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COVID-19 and Pennsylvania farmers: Financial impacts, relief programs, and resiliency strategies during the 2020 growing season

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Abstract

This article reports the findings of a multimethod study of the financial impact of the COVID-19 pandemic on Pennsylvania (PA) farmers during the 2020 growing season. Previous research on resiliency and the food system has encouraged exploring ways to describe the agency and adaptability of farmers as they respond to changing conditions. Further, the research has documented the ways that governments intervene to maintain the overall structure of the food system. This study utilized a three-part framework that focused on (a) understanding the impact of the pandemic on PA farmers, (b) describing farmer adaptation strategies and direct-to-consumer marketing practices, and (c) documenting federal relief program participation. The project included an anonymous survey of more than 300 farmers and semi-structured inter-

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views with a subset of 16 farmers. Based on the findings from the survey, under half (42%) of farmers reported a loss of revenue, while over half reported either no change or an increase in revenue in 2020. We also found that vegetable farmers fared slightly better than livestock/dairy farmers; those with a higher pre-COVID revenue did better than those with a lower pre-COVID revenue; and farms that were able to increase direct-to-consumer sales maintained or increased their total revenues. About half of the farmers surveyed participated in federal aid programs, yet a portion of small farms indicated they did not know whether they qualified for this funding. We discuss the unprecedented scale of federal aid to farmers in 2020 and the remaining access gaps for smaller farmers. Additionally, we discuss the potentially protective role of direct-to-consumer sales for enhancing the resilience of regional food systems.

Keywords
COVID-19, Pandemic, Agriculture, Regional Food Systems, Relief Programs, Direct to Consumer, Adaptation

Introduction

According to national headlines, the COVID-19 pandemic wreaked financial havoc on U.S. farmers during the 2020 season. Jackson-Smith and Veisi (2021) analyzed news articles and trade journal publications from March 2020 to March 2021 and found that a majority of the portrayals in media, particularly early on, emphasized negative impacts of the pandemic on farmers and the role of institutions in addressing these impacts. Their study also found portrayals of more adaptive and transformative responses to the ever-changing conditions that faced farmers during this first full season of the pandemic. One example of more adaptive or potentially transformative responses to shifting markets and consumer behavior included nationwide reports that community supported agriculture (CSA) memberships were booming and replacing lost revenue for some farmers early in the pandemic (Ricker & Kardas-Nelson, 2020; Shilton, 2020; Westervelt, 2020). Many farmers made successful adaptations during the height of the pandemic by increasing direct-to-consumer (DTC) sales. For example, Richards and Vassalos (2021) surveyed consumers in South Carolina and found that COVID-19 triggered an increase in demand for local meats during the 2020 season, though they also found uncertainty about consumer demand for local meats as pandemic conditions changed. The U.S. Department of Agriculture (USDA) Economic Research Service (ERS) review of the disruptions in food purchasing in 2020 supports this finding about the increase in DTC sales (Zeballos & Sinclair, 2021). The USDA ERS found an 11.1% increase in consumers' direct purchases from farmers, manufacturers, and wholesalers, although it was unclear whether this trend was due to consumers avoiding crowded supermarkets or because products were unavailable at common retail outlets (Zeballos & Sinclair, 2021). On the other hand, COVID-19 added to the preexisting issues faced by farmers. As USDA Chief Economist Robert Johansson (2020) argued, farmers were already facing financial hardships due to the challenges posed by a global food system focused on large-scale suppliers. These challenges included international trade tariffs in 2019 and the worsening impacts of climate change, such as hurricanes, drought, and excessive rainfall that destabilized markets and impacted planting and harvest seasons.

Pennsylvania (PA), in the northeast United States, is home to 53,157 farms (USDA National Agricultural Statistics Services [NASS], n.d.-c). Of these, 88% meet the USDA's definition of a small farm as they sell less than US$250,000 of agricultural product annually (Kelsey et al., 2021; USDA National Institute of Food and Agriculture, n.d.). Despite the preponderance of small farms, PA agriculture supports one out of 10 jobs and contributes $1 out of $16[1] in gross state product (Econsult Solutions Inc., 2021). Row crops (hay, grains, and oilseed) and livestock (beef, dairy, and other) are PA's leading agricultural products (Kelsey et al., 2021). PA ranks eighth nationwide in milk production (Center for Dairy Excellence, n.d.) and 22nd in crop production based on sales, with

[1] All currencies in this article are US$.

the fifth-highest number of fruit and vegetable farms in the U.S. (Econsult Solutions Inc., 2021). While half of the farm acreage in PA in 2017 was owned by farms selling less than US$100,000 annually, the number of small and midsized PA farms has declined while the number of large farms (those with annual sales over US$500,000) has increased over the past few years (Econsult Solutions Inc., 2021).

This multimethod study was designed by Chatham University faculty and staff from Pasa Sustainable Agriculture, a nonprofit organization that supports area farmers. The purpose was to better understand the impact of the pandemic on Pennsylvania farmers during the 2020 growing season with a specific focus on (a) describing the impact of the pandemic on farmers in terms of revenues and marketing channels, (b) exploring the frequency and effectiveness of adaptive strategies such as DTC marketing that farmers enacted to insulate their businesses from the dynamic disruptions to food systems, and (c) determining the nature of participation in different relief programs by farms with different income levels and predominant products. The study provides insights from the farm owner/operator perspective regarding the nature of the financial resilience of farms of various sizes and commodity type, makes empirical arguments regarding the wide range of farmer experiences that extends beyond media representations, and helps describe the adaptive capacity of regional food system actors who relied on shorter supply chains during a time of major disruption to markets and supply chains in the food system.

Literature Review

A Resiliency Lens of Food Systems During the Pandemic

Hendrickson (2015) summarized some of the inherent vulnerabilities of a consolidated, industrial food system and examined the utility of a "resiliency lens" in the food system. The concept of resiliency was derived from ecological sciences but has also been applied in social science. It describes the capacity of a system to withstand shocks or disturbances while maintaining overall structure and function (Han & Goetz, 2015). Applying a resiliency lens holds potential for understanding strategies for reducing risks for food systems during catastrophes like pandemics (Food and Agriculture Organization of the United Nations [FAO], 2013). Research on the impacts of COVID-19 on farmers has applied a resiliency lens to understanding the adaptive capacities of food businesses in Vermont (Whitehouse et al., 2023), the role of diversification for farms in Italy (Mastronardi et al., 2022), and supply chain maintenance for organic dairy farms in France (Perrin & Martin, 2021). Thilmany et al. (2021) described potential benefits of local and regional food systems and the supply chain relationships that enhanced DTC sales and minimized the disruptions experienced by national retailers, aggregators, and restaurants due to pandemic lockdowns.

