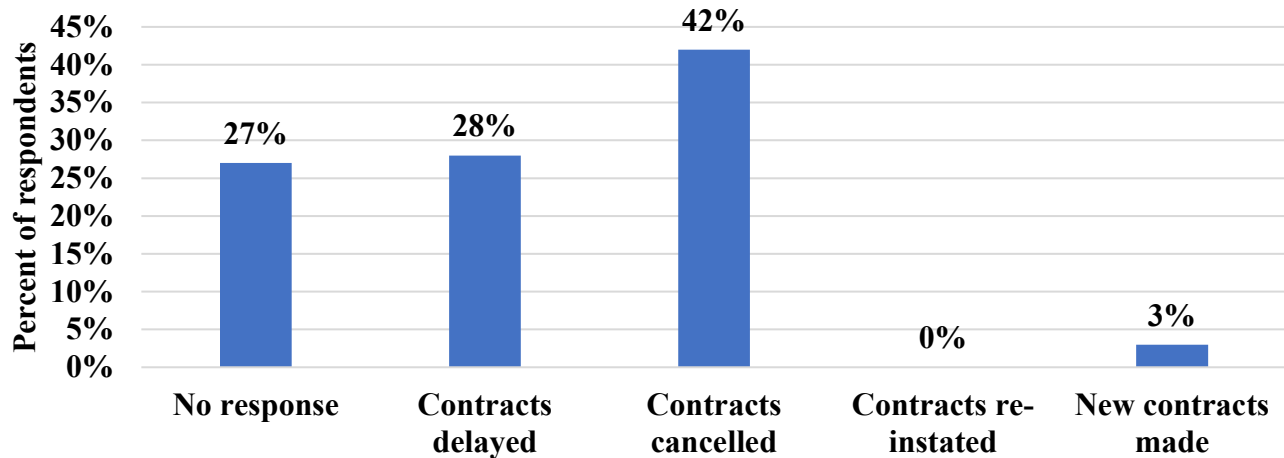
- No response : 64%
- Contracts delayed : 20%
- Contracts cancelled : 11%
- Contracts re-instated : 1%
- New contracts made : 4%



Q7. Have there been changes in private contracts in the period of time between October 1st 2020 and December 31st 2020 because of the coronavirus disease (COVID-19)?

(n = 100)

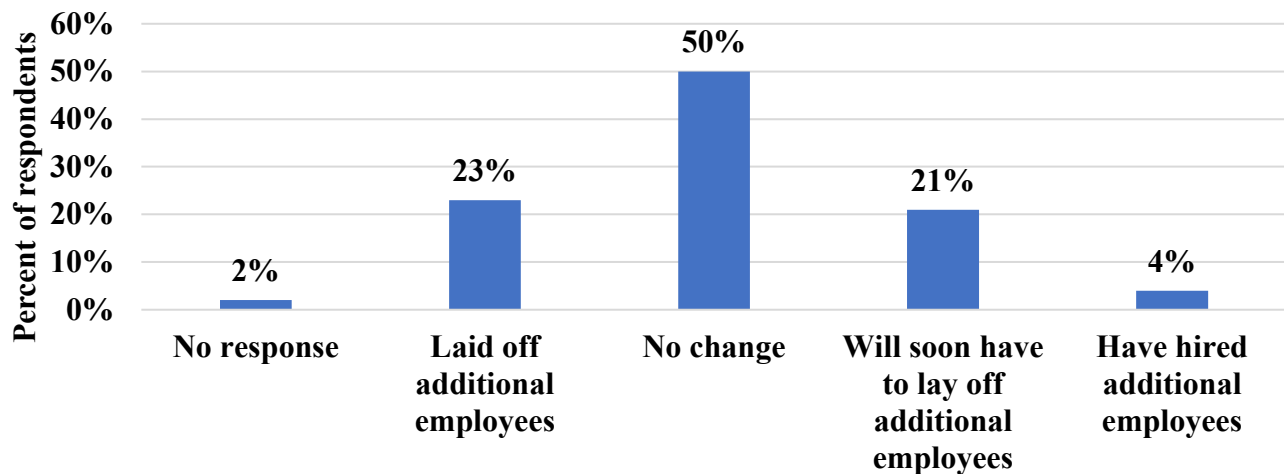
- No response : 27%
- Contracts delayed : 28%
- Contracts cancelled : 42%
- Contracts re-instated : 0%
- New contracts made : 3%



Q8. Please indicate what types of changes in employment have occurred in the period of time between October 1st 2020 and December 31st 2020 due to the coronavirus disease (COVID-19):

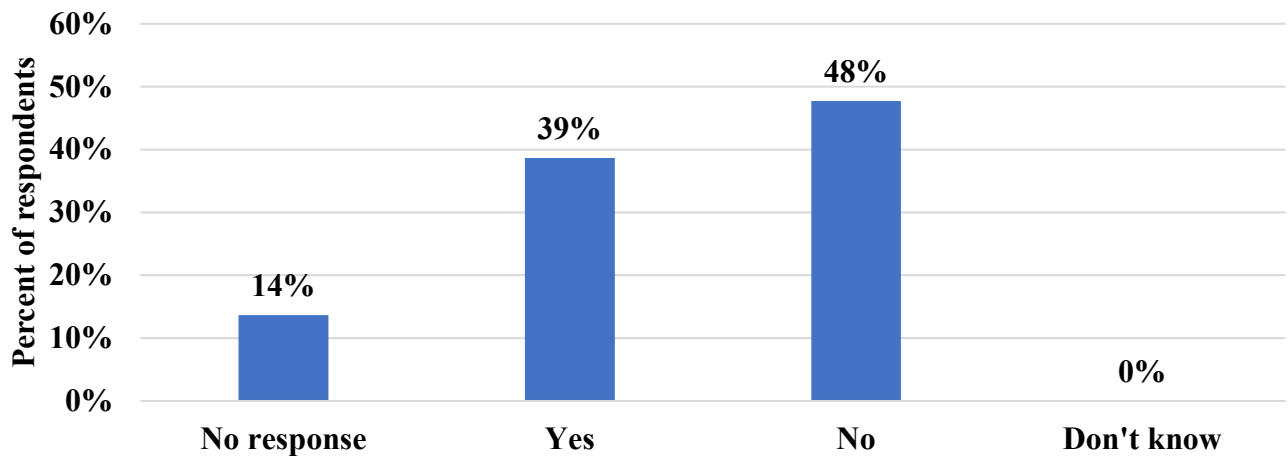
(n = 100)

- No response : 2%
- Laid off additional employees : 23%
- No change : 50%
- Will soon have to lay off additional employees : 21%
- Have hired additional employees : 4%



Q8.1. Are any of the employees that your farm or business had to, or will have to, lay off due to the coronavirus disease (COVID-19) designated as "Short-Time" or "Shared-Work" employees?
 (n = 44)

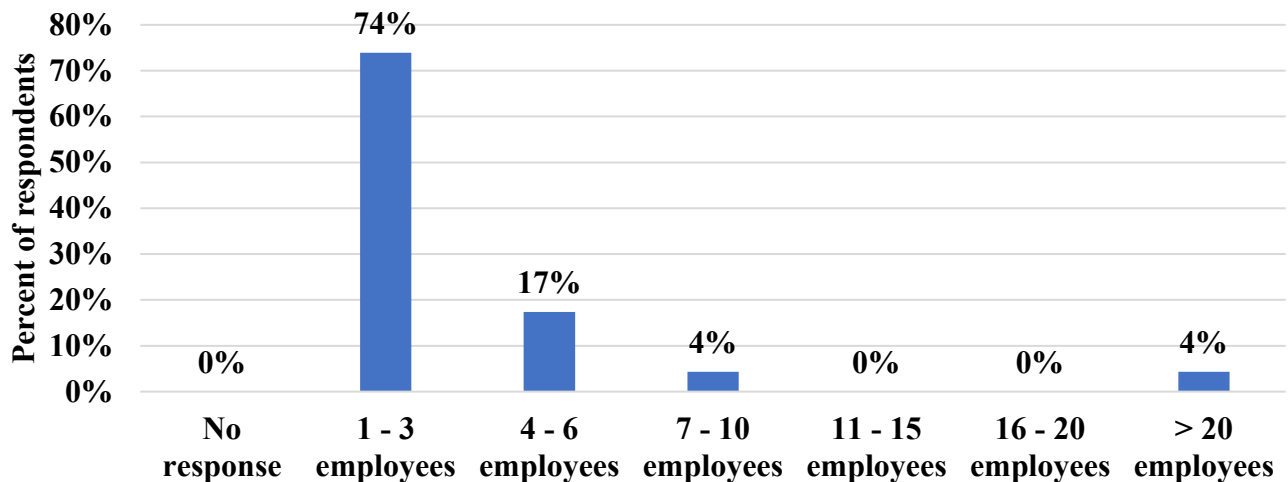
- No response : 14%
- Yes : 39%
- No : 48%
- Don't know : 0%



Q8.2. How many employees has your farm or business had to lay off in the period of time between October 1st 2020 and December 31st 2020 in response to the coronavirus disease (COVID-19)?

(n = 23)

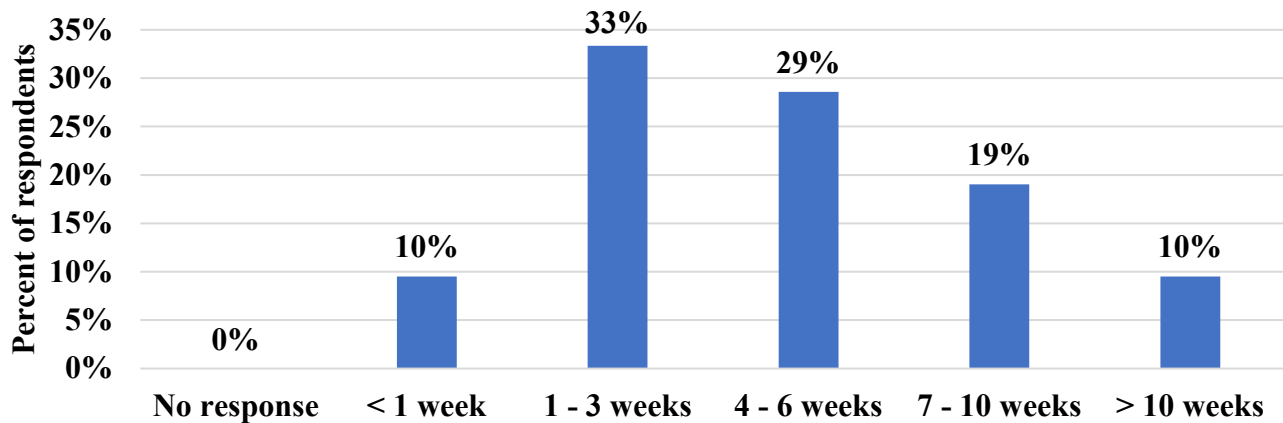
- No response : 0%
- 1 – 3 employees : 74%
- 4 – 6 employees : 17%
- 7 – 10 employees : 4%
- 11 – 15 employees : 0%
- 16 – 20 employees : 0%
- More than 20 employees : 4%



Q8.3. How many weeks before your farm or business will have to make a decision to lay off employees, in response to the coronavirus disease (COVID-19)?

(n = 21)

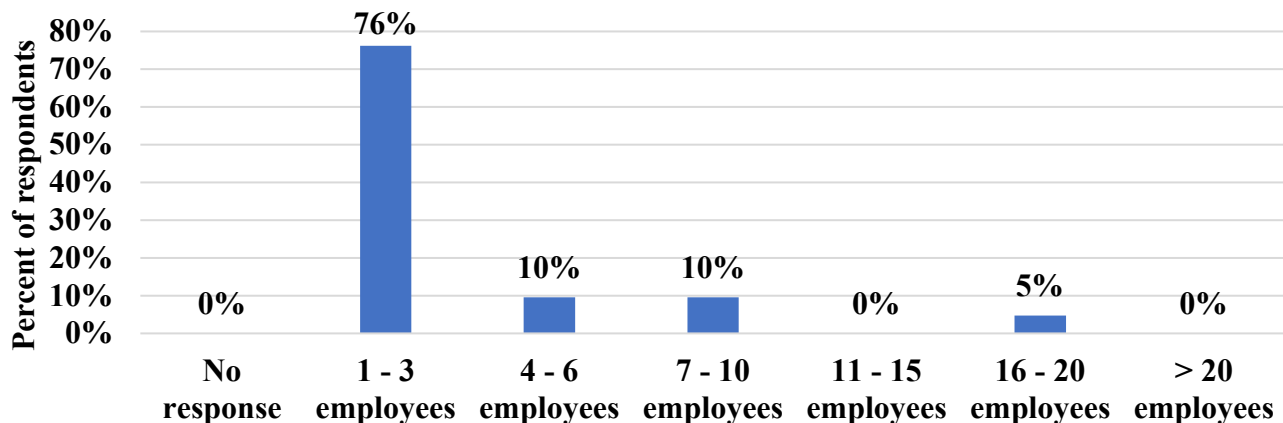
- No response : 0%
- Less than 1 week : 10%
- 1 – 3 weeks : 33%
- 4 – 6 weeks : 29%
- 7 – 10 weeks : 19%
- More than 10 weeks : 10%



Q8.4. How many employees do you estimate your farm or business will have to lay off in response to the coronavirus disease (COVID-19)?