Whitehouse et al. (2023) acknowledged some important limitations of the resiliency concept and referenced Borges-Méndez and Caron's (2019) critique of the resiliency lens when applied to the government response to major disasters such as Hurricanes Irma and Maria in Puerto Rico (p. 2). Both of these works highlighted the ways in which the resiliency concept can perpetuate the overall system structures by focusing on government interventions. The authors called for more focus on local actors and their agency during these times of disruption. With regard to resiliency during the COVID-19 pandemic, Whitehouse et al. (2022) focused on documenting the adaptability of Vermont food businesses who were in the position to market foods directly to consumers during a time of major supply chain disruptions. In contrast, the COVID-19 pandemic generated government aid to help maintain overall food system function.

Federal Relief Programs

The agriculture sector in the U.S. has benefitted from federal support since the 1930's through a variety of funding streams (USDA Farmer Services Agency [FSA], n.d.), but the COVID-19 pandemic created financial challenges and, subsequently, federal support unlike any seen in the recent past. Between 2000 and 2019, direct government payments to farm operations nationwide ranged between $9.7 billion and $24.3 billion annually

(USDA ERS, 2023). In PA, agriculture census data from 2012 and 2017 showed, respectively, that federal farm relief totaled $86.4 million and $74.1 million and was accessed by 27% and 21% of farmers (USDA NASS, n.d.-b). On March 27, 2020, Congress passed the Coronavirus Aid, Relief and Economic Security Act (CARES Act) to provide funds for food and nutrition programs as well as direct monetary relief to farmers and ranchers (Hungerford et al., 2021). By the close of 2020, direct government payments to farmers nationwide totaled $45.6 billion (USDA ERS, 2023) with the majority ($23.5 billion) provided by the Coronavirus Food Assistance Program (CFAP) and $6 billion provided through the Payroll Protection Program (PPP; Giri et al., 2021). In PA, 38% of farmers and ranchers received federal support in 2020, totaling $411 million (USDA Farmers.gov, n.d.-a; USDA Farmers.gov, n.d.-b). These relief payments aimed to mitigate the financial strains caused by price declines for agricultural product as well as cover financial losses due to COVID-19. The first iteration of this aid, the CFAP 1, was offered on May 21, 2020, providing funds to farmers suffering from price declines, while CFAP 2, implemented on September 1, 2020, based its payments on estimated financial losses (USDA Farmers.gov, n.d.-a; USDA Farmers.gov, n.d.-b). However, federal support may not have reached all farmers in need. The smallest businesses are often unaware of available government assistance (Demko et al., 2021; Humphries et al., 2020), and smaller PA farmers often lacked a connection to loan and grant providers (Econsult Solutions Inc., 2021). Beyond the CFAP subsidy payments, the CARES Act increased available loan options by extending loan maturity from 9 months to 12 months for marketing assistance and by enabling the Small Business Association (SBA) through the PPP to offer forgivable loans to small businesses, including farmers and ranchers, to help them keep employees on the payroll (Giri et al., 2021; Hungerford et al., 2021). McEowen (2021) described how another SBA program, Economic Injury Disaster Loan (EIDL), a traditional loan program, was structured and described potential challenges of these loans for farmers. Table 1 summarizes these federal programs.

According to Hungerford et al. (2021) and Orden (2021), CFAP's structure worked best for livestock and row crop farmers compared to specialty (fruit and vegetable) farmers. Moreover, because federal relief payments, including CFAP, are based on the farms' usual production levels, not acres planted, larger-revenue farms tend to receive the majority of federal subsidy payments as well as a higher payment proportionately than smaller farms (Belasco & Smith, 2022). Bekkerman et al.

Table 1. Selected Relief Program Summary for the Agriculture Sector

Relief Program	Coronavirus Food Assistance Program (CFAP)	Payroll Protection Program (PPP)	Economic Injury Disaster Loan (EIDL)
Description of relief program	Funded by the CARES Act in 2020, provided grants to producers of agricultural commodities who suffered sales losses and/or had increased marketing costs associated with the pandemic.[a]	Funded by the CARES Act in 2020, provided emergency forgivable loans to eligible farmers to keep their workforce employed during the height of the pandemic.[c]	Funded by the CARES Act in 2020, provided low-interest fixed-rate long-term loans to farmers to support recovery from the pandemic's economic impact.[d]
Application process	Eligibility criteria and application form available online. Local Farm Service Agency (FSA) could provide in-person assistance.[a]	Managed by the Small Business Association (SBA) and accessed through SBA-affiliated lenders.	Managed by the Small Business Association (SBA) and accessed through SBA-affiliated lenders.
Amount of federal funding	US$23.5B nationwide in 2020 through CFAP 1&2[b]	US$6B[b]	Included in PPP funding calculation[b]

[a] USDA FSA, 2020, [b] Giri et al., 2021, [c] Ludwig, 2021, [d] SBA, 2021

(2018) noted that disaster funding, like CFAP, often goes to farmers already receiving other federal support payments such as Agriculture Risk Coverage or Price Loss Coverage.

Previous research on resilience and the food system (FAO, 2013; Hendrickson, 2015; Whitehouse et al., 2023) has encouraged focusing simultaneously on a) describing the agency and adaptability of smaller farmers who may be more flexible to respond to changes and b) understanding the ways that government agencies may intervene to maintain the overall structure of the food system. This resiliency lens influenced the overall design of the study to allow for an empirical exploration of the adaptations that farmers enacted during the 2020 growing season and of the types of farmers able to participate in federal relief programs. The present study further explored the extent to which DTC marketing during the first year of the pandemic provided potentially insulated farmers from the financial impacts of the pandemic. This study included a more robust sample size than previous studies and qualitative and quantitative empirical data to learn more about the factors impacting their flexibility and adaptive capacity. Additionally, our study examined the ways in which federal aid programs may have played a role in providing stability for certain types of PA farmers.

Methods

The objectives of this multimethod study (Bell et al., 2020) were to (a) gain more insight into the impact of the pandemic on PA farmers during the 2020 growing season, (b) understand more about federal relief program participation, and (c) explore strategies farmers utilized to adapt to changing conditions. We conducted a cross-sectional survey and semi-structured interviews to further describe the impact of the pandemic on farmers, explore the potentially protective effects of adaptations such as direct-to-consumer marketing, and document farmers' experiences participating in federal relief programs. We describe this as a multimethod approach that allows for statistical analysis of responses across our sample and an in-depth exploration of experiences of farmers navigating the first year of the COVID-19 pandemic. Both Pasa Sustainable Agriculture and Chatham University are located in PA, have a longstanding focus on PA farmers, and worked together to design and implement this study. A selection of quantitative and qualitative data was analyzed for this paper, which was part of a larger effort to understand the initial impacts on and needs of farmers during this time of major upheaval in the food system. The data and analysis presented in this study use a resiliency lens to explore differences farmers encountered during the pandemic and the possibly protective role of DTC marketing for financial resiliency and understand more about who was able to participate in financial relief. The ultimate goal was to understand the long-range impacts of government funding and the food system. This study was approved by Chatham University's Institutional Review Board on December 6, 2020, as Expedited Research.

Instrument Development

After exploratory email conversations about the issues in June 2020, the team met virtually in July 2020 with the goal of designing a study to capture the impact of COVID on PA farmers. The team planned to distribute a survey in late 2020 or early 2021 to provide a yearlong look at farmers' COVID-related experiences, adding to the literature that, at that time, had focused only on the first few months of the pandemic. Thus, developing the survey tool was time-sensitive, and we sought previously developed questions instead of creating and testing new ones. We chose Pasa's financial benchmark survey as the initial guide (Egan & Bay Nawa, 2021). The financial benchmark survey began collecting financial data from direct-marketing vegetable farmers in 2017 and continues to be administered annually. Therefore, our COVID-centric survey would have context and add crisis-related detail to the financial information collected by Pasa. However, the Pasa survey, with its focus on vegetable farmers, was too narrow for our purpose of describing COVID's impact on PA farmers regardless of product. An online search identified the Carolina Farm Stewardship Association report by McReynolds (2020), which provided a snapshot of the pandemic's impact on farmers with annual incomes of less than $250,000, a group consistent with the majority of PA farmers. There-

fore, our survey questions were closely aligned with these two surveys and covered a variety of topics, many of which are outside the scope of this analysis. The survey instrument (see Appendix A) was developed in electronic and paper form and began with farmer demographic questions, for example, zip code, total acres, and predominant output, which mirrored the Pasa financial benchmark survey. Clarifying for the farmers that the survey was seeking changes *due to* COVID-19, it then focused on several domains, three of which are addressed in this paper:

1. **Financial impacts of the pandemic** sought to identify the PA farmers' financial experiences by asking about pre-COVID and 2020 farm revenue.
2. **Relief program participation** questioned the extent to which PA farmers participated in federal agriculture relief (CFAP and PPP) and their challenges, if any, in doing so.
3. **Adaptation strategies** questioned marketing channels to ascertain whether farmers adopted or increased DTC sales as indicated in the literature.

The survey also elicited demographic information such as race, gender, and age. The survey included a set of Likert scales, binary responses, checklists, and open-text boxes.

Survey: Sampling and Recruitment

While designing recruitment strategies for the survey and interviews, the research team realized that there was not an up-to-date sampling frame for farmers/producers in the state nor a way to access contact information for PA's over 53,000 farms. To reach the widest number of farmers with the financial resources available, the team developed an electronic and a paper survey but focused primarily on the dissemination of the web-based survey on the Qualtrics platform. Given the lack of an accessible, comprehensive database of PA farmers, we utilized a network of 11 farm-related organizations active in the state, including the PA Farm Bureau. We distributed a link to the survey through their email lists, which collectively totaled over 20,000 farmers. Eligible organizations served PA farmers, were willing to share their list-serve count, and agreed to send our IRB-approved email containing the survey link in January and February 2021. Additionally, Pasa Sustainable Agriculture used the US Postal Service to mail the survey to 200 farmers known to them as preferring hard-copy communication. Eligible participants were required to a) be at least 18 years of age and currently a farmer, b) have a farm located in Pennsylvania, and c) meet the USDA (2021) definition of a farm: $1,000 or more of agricultural products produced and sold, or normally sold, during the year. Before starting the survey, participants were provided with the purpose of the study and information regarding their voluntary participation and their right to withdraw from the study with no negative consequences. Participants were offered an opportunity to enter a drawing for a $50 gift card as an incentive for completing the survey through a link that separated their identifying data from their survey responses. For online surveys, participants were asked to confirm their consent. For paper surveys, participants were asked to disregard the survey if they chose not to participate.

Semi-Structured Interviews: Sampling and Recruitment

At the end of the electronic and paper surveys, farmers were given the option to voluntarily share their contact information, the zip code of their farm, and the farm type (vegetable, livestock, etc.) for participation in a qualitative, semi-structured interview. If selected for the interview, they would receive a $100 gift card. Sixty-two farmers expressed interest in being interviewed. In an effort to interview a representative sample from the state, we chose the number of farmers to interview by region based on how farmers are distributed across PA. Our research partner, Pasa Sustainable Agriculture, divides the state into four agricultural regions (Figure 1) based on roughly similar geography and Pasa's ability to provide educational events to area farmers. For each of these four regions, we determined the number of farms and their percentage of PA's total farms (Table 2).

Because we purposefully could not connect the survey information with the farmer, we used the

zip code and farm type of farmers willing to be interviewed and other information publicly available from farm websites to narrow the list of interviewees. The western, south central, and eastern regions contain 26%, 29%, and 28% of PA farms, respectively. The north central region has 16% of the farms. For each region, we chose a mix of smaller and larger farms (by acreage) as well as farm types that were predominately specialty crops (fruits/vegetables) and livestock. The distribution of the interviewed farms from each region is shown in Table 2.

Survey Analysis

Our first research objective was to explore the financial impacts of COVID on different types of farms (i.e., dairy/eggs/livestock, hay/forage/row crop/grain, and fruit/vegetable/specialty farms). We examined the participants' estimated changes in revenue due to the COVID-19 pandemic and whether participants' change in revenue was related to their typical (pre-2020) yearly farm revenues. Next, a one-way analysis of variance (ANOVA) was conducted to investigate the differences in the COVID-related financial impact across different farm types. The one-way ANOVA tested whether there is a difference in the population means using the sample data. This statistical approach is appropriate for exploring the relationship between a categorical predictor and a continuous variable (Huck, 2012). In this study, we used the different farm types as the independent variable and the COVID-related revenue change as the dependent variable in the ANOVA.

Our second research objective was to explore to what extent surveyed farmers were able to benefit from federal relief programs. We examined the percentage of participants who participated in any COVID-19-related farm or small business relief programs during 2020 and examined the reasons they may not have participated in relief programs. We also analyzed whether farmers' participation in these relief programs was related to their typical (pre-2020) yearly farm revenues and the predominant farm product. A Chi-square test was conducted to explore these relationships.