(n = 21)

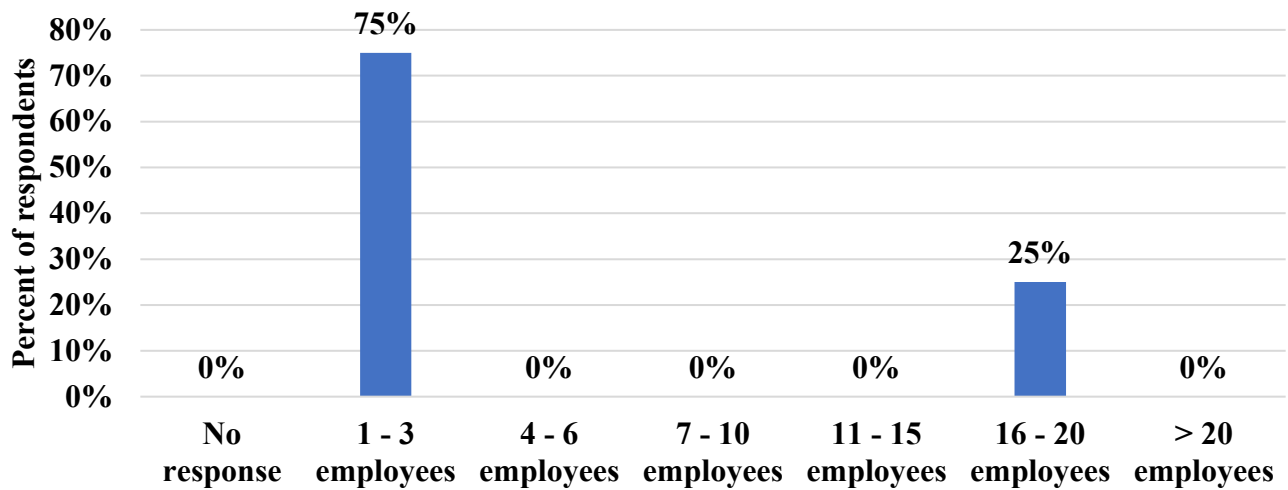
- No response : 0%
- 1 – 3 employees : 76%
- 4 – 6 employees : 10%
- 7 – 10 employees : 10%
- 11 – 15 employees : 0%
- 16 – 20 employees : 5%
- More than 20 employees : 0%



Q8.5 How many additional employees has your farm or allied business hired in the period of time between October 1st 2020 and December 31st 2020 in response to the coronavirus disease (COVID-19)?

(n = 4)

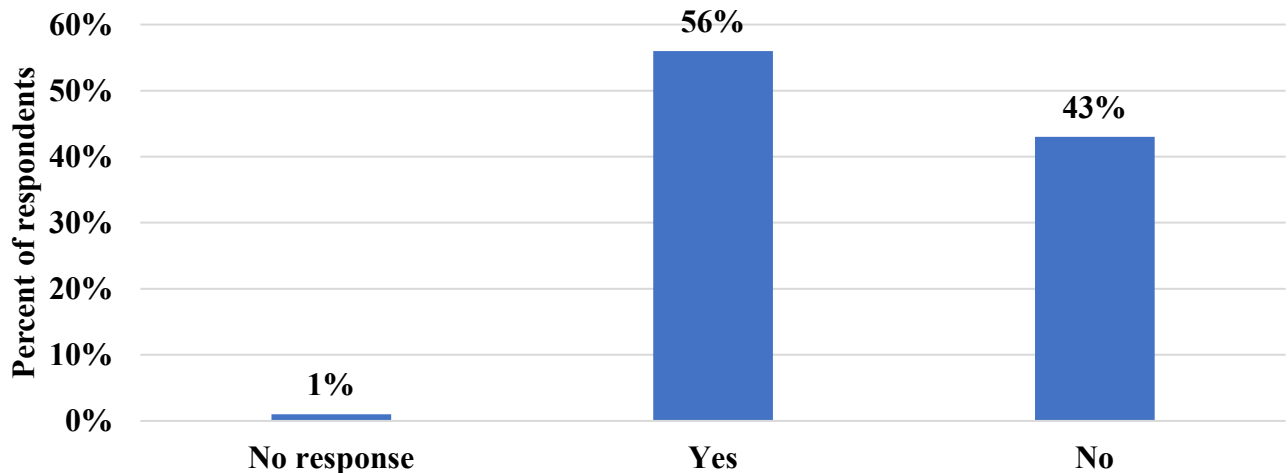
- No response : 0%
- 1 – 3 employees : 75%
- 4 – 6 employees : 0%
- 7 – 10 employees : 0%
- 11 – 15 employees : 0%
- 16 – 20 employees : 25%
- More than 20 employees : 0%



Q9. Has your farm or business had any employees miss work due to the coronavirus disease (COVID-19) in the period of time between October 1st 2020 and December 31st 2020?

(n = 100)

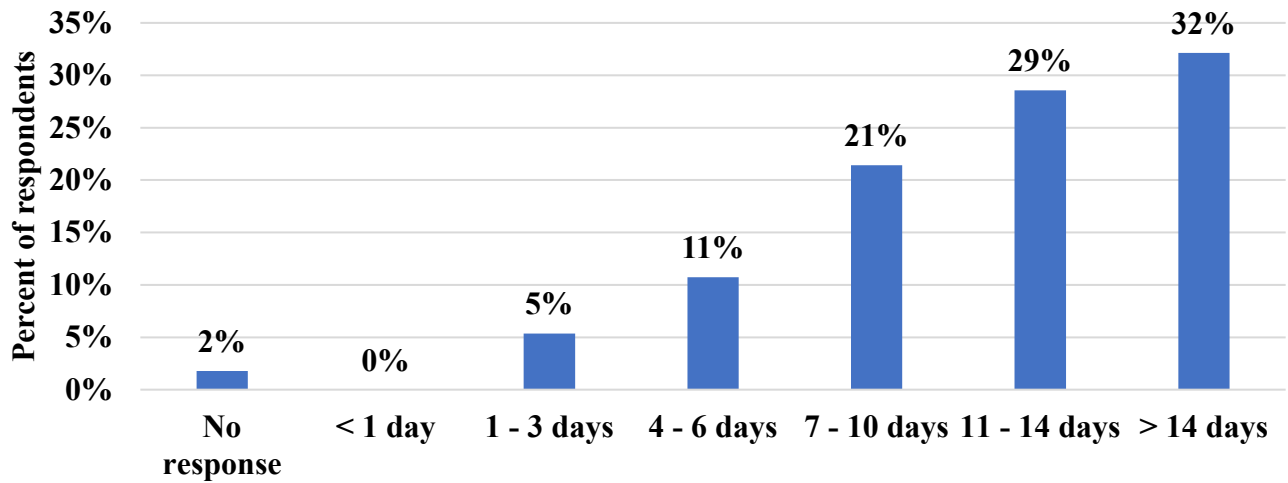
- No response : 1%
- Yes : 56%
- No : 43%



Q9.1. In total, approximately how many days have any employees in your farm or business missed work due to the coronavirus disease (COVID-19) in the period of time between October 1st 2020 and December 31st 2020?

(n = 56)

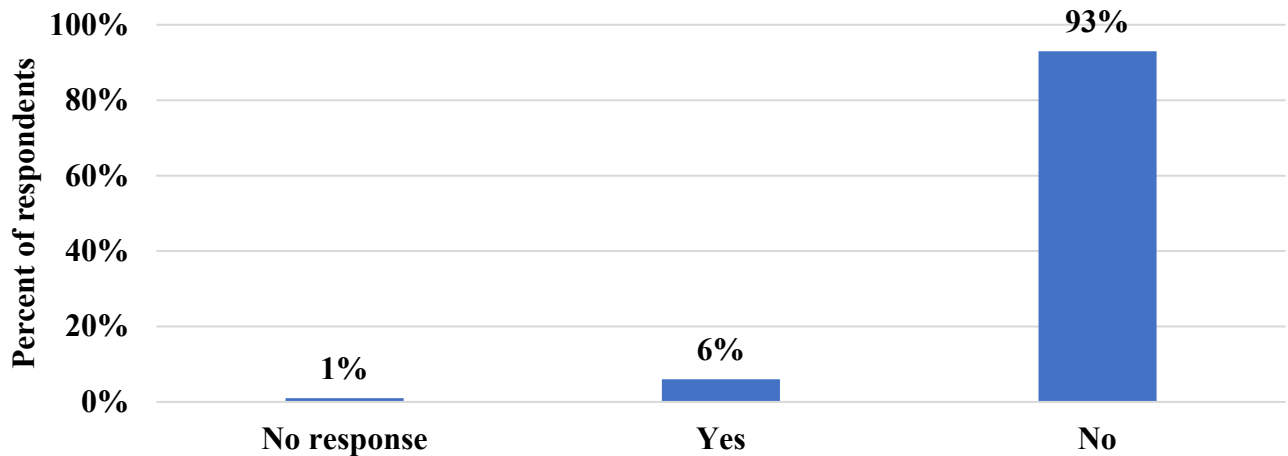
- No response : 2%
- Less than a day : 0%
- 1 - 3 days : 5%
- 4 – 6 days : 11%
- 7 – 10 days : 21%
- 11 – 14 days : 29%
- More than 14 days : 32%



Q10. Does your farm or business make use of H2A or H2B workers?

(n = 100)

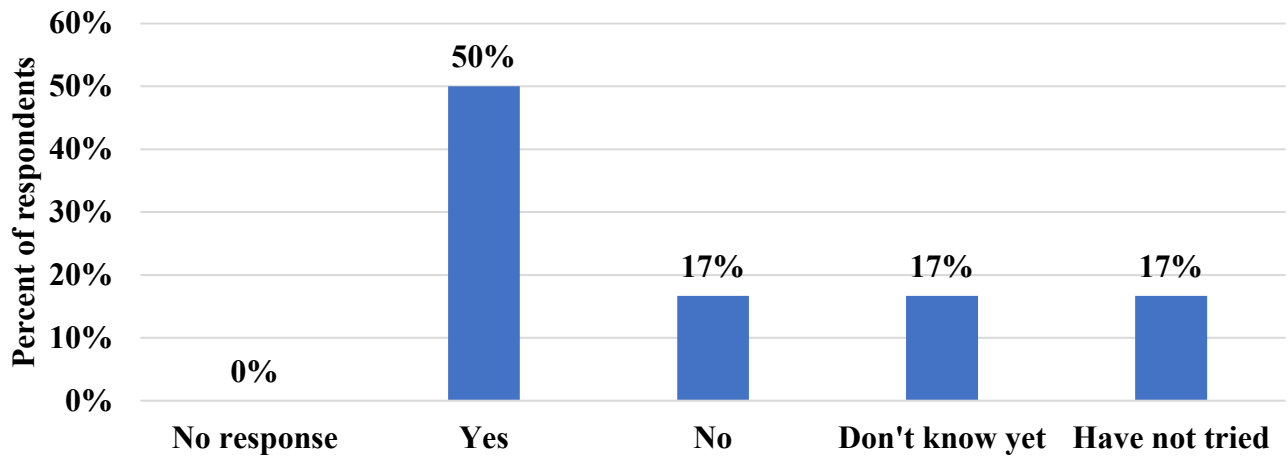
- No response : 1%
- Yes : 6%
- No : 93%



Q10.1. Has your farm or business been able to secure H2A and H2B workers during the coronavirus disease (COVID-19) pandemic in the period of time between October 1st 2020 and December 31st 2020?

(n = 6)

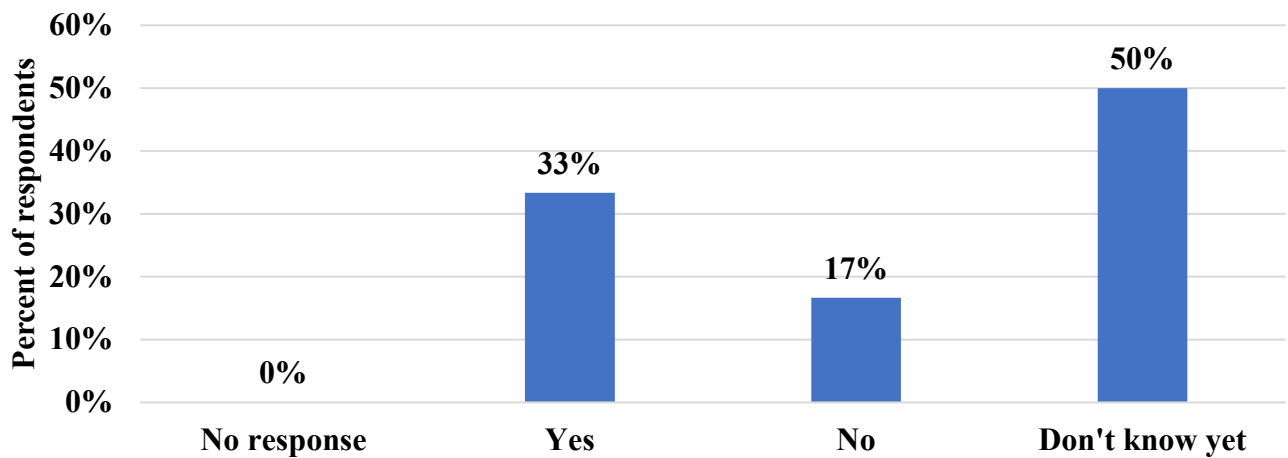
- No response : 0%
- Yes : 50%
- No : 17%
- Don't know yet : 17%
- Have not tried : 17%



Q10.2. Is your farm or business currently at risk of losing H2A or H2B workers due to the coronavirus disease (COVID-19) pandemic?

(n = 6)

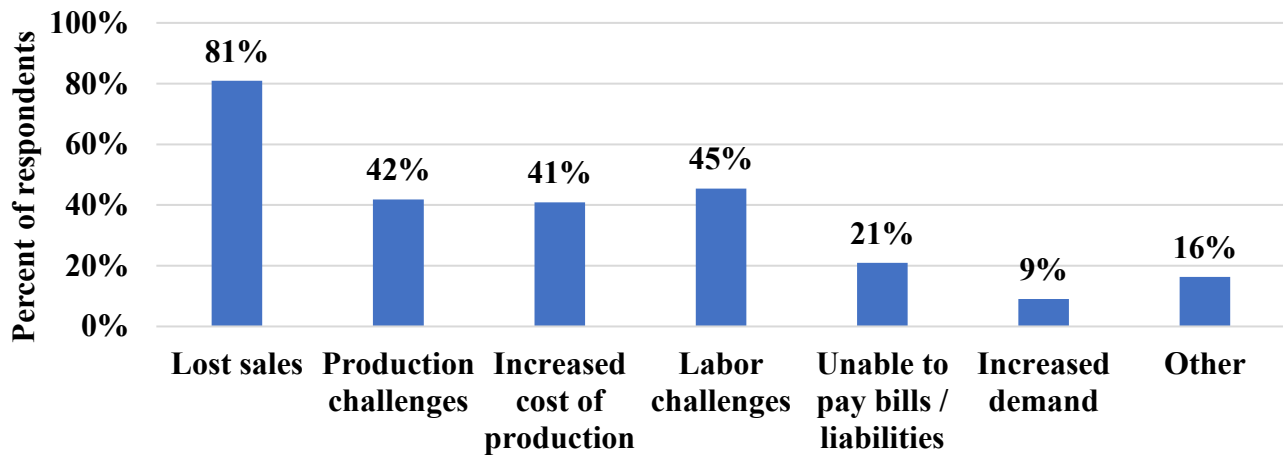
- No response : 0%
- Yes : 33%
- No : 17%
- Don't know yet : 50%



Q11. Has your farm or business experienced any of the following as a result of the coronavirus disease (COVID-19) in the period of time between October 1st 2020 and December 31st 2020? Please select all that apply.

(n = 110)

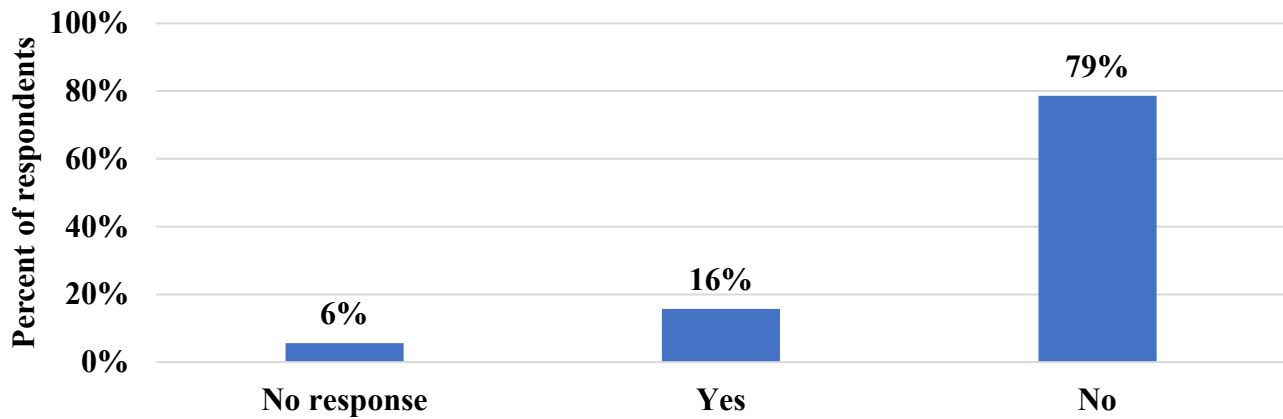
- Lost sales : 81%
- Production challenges (not related to labor) : 42%
- Increased cost of production : 41%
- Labor challenges : 45%
- Unable to pay bills or cover liabilities : 21%
- Increased demand for products : 9%
- Other : 16%



Q11.1. Has your farm or business experienced lost sales to international or export markets (outside of the United States), as a result of the coronavirus disease (COVID-19) in the period of time between October 1st 2020 and December 31st 2020?

(n = 89)

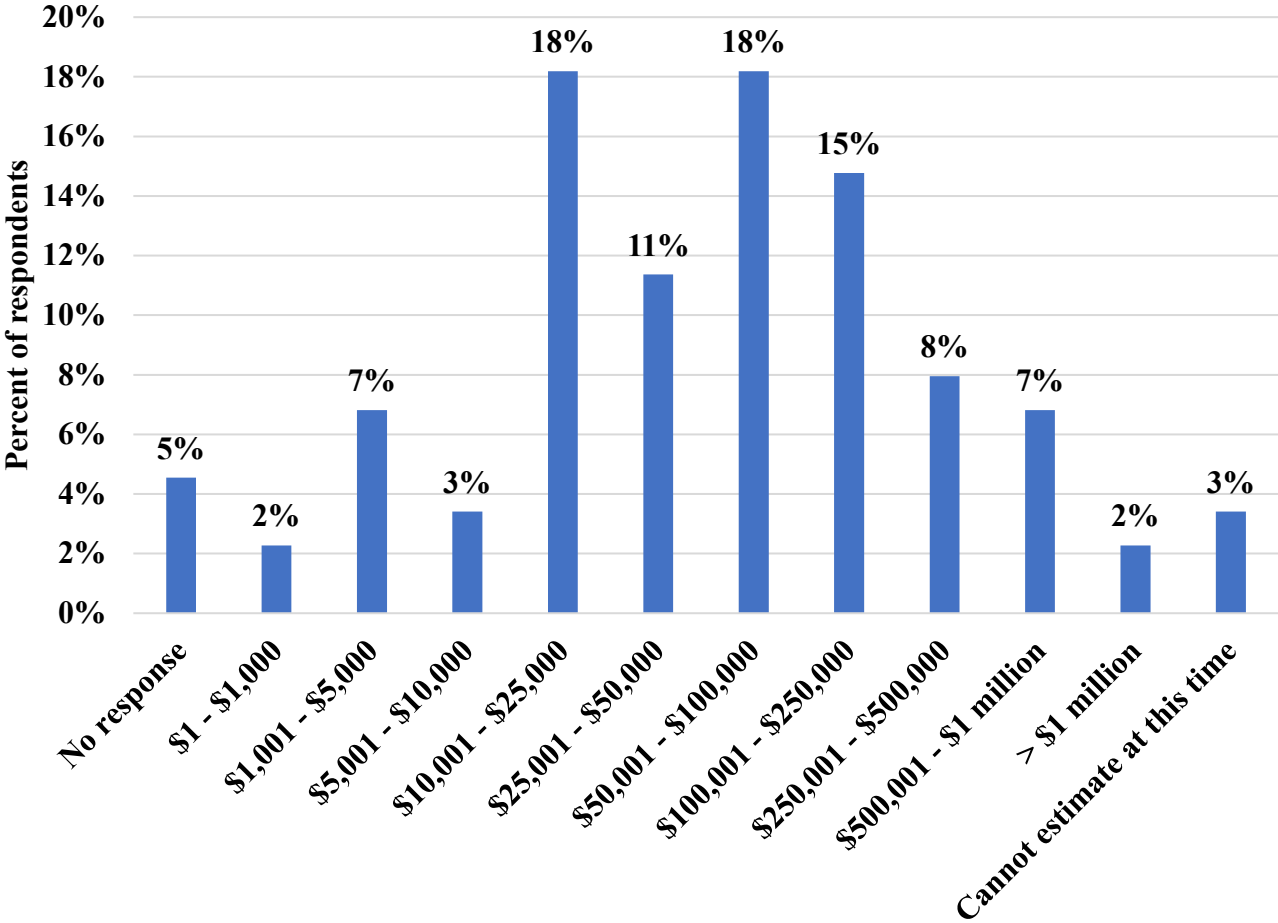
- No response : 6%
- Yes : 16%
- No : 79%



Q11.2. If your farm or business has experienced lost sales as a result of the coronavirus disease (COVID-19) in the period of time between October 1st 2020 and December 31st 2020, please estimate the value of lost sales:

(n = 88)

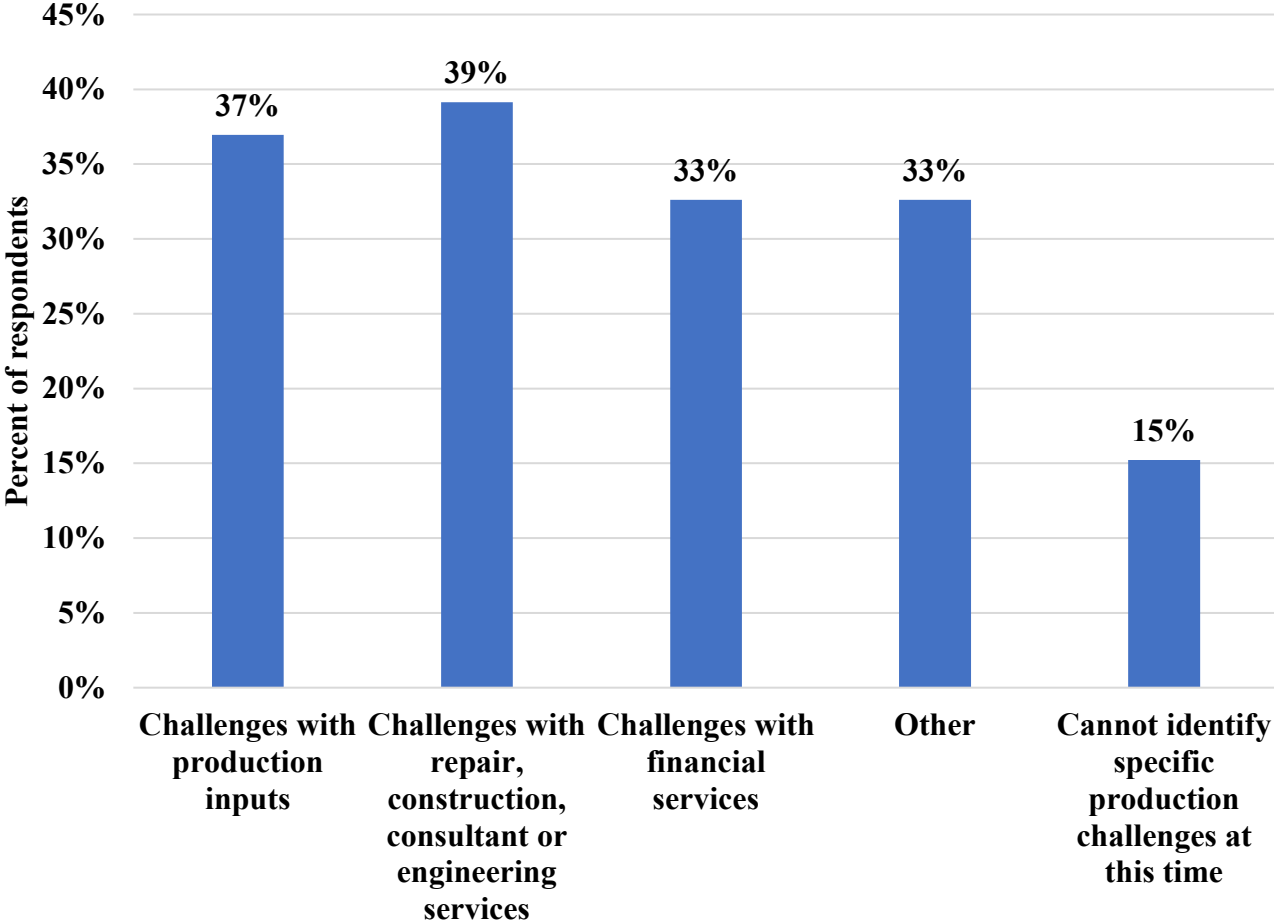
- No response : 5%
- \$1 - \$1,000 : 2%
- \$1,001 - \$5,000 : 7%
- \$5,001 - \$10,000 : 3%
- \$10,001 - \$25,000 : 18%
- \$25,001 - \$50,000 : 11%
- \$50,001 - \$100,000 : 18%
- \$100,001 - \$250,000 : 15%
- \$250,001 - \$500,000 : 8%
- \$500,001 - \$ 1million : 7%
- Greater than \$1 million : 2%
- Cannot estimate at this time : 3%



Q11.3. If your farm or business has experienced production challenges (not related to labor) as a result of the coronavirus disease (COVID-19) in the period of time between October 1st 2020 and December 31st 2020, can those challenges be specified? Please select all that apply.

(n = 46)

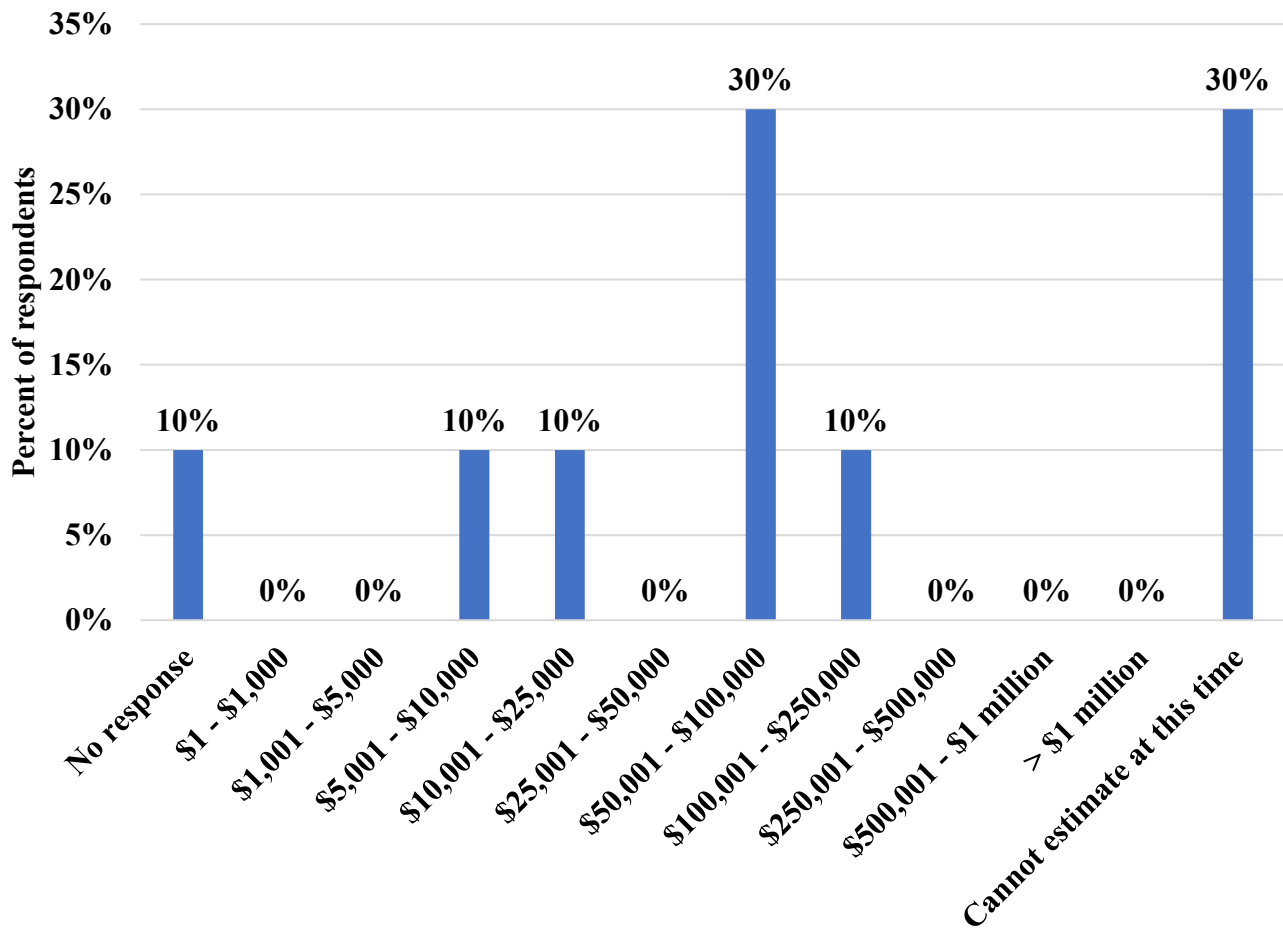
- Challenges with production inputs (feed, chemicals, therapeutants, etc.) : 37%
- Challenges with repair, construction, consultant, or engineering services : 39%
- Challenges with financial services (operating loans, leases, etc.) : 33%
- Other : 33%
- Cannot identify specific production challenges at this time : 15%