Our third research objective was to investigate to what extent the farmers were able to benefit from implementing adaptation strategies in their businesses. We examined the percentage of participants who implemented DTC strategies and enhanced online promotion practices. We also examined whether different levels of business adaptation would be related to changes in farm revenue. A one-way ANOVA was conducted to compare farm revenue change across different levels of adaptation (i.e., decreased, maintained, increased) in DTC strategies and online promotion practices separately.

Figure 1. The Four Regions of Pennsylvania and Outlined Counties

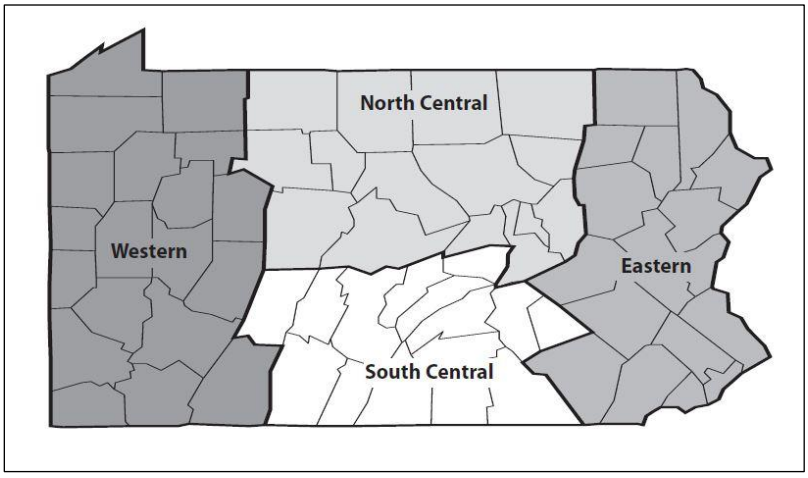


Table 2. Number of Farms in Pennsylvania Regions and Distribution of Interviewees in These Regions

Pennsylvania Region	Western	South Central	Eastern	North Central	Total
Number of farms	13,958	15,522	14,740	8937	53,157
Percent of total farms	26%	29%	28%	17%	100%
Number of volunteers	33	11	13	5	62
Number of interviews	5	5	4	2	16

Semi-Structured Interviews Analysis

The semi-structured interviews were conducted and recorded via Zoom. The semi-structured interview protocol is presented in Appendix B. It was developed by the research team utilizing a similar framework to the survey, which focused on learning more about farmer experiences during the pandemic related to financial impacts, federal relief program participation, and noteworthy adaptation strategies. The interviews were transcribed using Otter.ai and analyzed using the following major domain areas: factors impacting operations in 2020, experiences with federal relief programs, and direct-to-consumer adaptation strategies. The transcripts were coded first by the interviewer using these domains and then later by a member of the research team who had not conducted the interview. Representative quotations or unique perspectives were identified from these domain areas, edited for clarity, and used to further elaborate upon related findings from the quantitative study. The perspectives from the interviews helped confirm and/or offer nuance to findings in the quantitative analysis and represented farmers' experiences navigating the pandemic and federal relief programs.

Results

Survey and Semi-Structured Interview Participants

The survey was closed on April 6, 2021, with responses from 492 farmer owner-operators, of whom 318 met our inclusion criteria. We removed responses from 12 farmers who did not have a farm within PA, 14 who had not produced or sold $1,000 or more of agricultural products in the previous year, and 148 respondents who completed less than half of the survey. Even though the nature of our recruitment yielded a low response rate, we found that respondents were representative of farmers across all regions of PA and aligned with the most recent demographic profile from the Pennsylvania Department of Agriculture in terms of race/ethnicity, gender, and age, with an overrepresentation of large farms (based on revenues) in the sample (Table 3). The majority (96%) were for-profit farms, and 83% of our respondents were from rural areas. Additionally, the respondents reflected a range of predominant farm outputs, shown in Table 3. The characteristics of farmers selected for the semi-structured interviews is shown in Table 4.

Financial Impacts of the Pandemic

Farmers' responses to our survey revealed a mixed picture of the impacts of COVID-19 on Pennsylvania farm revenues in 2020. Less than half of farmers (42%, n=125) reported a negative revenue change; 21% (n=63) reported no change; and 37% (n=110) saw a positive change in revenue due to the pandemic compared to previous years. This data was self-reported and based on the farmers' estimates of their farm revenue during 2020. The degree of the negative and positive financial impact varied, as shown in Table 5.

We further explored the farm characteristics to examine potential differences in financial outcomes. A Pearson's correlation coefficient was computed between pre-COVID revenue and revenue change. There was a weak but positive correlation, r (298)=.17, p=.003, between the two variables. This finding suggested that farmers who reported lower pre-COVID revenue were slightly more likely to report a COVID-related loss of revenue. This may have been related to higher rates of relief program participation for higher-revenue farms (discussed below in Figure 3).

A one-way ANOVA was conducted to compare farmers' ratings of revenue change across different types of predominant output. Levene's test of homogeneity suggested that the variances of farmers' ratings were not homogeneous. Therefore, a Brown-Forsythe test was conducted to provide robust test results. The results were significant, F(2, 253)=5.18, p=.006. Specifically, dairy/egg/livestock farmers reported a significantly lower gain (M=4.40, SD=2.03) than the fruit/vegetable/specialty farmers did (M=5.21, SD=2.26). This finding suggested that the fruit/vegetable/specialty farmers fared better than the dairy/eggs/livestock farmers, with the former reporting on average no change in revenue and the latter reporting a 1–10% revenue loss (Figure 2).

In our semi-structured interviews, one of the dairy farmers interviewed explained more about

their experiences in the 2020 growing season and explained both financial losses due to changing market pressures and a frustration with government programs that were too slow to prevent food waste:

> We had a perishable product and we kind of sit on it. So that was sort of disappointing, just to see the milk go down the drain. And then you also know that there's people that need nutritious food because they were laid off. (Farmer Interview, 004)

Based on the data we collected, it is unclear why fruit/vegetable/specialty farmers may have had reduced financial losses. However, a small-scale vegetable grower on 15-acres, without outside laborers and with a long-established CSA program summarized their growing year as follows:

> They've been going really well. So maybe that's not what you've been hearing. But our business economically is doing better than ever. Because with the pandemic, people panic about where their food was going to come from. All of our marketing and all of our sales are through CSA, so we don't have any restaurant or wholesale accounts. And so we weren't affected by the restaurants closing. If anything, our sales went up because people were cooking