Q11.6. If your farm or business has experienced increased demand for products as a result of the coronavirus disease (COVID-19) in the period of time between October 1st 2020 and December 31st 2020, please estimate the value of those effects on sales:

(n = 10)

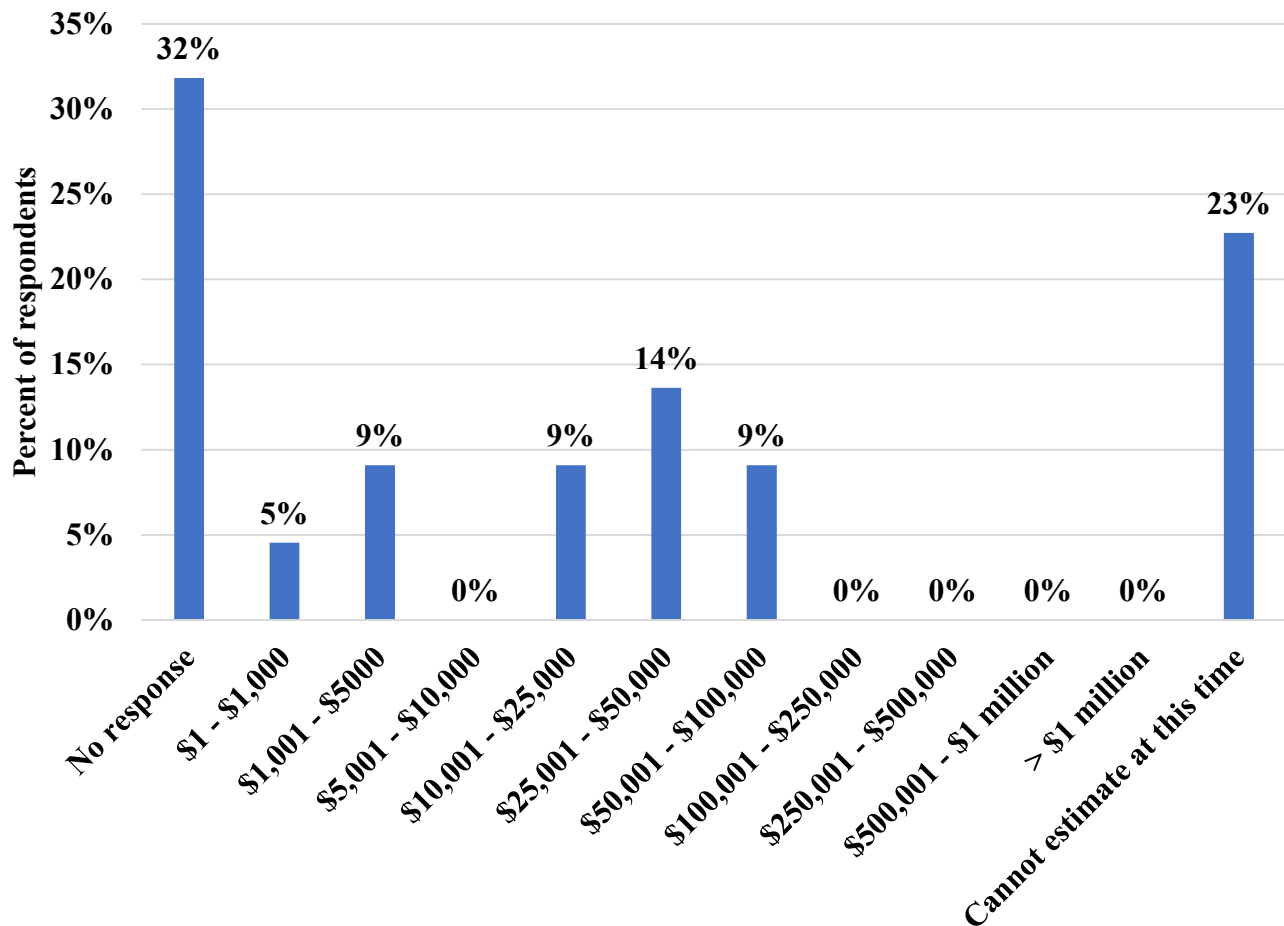
- No response : 10%
- \$1 - \$1,000 : 0%
- \$1,001 - \$5,000 : 0%
- \$5,001 - \$10,000 : 10%
- \$10,001 - \$25,000 : 10%
- \$25,001 - \$50,000 : 0%
- \$50,001 - \$100,000 : 30%
- \$100,001 - \$250,000 : 10%
- \$250,001 - \$500,000 : 0%
- \$500,001 - \$ 1million : 0%
- Greater than \$1 million : 0%
- Cannot estimate at this time : 30%



Q11.8. If your farm or allied business has experienced missed bill or loan payments as a result of the coronavirus disease (COVID-19) in the period of time between October 1st 2020 and December 31st 2020? Please estimate the value of those missed payments:

(n = 22)

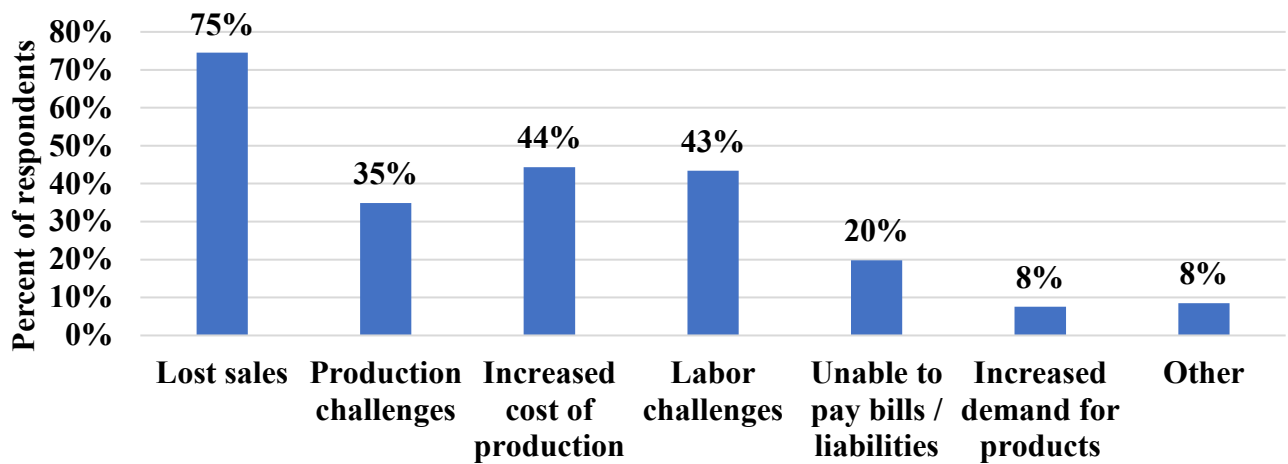
- No response : 32%
- \$1 - \$1,000 : 5%
- \$1,001 - \$5,000 : 9%
- \$5,001 - \$10,000 : 0%
- \$10,001 - \$25,000 : 9%
- \$25,001 - \$50,000 : 14%
- \$50,001 - \$100,000 : 9%
- \$100,001 - \$250,000 : 0%
- \$250,001 - \$500,000 : 0%
- \$500,001 - \$ 1million : 0%
- Greater than \$1 million : 0%
- Cannot estimate at this time : 23%



Q12. Does your farm or business expect to experience any of the following as a result of the coronavirus disease (COVID-19) in the 1st Quarter of 2021 (January, February, March)? Please select all that apply.

(n = 106)

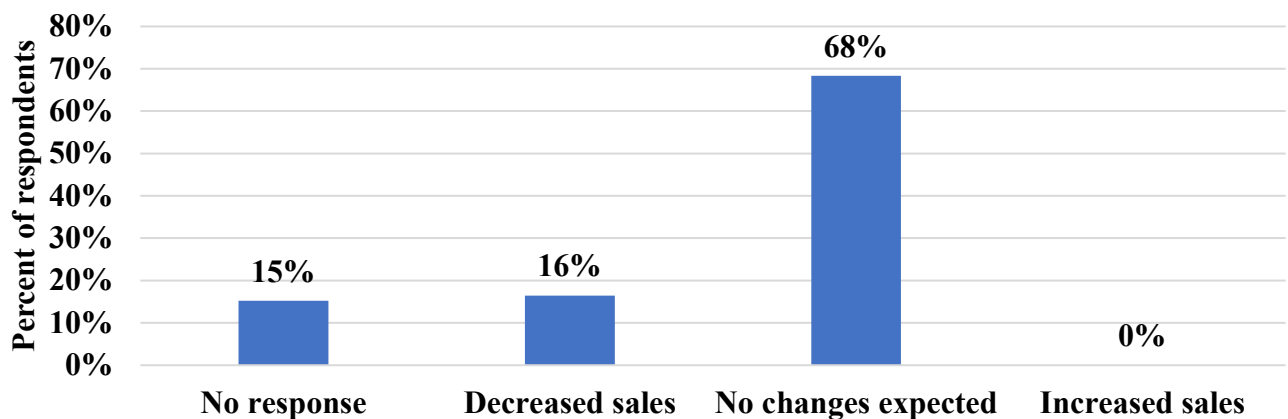
- Lost sales : 75%
- Production challenges (not related to labor) : 35%
- Increased cost of production : 44%
- Labor challenges : 43%
- Unable to pay bills or cover liabilities : 20%
- Increased demand for products : 8%
- Other : 8%



Q12.1. Does your farm or allied business expect to experience changes in sales to international or export markets (outside of the United States), as a result of the coronavirus disease (COVID-19), in the 1st Quarter of 2021 (January, February, March)?

(n = 76)

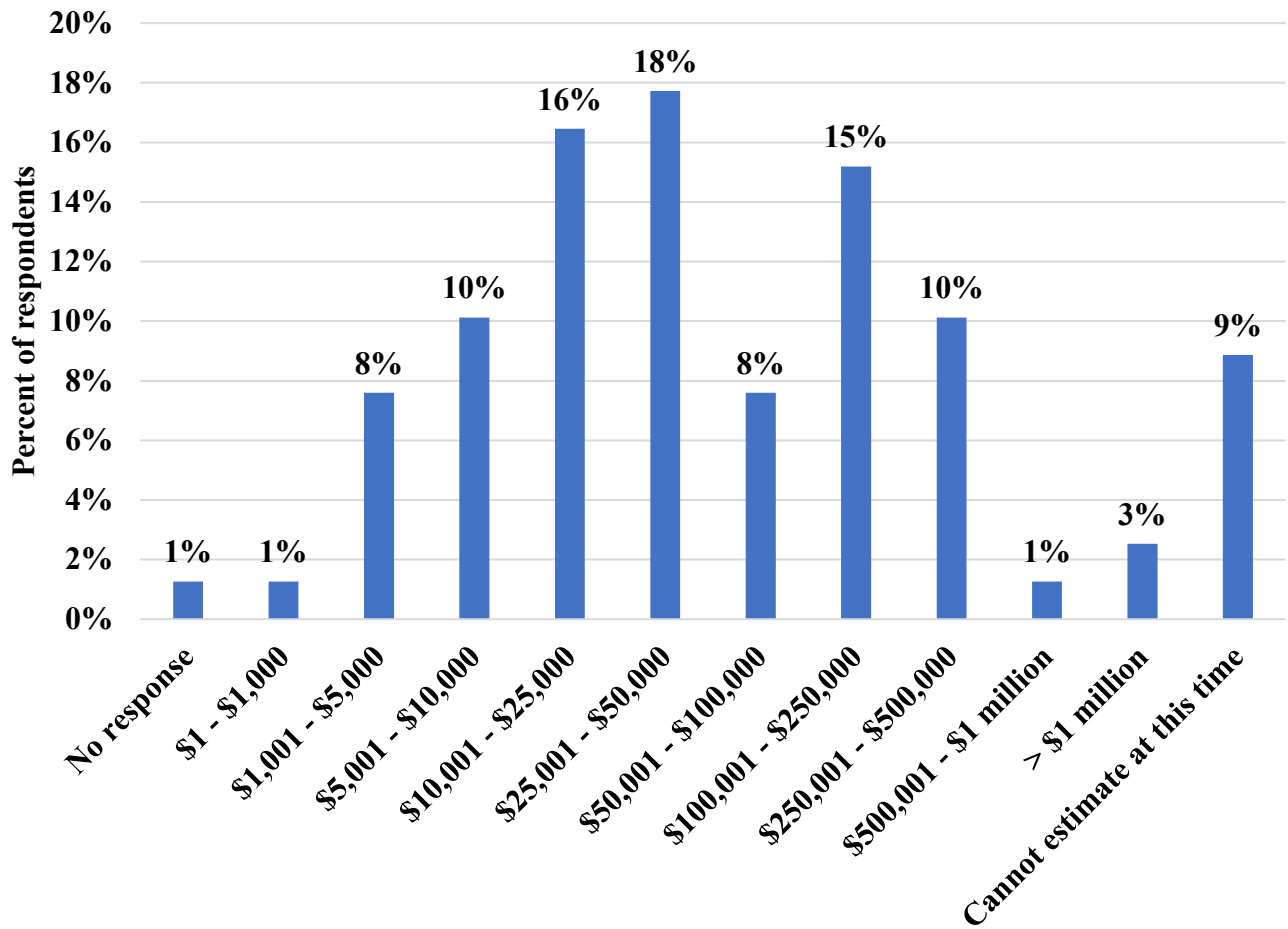
- No response : 15%
- Decreased sales : 16%
- No changes expected : 68%
- Increased sales : 0%



Q12.2. Does your farm or business expect to experience lost sales as a result of the coronavirus disease (COVID-19) in the 1st Quarter of 2021 (January, February, March)? Please estimate the value of lost sales:

(n = 79)