Table 3. Characteristics of the Survey Respondents and their Farms

	Survey Respondents Frequency (%) [a]	PA Farmers Frequency (%) [b, c]
Race/Ethnicity		
American Indian or Alaskan Native	0 (0%)	108 (0.1%)
Asian	1 (0.4%)	103 (0.1%)
Black or African American	1(0.4%)	80 (0.1%)
Native Hawaiian and Pacific Islander	0 (0%)	23 (0.0%)
White	258 (99.2%)	89,843 (99.3%)
Hispanic	5 (2%)	759 (1%)
Sex/Gender		
Female	87 (35%)	31,449 (35%)
Male	163 (64.6%)	59,012(65%)
Nonbinary	1	—
Age		
Average age (range)	53 (23–88)	54.9
Pre-COVID Farm Revenue		
<US$1000	—	12,748 (24.0%)
US$1,000–24,999	99 (33.4%)	21,054 (39.6%)
US$25,000–49,999	46 (15.5%)	4437 (8.3%)
US$50,000–99,999	41 (13.9%)	3570 (6.7%)
US$100,000–249,999	46 (15.5%)	5056 (9.5%)
US$250,000–499,999	26 (8.8%)	3205 (6%)
≤US$500,000	38 (12.8%)	3087 (5.8%)
Predominant Farm Output		
Dairy/Eggs/Livestock	131 (44%)	—
Hay/Forage/Row Crop/Grain	64 (21%)	—
Fruit/Vegetable/Specialty	95 (32%)	—
Other	11 (4%)	—

Note. *N*=318.

[a] The number of respondents for each variable ranges between 219 and 307 due to missing values. Farmers reporting revenues less than US$1,000 were not included in this study.

[b] Total: 53,157 farms and 90,461 total producers. (Data collected for a maximum of four producers per farm.) The demographic information used the total number of producers (USDA NASS, n.d.-c).

[c] Farm revenue used the number of farms. The USDA reports market value of agricultural products, and we compare these values with the farm revenue of our respondents in this table (USDA NASS, n.d.-a).

Table 4. Characteristics of Semi-Structured Interview Participants

ID	Region	County	Acres	Products
002	Eastern	Lehigh	2	Organic vegetables, diversified livestock, other value-added products
004	Eastern	Berks	300	Dairy
006	North Central	Lycoming	1	Vegetables, herbs, flowers, livestock
008	North Central	Centre	9	Vegetables
009	South Central	York	4.5	Vegetables and fruit
010	South Central	Huntingdon	5	Organic vegetables
011	South Central	Juniata	25	Diversified vegetables, fruit, and livestock
012	South Central	Mifflin	110	Diversified livestock and education
013	South Central	Cambria	800	Dairy and dairy products DTC
014	Western	Jefferson	2	Organic vegetables, herbs, and edible flowers
015	Western	Fayette	3	Seedlings and berries
016	Western	Forest	65	Diversified vegetables, fruit, quail eggs, and timber
017	Western	Lawrence	50	Seedlings and vegetables
019	Western	Washington	220	Organic grains, grass-fed beef, and eggs
020	Eastern	Lancaster	85	Diverse livestock
021	Eastern	Lancaster	55	Dairy and vegetables

Note. *N*=16. Other demographic characteristics for semi-structured interview participants were not collected as part of selection and recruitment and because of privacy concerns the interviewees were not linked to their survey responses.

> at home. And so we sell this for home use. And so we sell out every year; this will be our 10th year coming up. And every year we sell out, so we sold out last year. And we are at capacity. (Farmer Interview, 008)

A diversified livestock farmer who sells directly in urban markets with a small team of employees had a more positive experience than others and explained the status of their business:

> Actually, it's been a silver lining. I do a market at farmer's markets, I sell meat and eggs. And when the grocery stores were empty last spring, they all came to the farmers markets, and since we're totally outside, it's been a blessing for us. (Farmer Interview, 020)

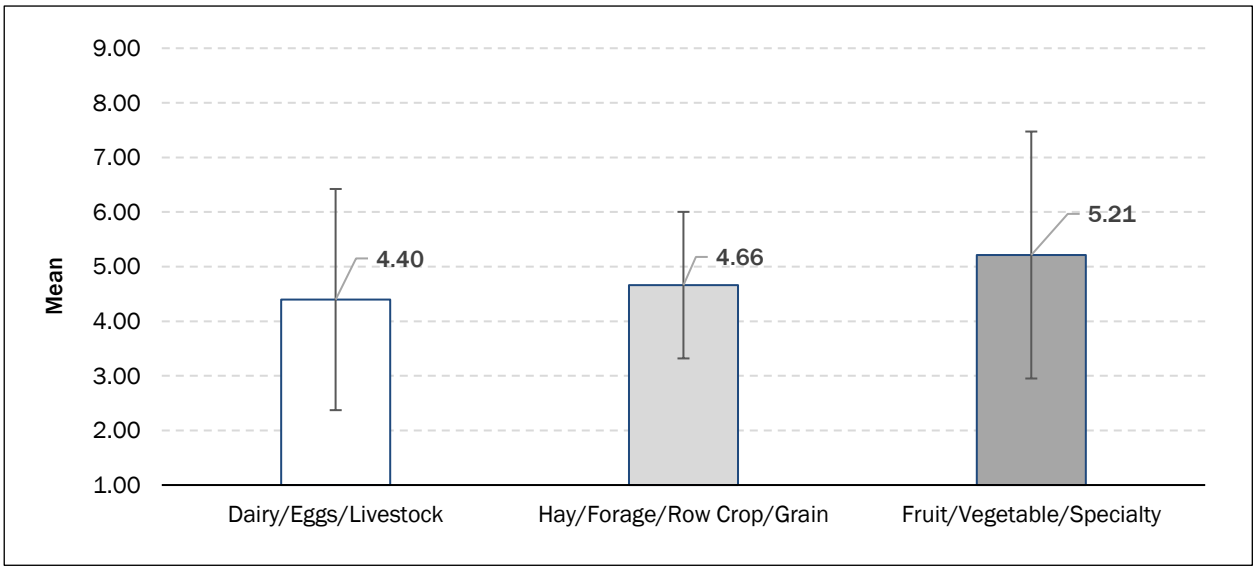
While dairy, egg, and livestock producers in the survey fared slightly worse than fruit and vegetable growers, this farmer, who was marketing directly, was able to find a "silver lining" during the 2020 growing season. Overall, the interviewed farmers conveyed a wide range of experiences and reflected a time of substantial shifts and uncertainties that were understandably linked to pre-existing practices and marketing challenges. The quotations above are not meant to be representative of these mixed experiences but instead add depth to some of the specific farmer experiences regarding the impact of the pandemic on their businesses.