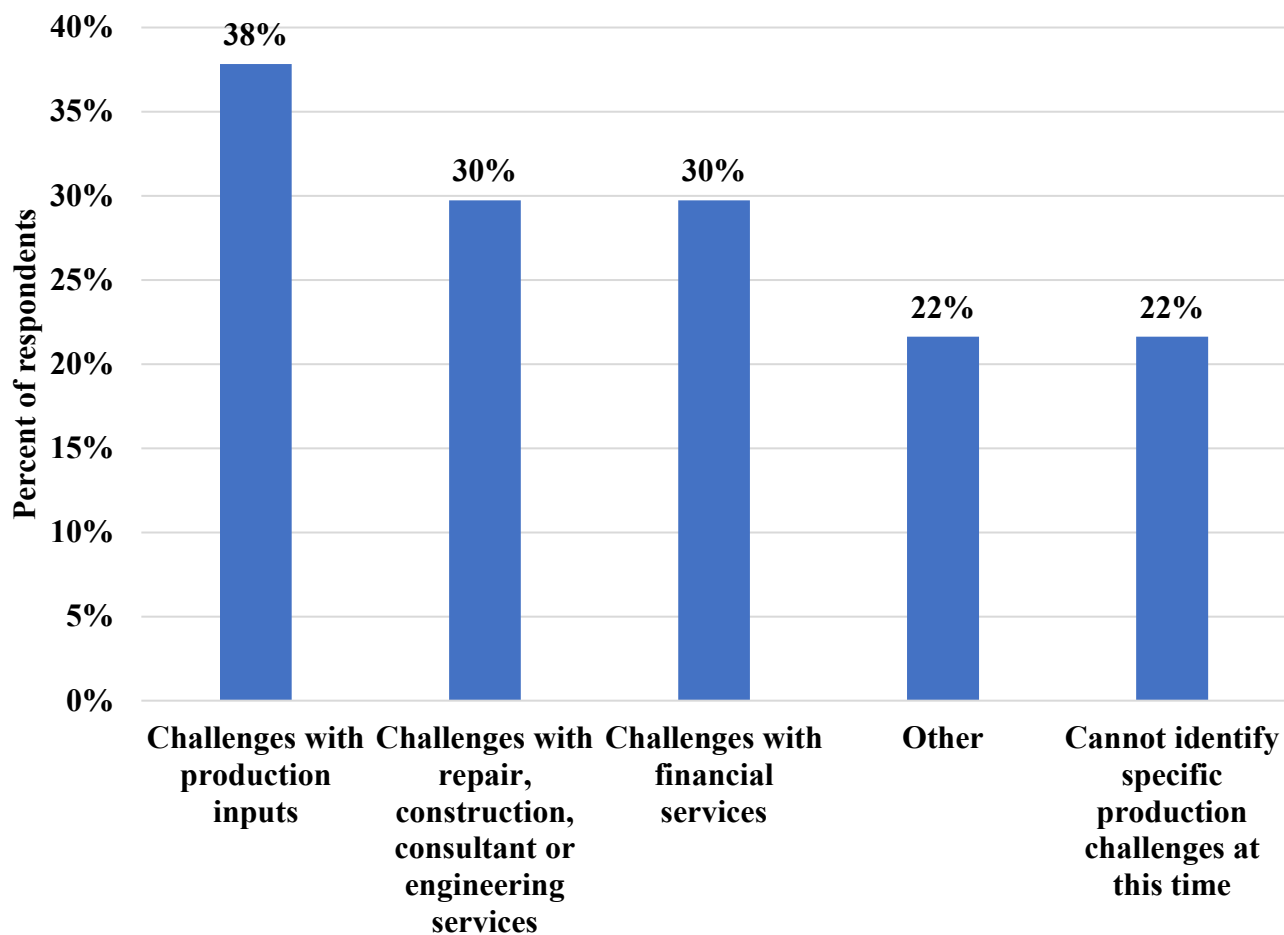
- No response : 1%
- \$1 - \$1,000 : 1%
- \$1,001 - \$5,000 : 8%
- \$5,001 - \$10,000 : 10%
- \$10,001 - \$25,000 : 16%
- \$25,001 - \$50,000 : 18%
- \$50,001 - \$100,000 : 8%
- \$100,001 - \$250,000 : 15%
- \$250,001 - \$500,000 : 10%
- \$500,001 - \$ 1million : 1%
- Greater than \$1 million : 3%
- Cannot estimate at this time : 9%



Q12.3. Does your farm or business expect to experience production challenges (not related to labor) as a result of the coronavirus disease (COVID-19) in the 1st Quarter of 2021 (January, February, March), please select all that apply.

(n = 37)

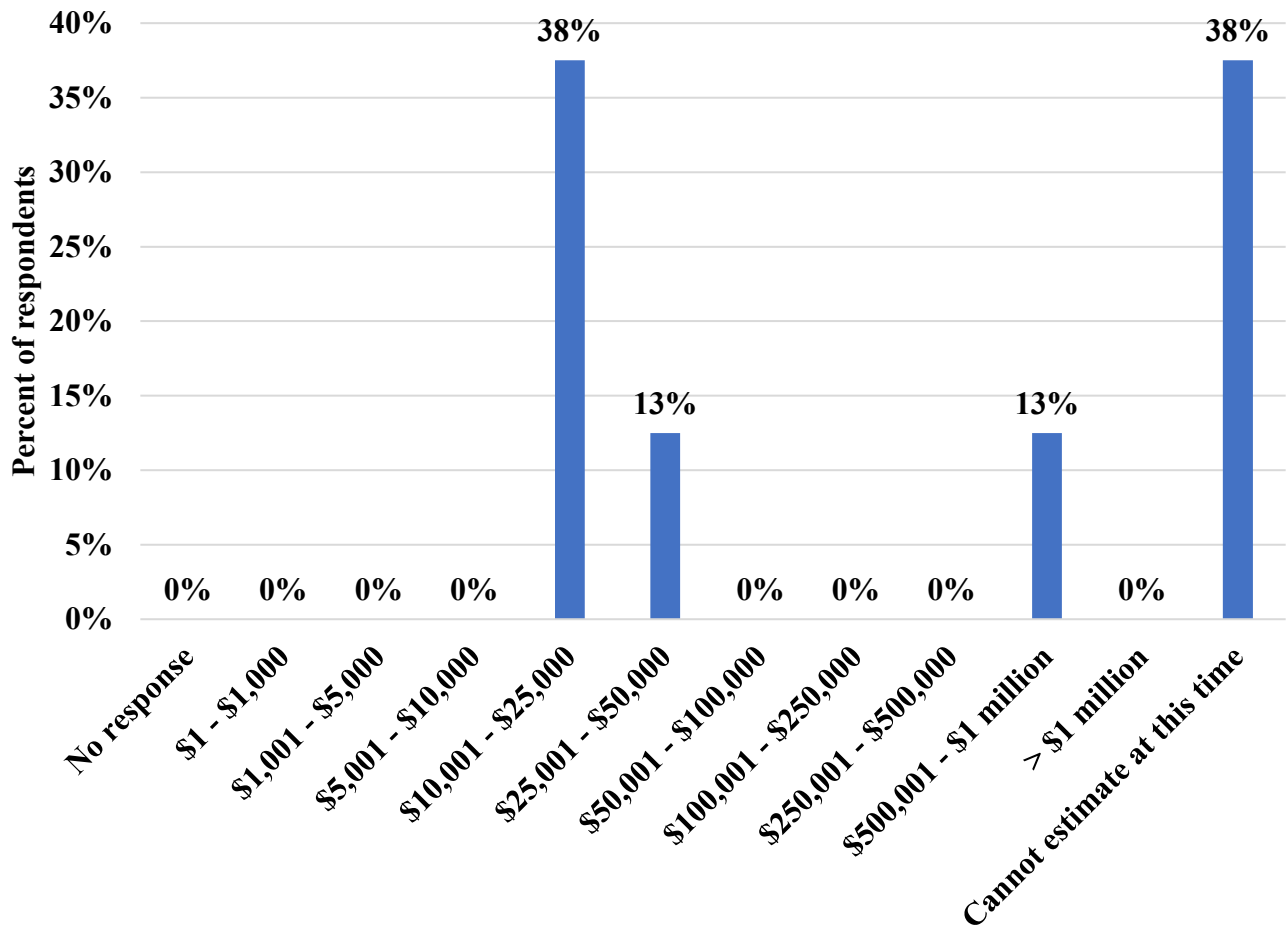
- Challenges with production inputs (feed, chemicals, therapeutants, etc.) : 38%
- Challenges with repair, construction, consultant or engineering services : 30%
- Challenges with financial services (operating loans, leases, etc.) : 30%
- Other : 22%
- Cannot identify specific production challenges at this time : 22%



Q12.6. Does your farm or business expect to experience increased demand for products as a result of the coronavirus disease (COVID-19) in the 1st Quarter of 2021 (January, February, March)? Please estimate the value of those effects on sales:

(n = 8)

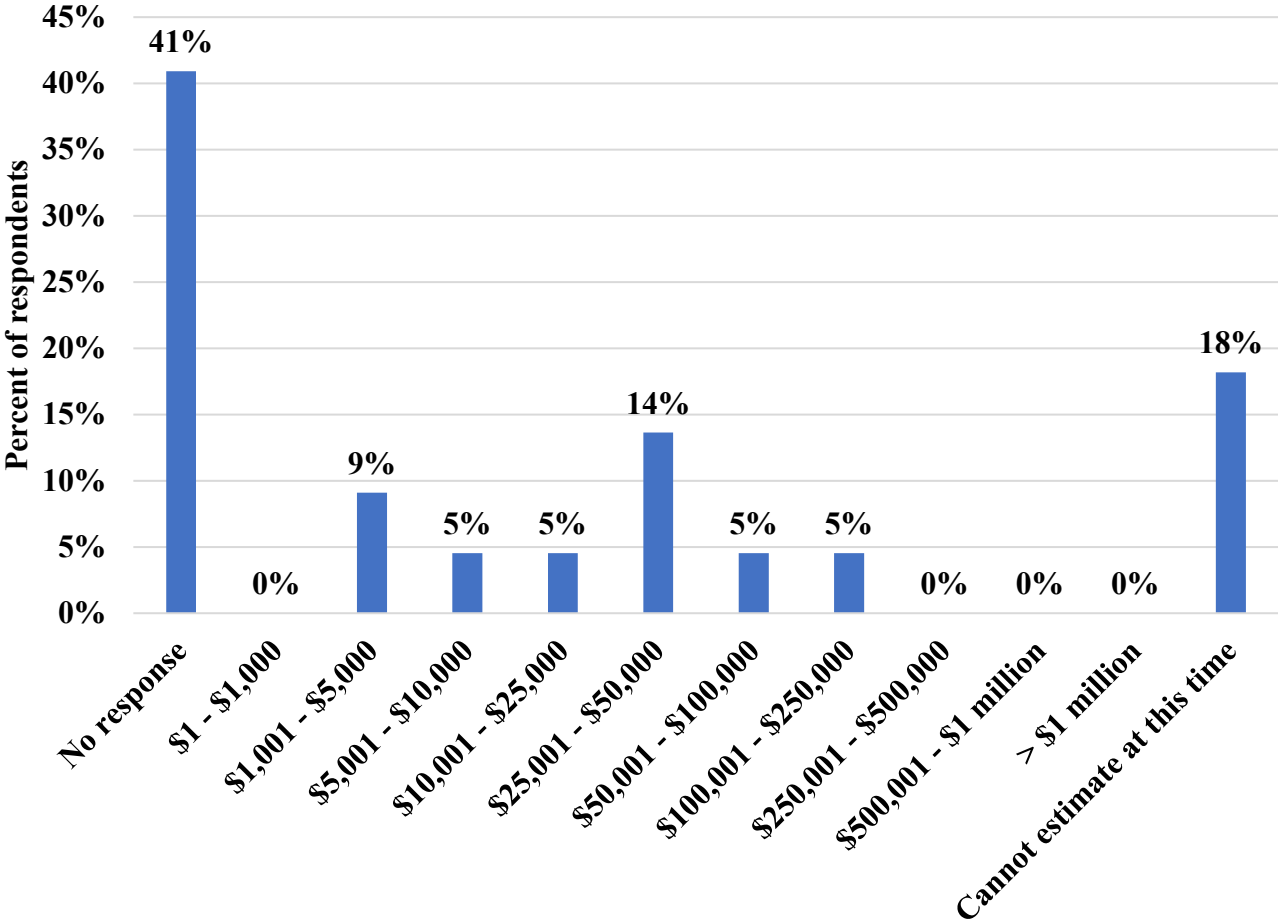
- No response : 0%
- \$1 - \$1,000 : 0%
- \$1,001 - \$5,000 : 0%
- \$5,001 - \$10,000 : 0%
- \$10,001 - \$25,000 : 38%
- \$25,001 - \$50,000 : 13%
- \$50,001 - \$100,000 : 0%
- \$100,001 - \$250,000 : 0%
- \$250,001 - \$500,000 : 0%
- \$500,001 - \$ 1million : 13%
- Greater than \$1 million : 0%
- Cannot estimate at this time : 38%



Q12.8. If your farm or allied business expects to miss bill or loan payments as a result of the coronavirus disease (COVID-19) in the 1st Quarter of 2021 (January, February, March), please estimate the value of those missed payments:

(n = 22)

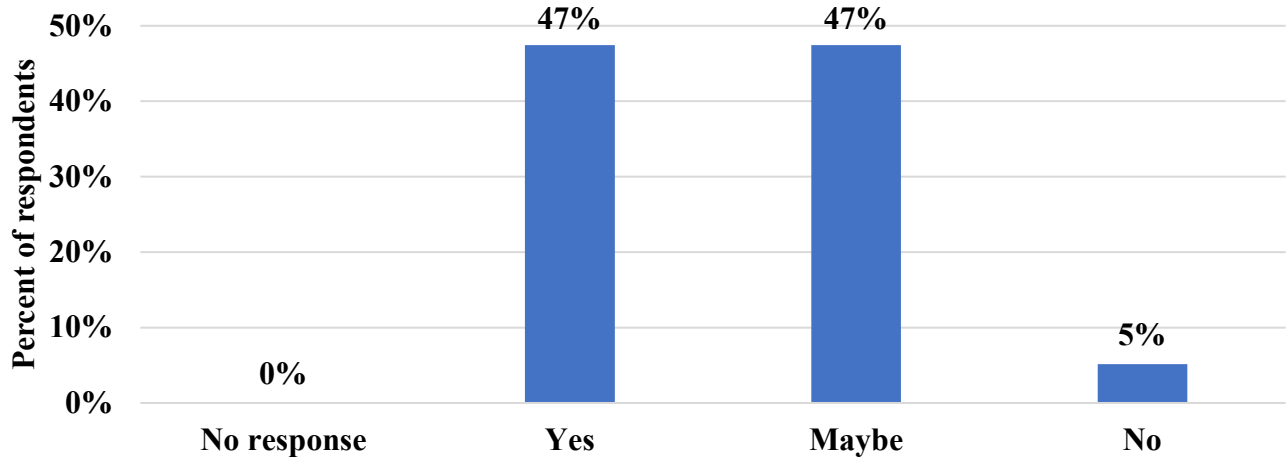
- No response : 41%
- \$1 - \$1,000 : 0%
- \$1,001 - \$5,000 : 9%
- \$5,001 - \$10,000 : 5%
- \$10,001 - \$25,000 : 5%
- \$25,001 - \$50,000 : 14%
- \$50,001 - \$100,000 : 5%
- \$100,001 - \$250,000 : 5%
- \$250,001 - \$500,000 : 0%
- \$500,001 - \$ 1million : 0%
- Greater than \$1 million : 0%
- Cannot estimate at this time : 18%



Q13. Without external intervention (for example, governmental assistance), will your farm or business survive in the next 3 (three) months?

(n = 97)

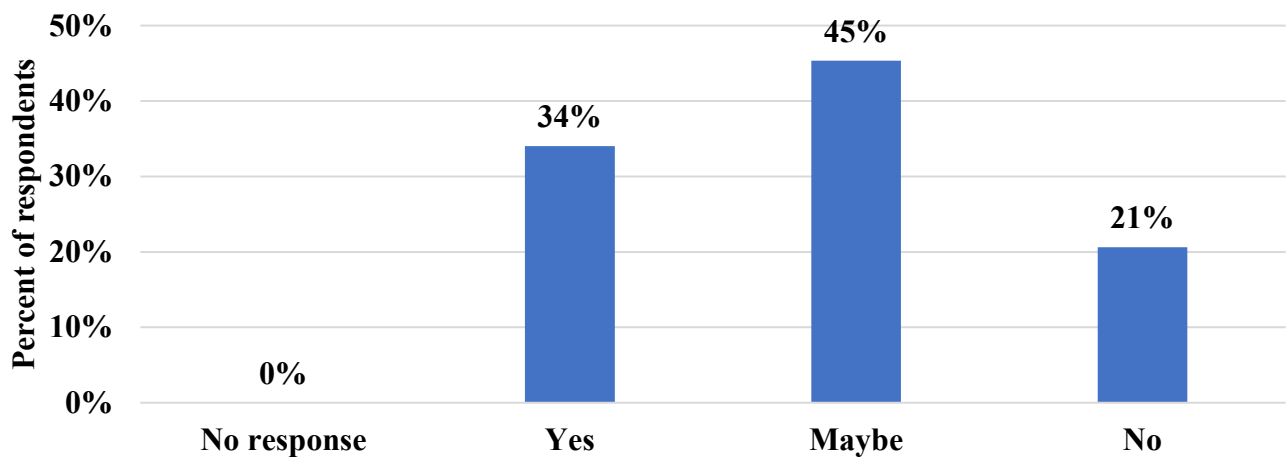
- No response : 0%
- Yes : 47%
- Maybe : 47%
- No : 5%



Q14. Without external intervention (for example, governmental assistance), will your farm or business survive in the next 6 (six) months?

(n = 97)

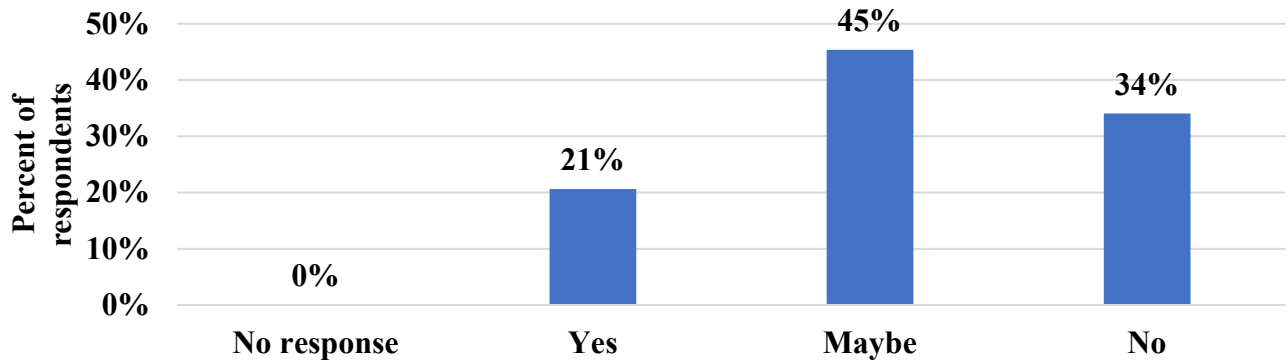
- No response : 0%
- Yes : 34%
- Maybe : 45%
- No : 21%



Q15. Without external intervention (for example, governmental assistance), will your farm or business survive in the next 12 (twelve) months?

(n = 97)

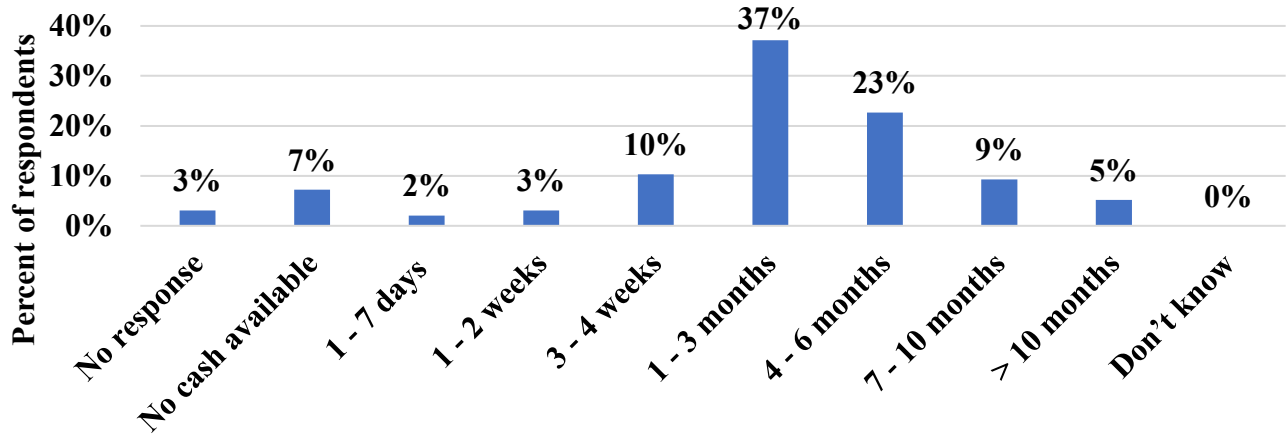
- No response : 0%
- Yes : 21%
- Maybe : 45%
- No : 34%



Q16. How would you describe the current availability of cash on hand for your farm or allied business, including financial assistance or loans? Please select how long a period the current cash on hand will cover:

(n = 97)

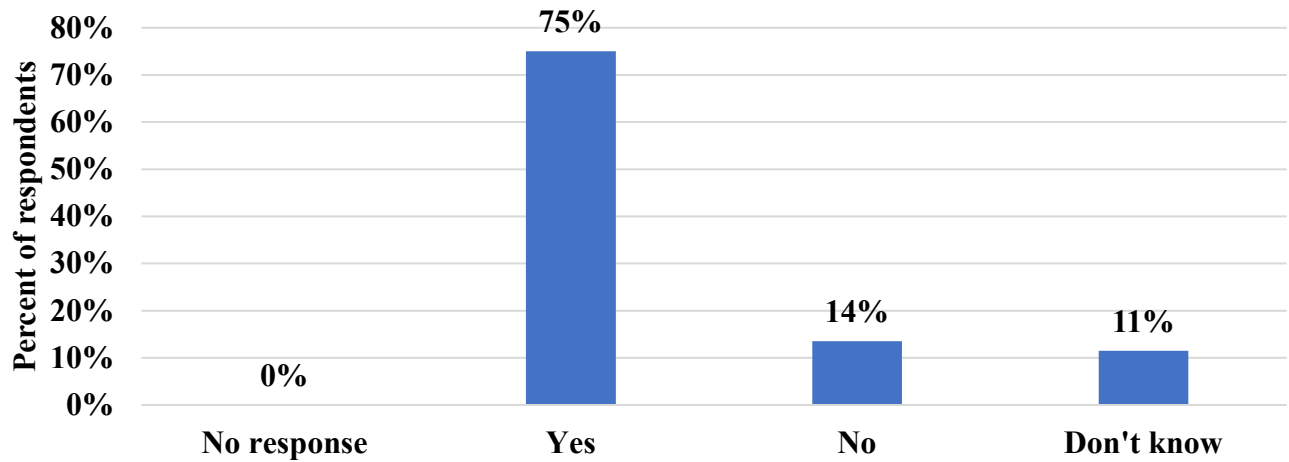
- No response : 3%
- No cash available for business operations : 7%
- 1 - 7 days of operations : 2%
- 1 - 2 weeks of operations : 3%
- 3 - 4 weeks of operations : 10%
- 1 - 2 months of operations : 37%
- 4 - 6 months of operations : 23%
- 7 - 10 months of operations : 9%
- More than 10 months of operations : 5%
- Don't know : 0%



Q17. Will holding market ready product, as a result of the coronavirus disease (COVID-19), make it less marketable?

(n = 96)

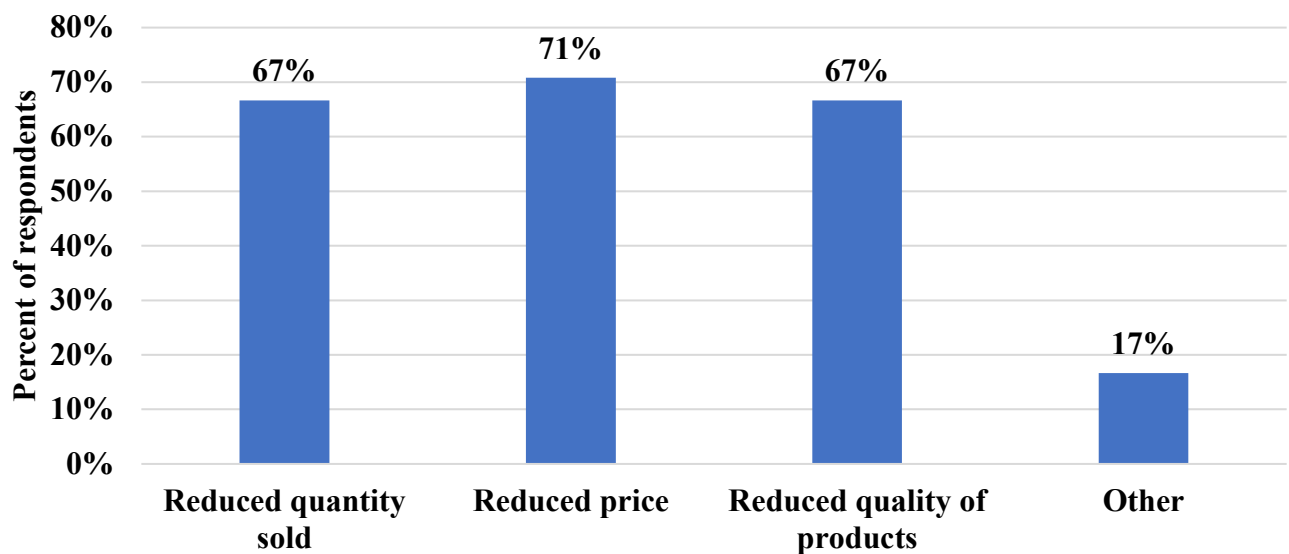
- No response : 0%
- Yes : 75%
- No : 14%
- Don't know : 11%



Q17.1. Will holding market ready product, as a result of the coronavirus disease (COVID-19), result in: Please select all that apply.

(n = 72)

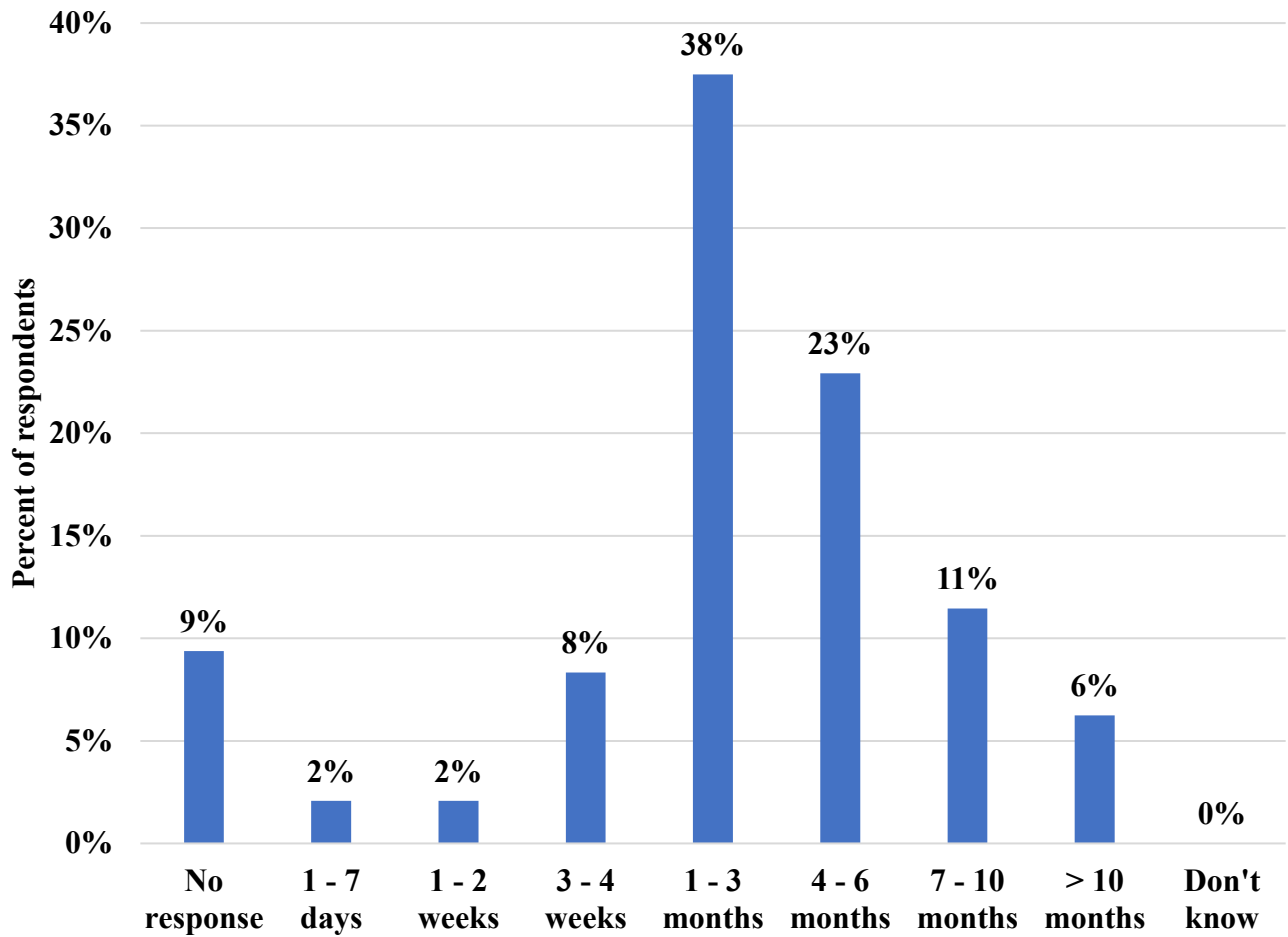
- Reduced quantity sold : 67%
- Reduced price : 71%
- Reduced quality of product : 67%
- Other : 17%



Q18. How long can your farm or allied business hold market ready product, as a result of the coronavirus disease (COVID-19), before it becomes an issue for new crops or planting?