Table 5. Farmer-Estimated Change of Revenue in 2020 Due to COVID-19 Pandemic

	Frequency [a]	Valid Percent
>50% loss	27	9.1%
26–50% loss	18	6.0%
11–25% loss	51	17.1%
1–10% loss	29	9.7%
No change	63	21.1%
1–10% increase	54	18.1%
11–25% increase	34	11.4%
26–50% increase	17	5.7%
>50% increase	5	1.7%
Total	298	100.0%

[a] Of the total 318 survey participants, 298 farmers responded to this question.

Figure 2. Change in Revenue Due to the COVID-19 Pandemic



Note. 289 farmers responded to this question. The farmers were asked to rate their change in revenue on a 9-point scale (1 = > 50% loss, 2 = 26-50% loss, 3 = 11–25% loss, 4 = 1–10% loss, 5 = no change, 6 = 1–10% increase, 7 = 11–25% increase, 8 = 26–50% increase, 9 = >5% increase). The error bar indicates the standard deviation.

Relief Program Participation

In our sample, 291 farmers responded to the questions about relief program participation. The results showed that 143 respondents (49%) participated in at least one pandemic-relief program and 148 farmers (51%) participated in no relief programs.

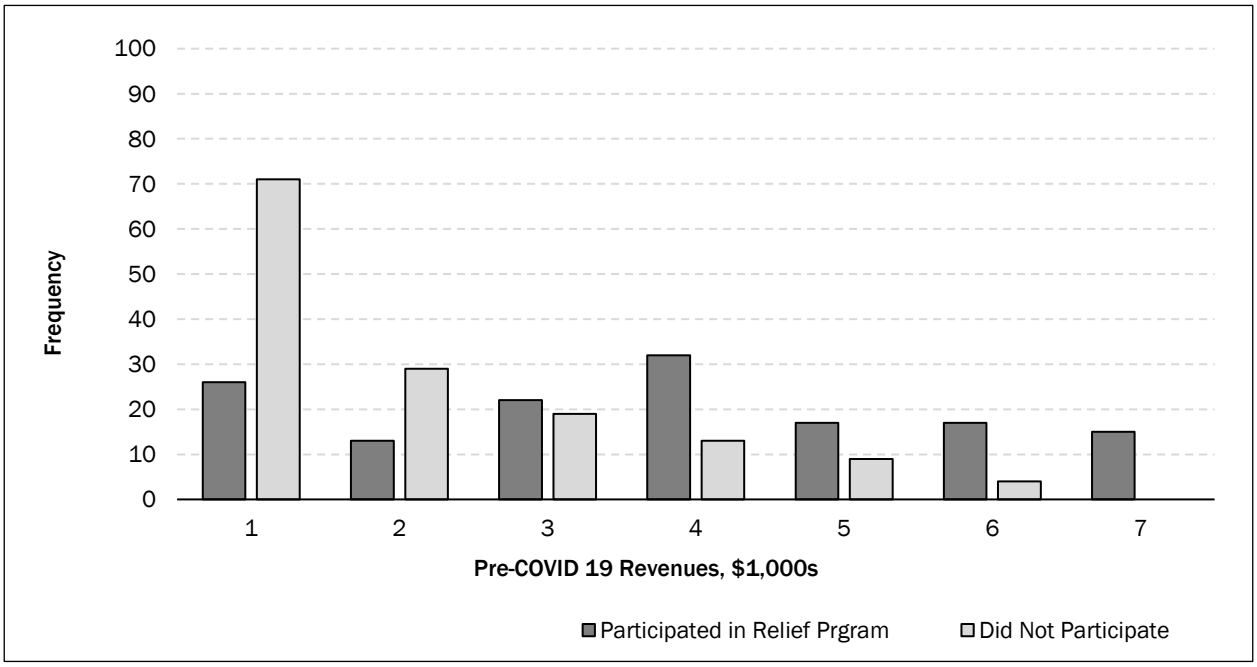
We further explored the farm characteristics to examine potential differences in the relief program participation. A point-biserial correlation was computed between pre-COVID revenue and relief program participation. The correlation was significant, r (287)=-.44, p <.001. A moderate, negative association was observed between pre-COVID revenue and relief program participation. The results suggested that farmers who reported lower pre-COVID revenue were less likely to participate in the relief programs (Figure 3).

Of those who participated in at least one pandemic-related relief program, 88 (62%) of our respondents named CFAP1/CFA2, while another ten farmers indicated CARES, FSA, or USDA, which may have been their name for CFAP. Seventy-four (52%) of our farmers indicated participation in an SBA program, with more of them identifying the PPP (n=66) than EIDL (n=8). More than a quarter (27%) of our sample reported participating in more than one program. Some farmers also participated in other localized programs. On the other hand, 42 (28%) selected the survey option that indicated an inability to determine eligibility or how to apply. One of these farmers commented on the survey, "I was confused about filling out the form and they gave me the incorrect information (referred me to the wrong program) and then the application expired." Similarly, another farmer wished for a "better explanation [of] grants that we are eligible to apply for." Of these 42 farmers, almost 60% (n=25) reported at least some revenue loss due to COVID, 14% reported no change, and 26% showed some increase in revenue.

Finally, we explored whether farmers' participation in the relief program would vary across different types of predominant output using a Chi-square test. There was not a significant association between farmers' participation in the relief program and their predominant output (i.e., dairy/eggs/livestock, hay/forage/row crop/grain, and fruit/vegetable/specialty farms; see Figure 4).

Our semi-structured interviews featured a number of perspectives from farmers regarding the

Figure 3. Histograms of Typical Pre-COVID-19 Annual Revenues for Farms That Participated in Federal Relief Funds and Farms That Did Not



Note. 291 farmers responded to this question. The farmers were asked to rate their typical (pre-2020) yearly farm revenues on the following options (1 = US$1,000–24,999, 2 = US$25,000–49,999, 3 = US$50,000–99,999, 4 = US$100,000–249,999, 5 = US$250,000–499,999, 6 = US$500,000–999,999, 7 = Greater than US$1,000,000).

process of participating in federal relief programs such as CFAP. One specialty mushroom grower explained that applying for and receiving these funds was straightforward and supported by National Research Conservation Service (NRCS) agents and accounting software that they use to monitor farm finances:

> So what I did, I compared the 2019 mushroom sales, to our 2020 mushroom sales. I had those numbers right there, we use QuickBooks, so it was just right there like night-and-day numbers. Through our local NRCS agency, you know, they're under USDA. But [CFAP] was a real simple application. And I think there were maybe $5,000 lost in sales. We just submitted that, and then we received a check. (Farmer Interview, 014)