(n = 96)

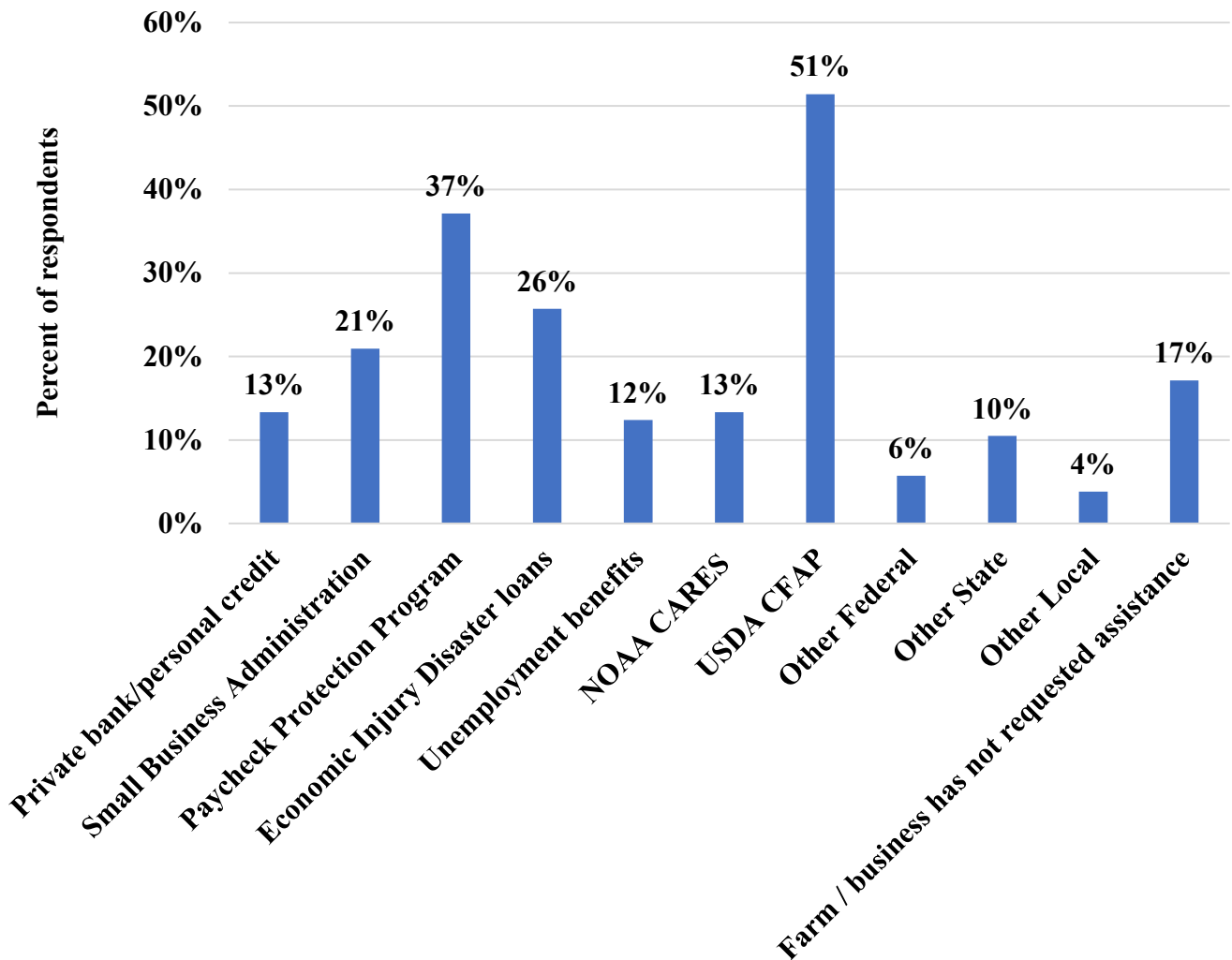
- No response : 9%
- 1 - 7 days : 2%
- 1 - 2 weeks : 2%
- 3 - 4 weeks : 8%
- 1 - 3 months : 38%
- 4 - 6 months : 23%
- 7 - 10 months : 11%
- More than 10 months : 6%
- Don't know : 0%



Q19. Please indicate if your farm or allied business has applied for loans or financial assistance from any of the following programs in the period of time between October 1st 2020 and December 31st 2020: (please select all that apply)

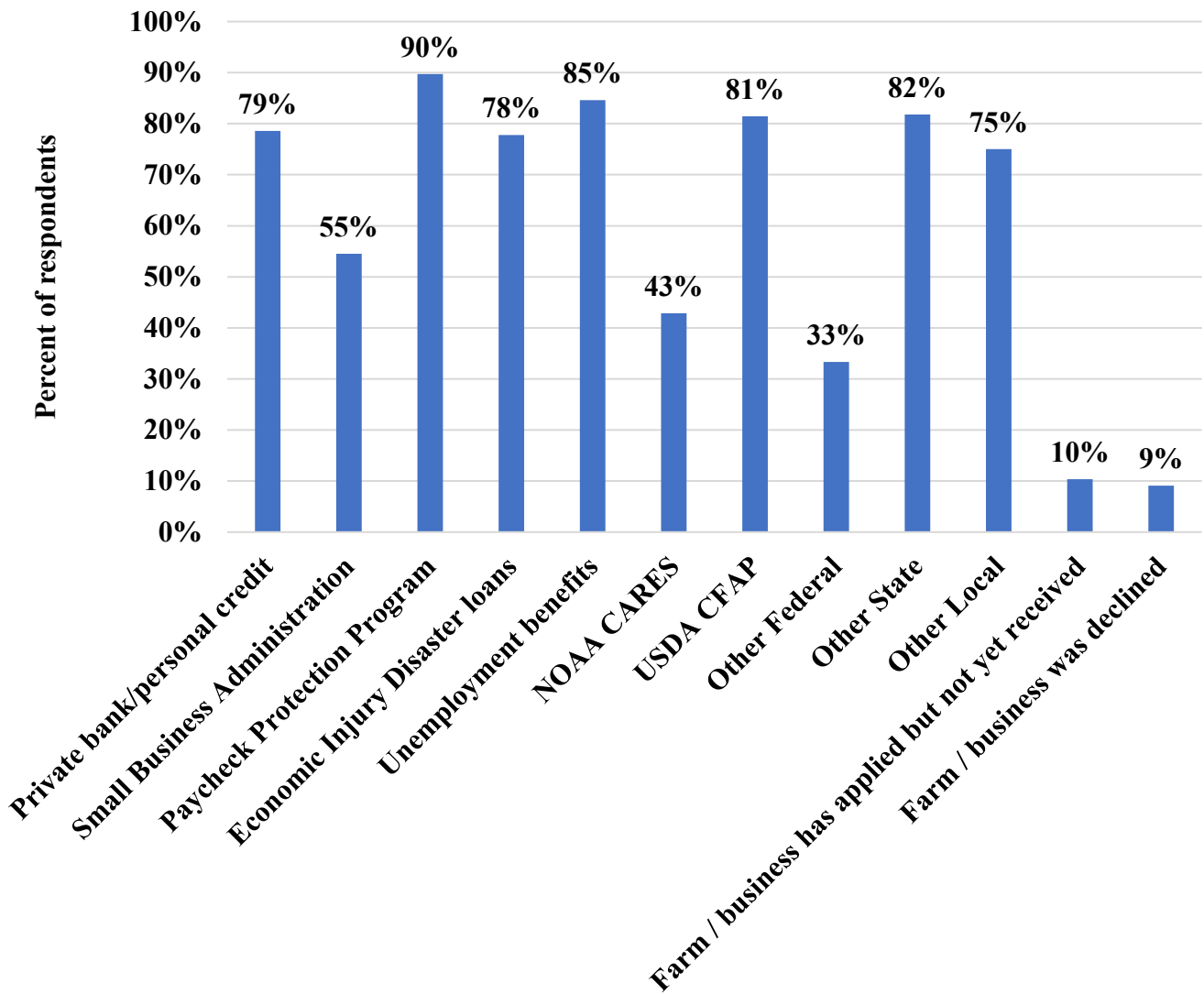
(n = 105)

- Private bank loans / personal line of credit : 13%
- Small Business Administration loans (SBA) : 21%
- Paycheck Protection Program loans (PPP) : 37%
- Economic Injury Disaster Loans (EIDL) : 26%
- Unemployment benefits : 12%
- NOAA CARES ACT Section 12005 : 13%
- USDA Coronavirus Food Assistance Program (CFAP) : 51%
- Other **Federal** program or initiative (please describe): : 6%
- Other **State** program or initiative (please describe): : 10%
- Other **Local** program or initiative : 4%
- Farm or business has not requested financial assistance from any source : 17%



Q19.1. Please indicate if your farm or allied business has received loans or financial assistance from any of the following programs that you applied for: (please select all that apply)

- Private bank loans / personal line of credit (n = 14) : 79%
- Small Business Administration loans (SBA) (n = 22) : 55%
- Paycheck Protection Program loans (PPP) (n = 39) : 90%
- Economic Injury Disaster Loans (EIDL) (n = 27) : 78%
- Unemployment benefits (n = 13) : 85%
- NOAA CARES ACT Section 12005 (n = 14) : 43%
- USDA Coronavirus Food Assistance Program (CFAP) (n = 54) : 81%
- Other **Federal** program or initiative (n = 6) : 33%
- Other **State** program or initiative (n = 11) : 82%
- Other **Local** program or initiative (n = 4) : 75%
- Farm or business has applied but not yet received loans or assistance (n = 77) : 10%
- Farm or business applications have been denied / declined (n = 77) : 9%



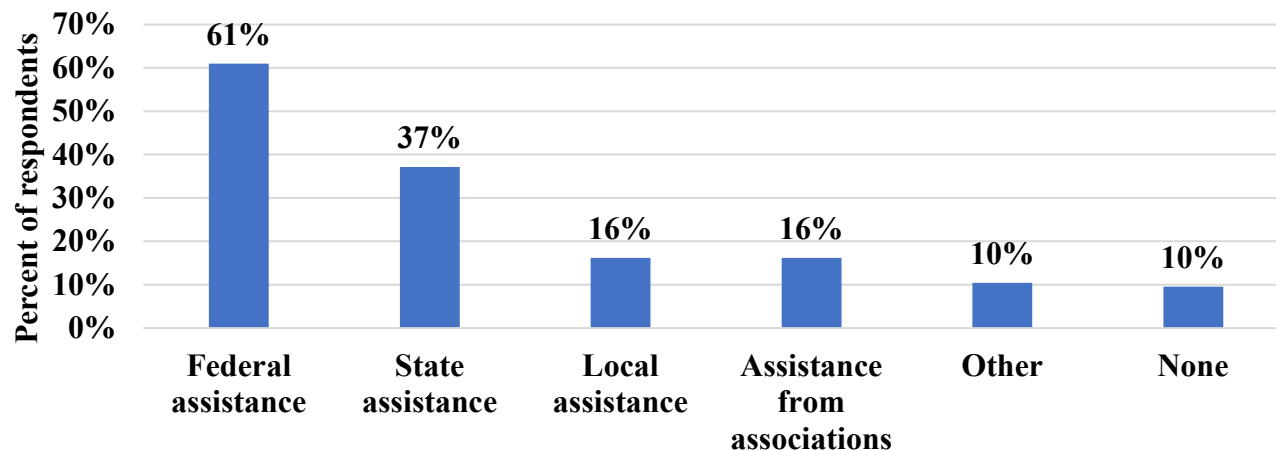
Q19.2. Please indicate if loans or financial assistance received by your farm or allied business has been helpful.

Financial Assistance Program	No response	Yes	No
Private bank loans / personal line of credit (n = 11)	9%	82%	9%
Small Business Administration loans (SBA) (n = 12)	0%	92%	8%
Paycheck Protection Program loans (PPP) (n = 35)	3%	94%	3%
Economic Injury Disaster Loans (EIDL) (n = 21)	5%	90%	5%
Unemployment benefits (n = 11)	0%	91%	9%
NOAA Cares Act Section 12005 (n = 6)	17%	83%	0%
USDA Coronavirus Food Assistance Program (CFAP) (n = 44)	2%	95%	2%
Other Federal program or initiative (n = 2)	0%	100%	0%
Other State program or initiative (n = 9)	0%	89%	11%
Other Local program or initiative (n = 3)	0%	100%	0%

Q20. Are there specific steps or types of assistance that would increase the likelihood for your farm or business to survive? Please select all that apply.