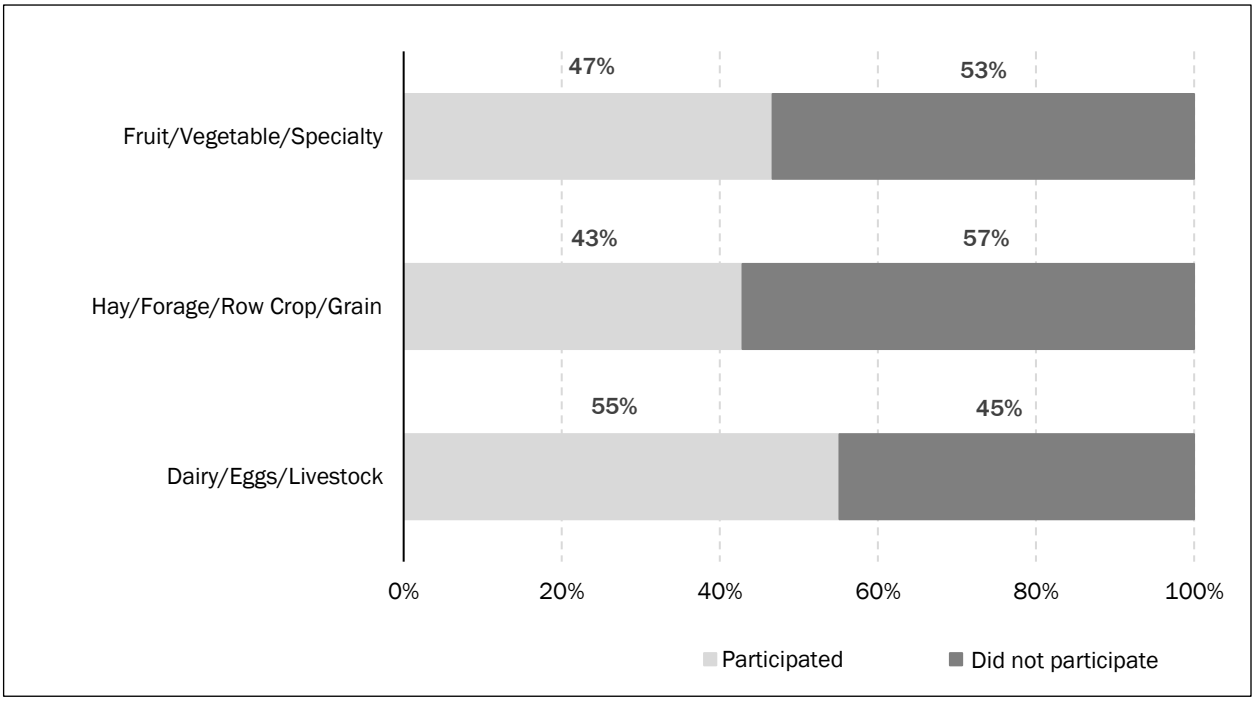
In another interview, one of the farmers indicated that a key challenge was figuring out the appropriate pathways for applying for funds: "It wasn't difficult. The only difficult thing was, I guess, like deciding, you know, who to apply through, we just went with a local bank, Fulton bank. They helped us with the application" (Farmer Interview, 009).

Qualitative data from the survey and semi-structured interviews suggests that knowing how to navigate and engage with infrastructure to support farm businesses, such as the NRCS and regional banks who were positioned to support farm businesses, was key for some of the interviewed farmers.

Adaptation Strategies

Participants in this study were also asked about their business adaptation strategies after the COVID-19 pandemic began. Particularly, we were interested in exploring whether DTC sales, such as CSAs, farmers' market participation, and/or on-farm sales, positively supported revenue during the pandemic. In our sample, about half of the research participants reported maintaining or increasing their DTC sales (n =150, 51.4%), and the rest reported a decrease or no DTC.

Figure 4. Farmer's Relief Program Participation and Farm Type



Note. 291 farmers responded to this question. No statistical significance, X^2 (df=2)=3.00, p=.223.

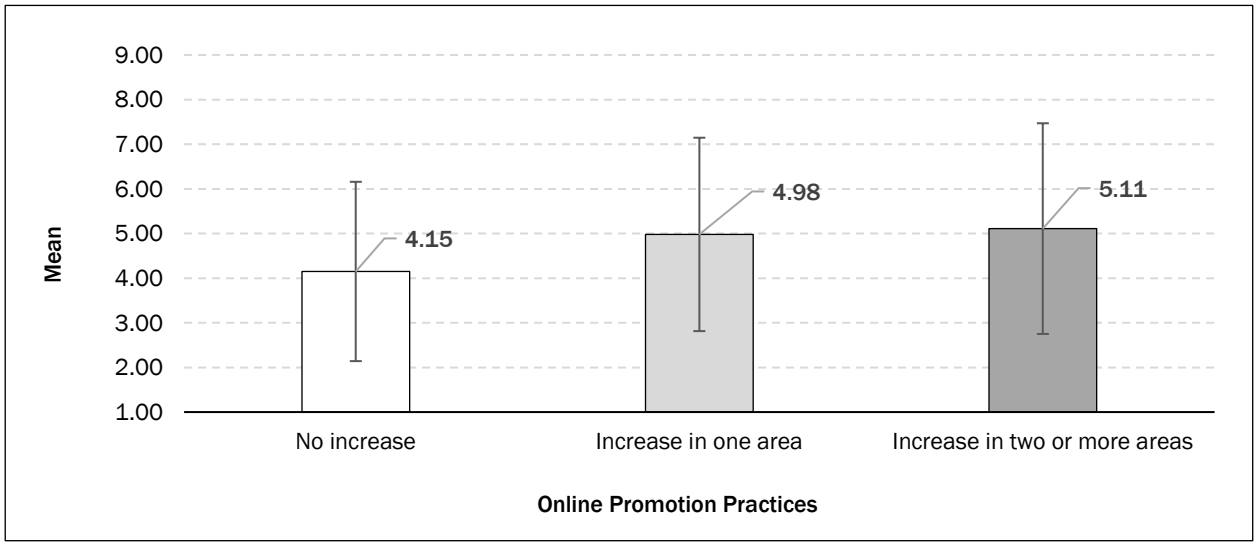
We conducted an independent samples t-test to compare farmers' ratings of revenue change between farmers who maintained or increased DTC sales and farmers who decreased or made no DTC sales. Levene's test of homogeneity suggested that the variances of farmers' ratings were not homogeneous. Therefore, we used Welch's t-test analysis and the adjusted degree of freedom. The analysis was significant, t (288)=9.08, p<.001. Our results suggested that farmers who decreased or made no DTC sales reported significantly greater financial losses than those who maintained or increased their DTC sales.