(n = 105)

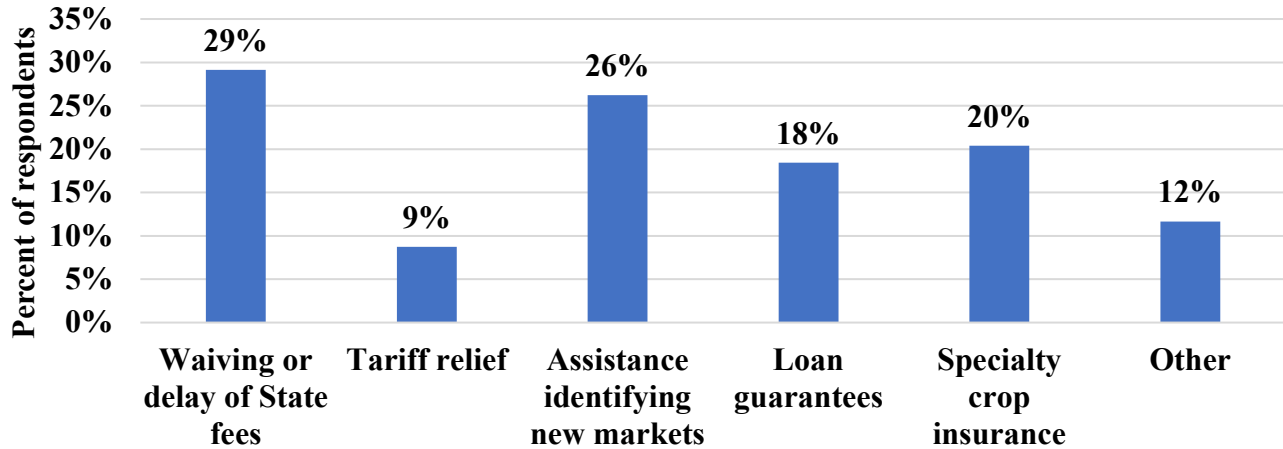
- Federal assistance : 61%
- State assistance : 37%
- Local assistance : 16%
- Assistance from associations : 16%
- Other : 10%
- None : 10%



Q21. Would assistance with any of the following be helpful to your farm or business right now? Please select all that apply.

(n = 103)

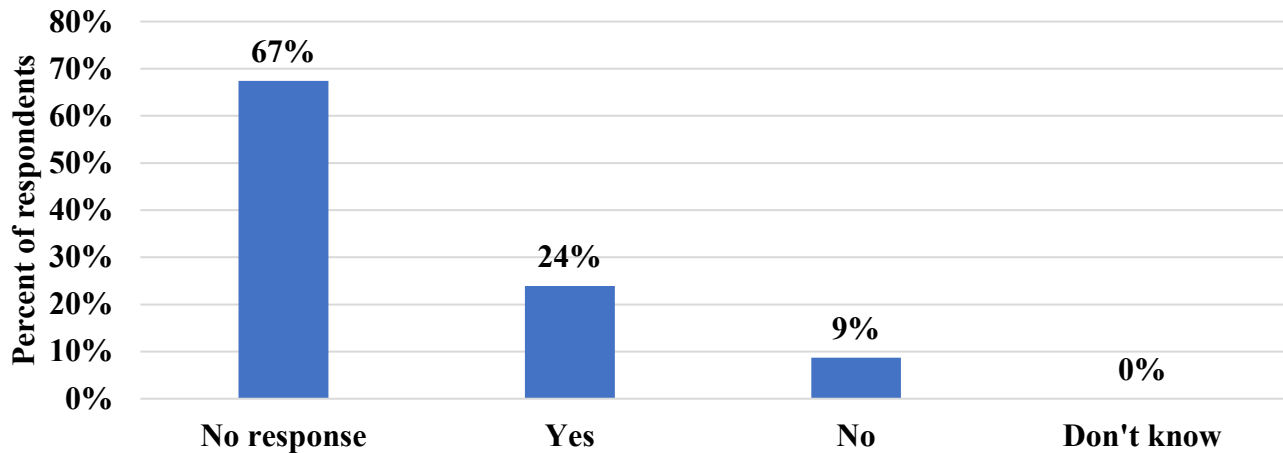
- Waiving or delay of State fees : 29%
- Tariff relief : 9%
- Assistance identifying new markets : 26%
- Loan guarantees : 18%
- Specialty Crop Insurance : 20%
- Other : 12%



Q22. Are there any existing programs that your aquaculture, aquaponics, or allied business does not currently qualify for, that would increase the likelihood of survival of your farm or business?

(n = 46)

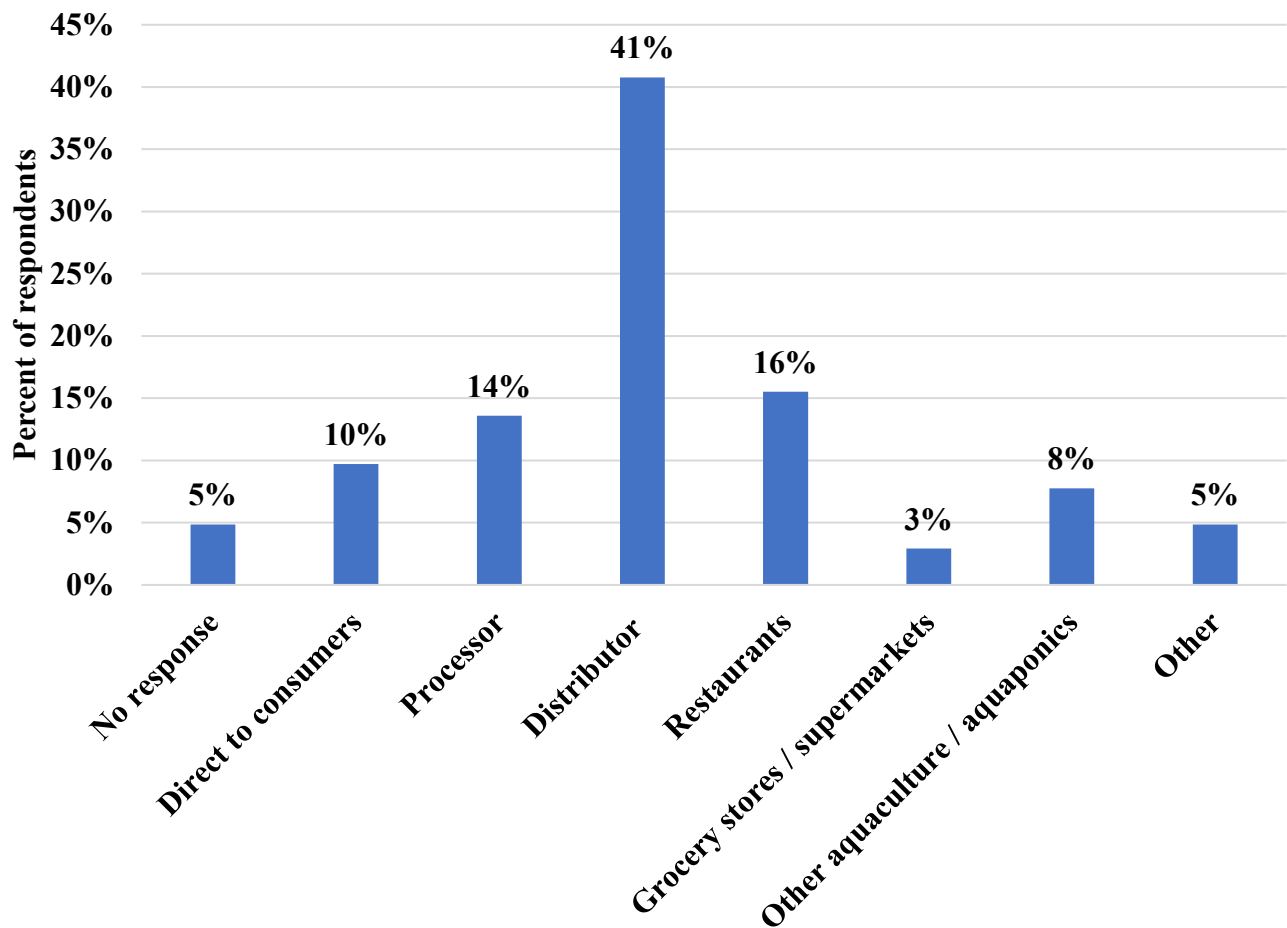
- No response : 67%
- Yes : 24%
- No : 9%
- Don't know : 0%



Q23. How did your farm or allied business primarily market or sell aquaculture / aquaponics products before the effects of the coronavirus disease pandemic (COVID-19)?

(n = 103)

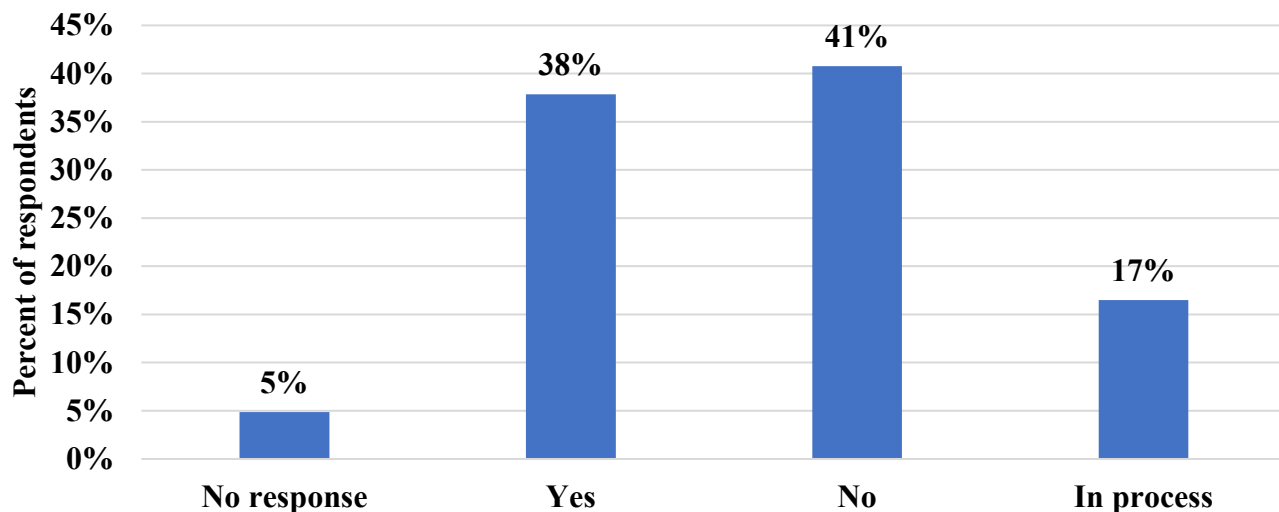
- No response : 5%
- Direct to consumers : 10%
- Processor : 14%
- Distributor : 41%
- Restaurants : 16%
- Grocery Stores / Supermarkets : 3%
- Other aquaculture/aquaponics farms or businesses : 8%
- Other : 5%



Q23.1. Did your farm or allied business implement or attempt to implement a new marketing or sales channel in the period of time between October 1st 2020 and December 31st 2020 because of coronavirus disease (COVID-19)?

(n = 103)

- No response : 5%
- Yes : 38%
- No : 41%
- In the process of implementing : 17%



Q23.2. What percent of sales from your farm or allied business in the period of time between October 1st 2020 and December 31st 2020 went through a new marketing channel?

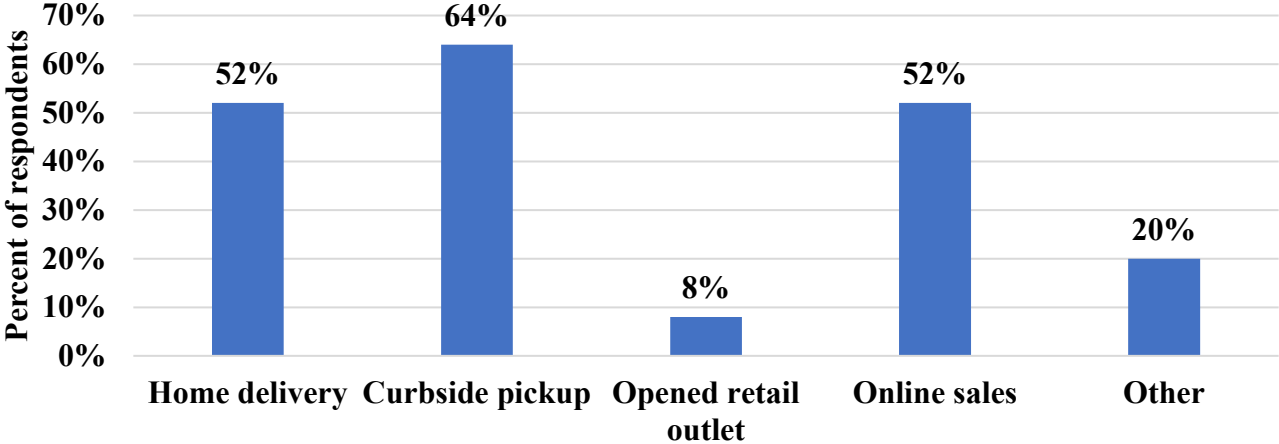
(n = 38)

Marketing Channel	Average percent of sales
Direct to consumers / end users	34%
Processor	51%
Distributor	51%
Restaurants	34%
Grocery stores / supermarkets	14%
Other aquaculture / aquaponics farms or business	15%
Other	32%

Q23.3. If your farm or allied business implemented or attempted to implement a "Direct to consumer / end user" marketing channel, please specify the method(s) from the options below: (please select all that apply)?

(n = 25)

- Home delivery : 52%
- Curbside pickup : 64%
- Opened a retail outlet : 8%
- Online sales : 52%
- Other : 20%



References

USDA (United States Department of Agriculture). 2019. 2018 Census of Aquaculture. National Agricultural Statistics Service, USDA, Washington, District of Columbia, USA. Accessible at: https://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Census_of_Aquaculture/index.php.

Acknowledgements

Thank you to all respondents who participated in this study. Also, thank you to all of the national, regional, and state associations, agencies, Extension, and all others who helped us disseminate the survey. There are simply too many names to list, thanks to all of you. Thank you to NOAA Sea Grant, the National Marine Fisheries Service, and the North Central Regional Aquaculture Center for funding this work.