When asked about their online promotion practices, 94 (45.9%) respondents reported that they enhanced or added two or more online promotion practices, such as a business website, marketing emails, Facebook page, or Twitter. We conducted a one-way ANOVA to compare farmers' ratings of revenue change by enhancing or adding an online promotion approach. The analysis was significant, F (2, 200)=3.98, p=.020. Specifically, farmers who made enhancements in two or more online promotion approaches (M=5.11, SD=2.36) reported a significantly higher gain than those who did not make any enhancement (M=4.15, SD=2.01; Figure 5). Overall, our results supported that farmers' DTC sales and online promotion practices were associated with less loss in farm revenue.

Exploring additional community-based relationships to provide direct service opened up new opportunities for some farmers to understand the resiliency benefits of more regionally based food systems. For example, an interviewee described not only how more DTC arrangements facilitated sales during the pandemic but also how further coordination with neighboring farms and food producers supported that revenue growth:

> Well, during the pandemic, it really came to be a lot of local markets, farmers markets, were taking extra products from other people, other farmers to sell so that they had more product to give to the public, … and that really boosted productivity, and our income for the farm went way up. (Farmer Interview, 002)

Figure 5. Revenue Change and Online Promotion Practices



Note. 203 farmers responded to this question. The farmers were asked to rate their change in revenue on a 9-point scale (1 = >50% loss, 2 = 26–50% loss, 3 = 11–25% loss, 4 = 1–10% loss, 5 = no change, 6 = 1–10% increase, 7 = 11–25% increase, 8 = 26–50% increase, 9 = >5% increase). The error bar indicates the standard deviation.

While recognizing the importance of DTC sales and online ordering systems, one farmer admitted the need for professional help:

> We're attempting to improve our direct-to-farm marketing, but the expenses of hiring a qualified professional to develop a website, online store, social media marketing, professional logo and design work is prohibitive when you can't predict sales. (Open-Ended Survey Response)

In some cases, farmers may need specific training and enhanced capacity to manage inventory, packing and ordering. However, one farmer possessed those skills and described how they adjusted business operations during the pandemic to offer farm-produce delivery services: "When the pandemic started, we started to look at offering pretty much pre-ordering services, by the way of home delivery, but also offering market pickup. So folks could place an order online, I use a software called Acropolis" (Farmer Interview, 009)

Both PA farmers and food systems experts appreciate the potential for DTC and robust regional distribution networks to meet current and anticipated food supply chain challenges. The open-ended survey question asking farmers about their future plans elicited many mentions of DTC, including "hoping to sell more freezer beef direct to the consumer" and "working to increase yield for pick-your-own in anticipation of another year of strong demand." One farmer's comment summed up many farmers' views about their future plans: "more direct-to-consumer sales and marketing."

Discussion

Our study examined the financial impacts of the pandemic on PA farmers, their participation in federal relief programs, and adaptive strategies to minimize disruptions to their businesses. In this section, these findings are situated with other research on the impact of COVID-19 on farmers in the U.S., and we include some noteworthy perspectives from semi-structured interviews and qualitative survey data. While snapshot assessments of farm revenue early in the pandemic indicated significant financial losses, our findings, like those of McElrone et al. (2022), who performed a full-year (2020) review of farmers in Tennessee, showed mixed results that appeared to be mediated by the farmers' adaptability to meet the challenges and opportunities presented by COVID-19. Less

than half of our surveyed farmers (42%, n=125) reported a negative revenue change, while more than half (58%, n=173) reported no change or a positive change in revenue due to the pandemic compared to previous years. A closer look at our farmers' experiences with and participation in federal relief programs as well as their use of DTC and online marketing channels can help inform policies and priorities that support the viability of smaller, regional farmers in the future.

Participation in Federal Relief Programs

As noted earlier, the CARES Act provided the agricultural sector an opportunity to access US$35 billion dollars in federal relief funds in 2020, with almost US$30 billion of that amount going to farm operations, an amount significantly higher than any federal agriculture funding in recent history (Giri et al., 2021). Consistent with the national data, federal relief payments to farmers in PA rose in 2020, with CFAP 1 and 2 providing the major source of agricultural relief to PA farmers and ranchers. Applying for CFAP was a relatively simple online process, and local FSA staff were available to assist as needed. Approximately 38% of PA farmers and ranchers received a total of $411 million (USDA Farmers.gov, n.d.-a; USDA Farmers.gov, n.d.-b) compared to 20.5% of PA farmers receiving a total of $74.1 million in 2017 (USDA NASS, n.d.-b). In our sample, a greater percentage (49%) of farmers than the PA average received federal support. This greater number may reflect that the average farm size of the surveyed farmers was larger than that of the average PA farm (261 compared to 137 acres) and that farmers with higher revenues were overrepresented in the survey sample. As noted by Belasco and Smith (2022), these attributes increased the likelihood of receiving federal aid. The USDA-published qualification criteria for CFAP grants was production-specific based on the farmer reporting usual production and anticipated lost revenue due to the pandemic (USDA FSA, 2020; USDA Farmers.gov, n.d.-a; n.d.-b). One farmer interviewed supported this view by describing the ease with which he applied for and received US$5,000 due to a drop in mushroom sales (Farmer Interview, 014). Like farmers nationwide, the surveyed farmers also accessed SBA programs with PPP, a forgivable loan, predominating over EIDL, a traditional loan. More than one quarter of the respondents participated in more than one aid program, although some farmers communicated in the survey that they usually can manage on their own. One farmer shared: "[Relief programs] definitely helped us to cash flow, [but] we try to manage our business that we don't need that extra money thrown at us" (Farmer Interview, 004).

Although none of the farmers interviewed complained about the amount of their CFAP grant, nationwide, small and mid-sized farms (per farm revenue) receiving CFAP funds received a proportionately lesser amount of total funds than the larger farms (Belasco & Smith, 2022). Relatedly, we found that farmers who reported lower pre-COVID revenue compared to higher-revenue farms were less likely to participate in relief programs (Figure 3). Bekkerman et al. (2018) noted that any COVID-related federal relief was in addition to the direct payment support some farmers traditionally receive from the USDA, such as Federal Crop Insurance, Agriculture Risk Coverage, and/or Price Loss Coverage. Bekkerman et al. argue that, moving forward, given the high price of these programs, caps should be set on relief payments and some farmers already receiving federal support should be ineligible for disaster funding. One of the farmers interviewed expressed similar concerns:

> I don't know, you know, at what point in time, there really should have just been a cap [on relief funding. ... I think it should have just been one general cap, I don't think you need to throw a lot of money out there. That money has to come from somewhere. (Farmer Interview, 004)

Although SBA funding targeted small farmers, applications for PPP and EIDL required a visit to an SBA-affiliated lender, usually a bank with that designation (Ludwig, 2021; SBA, 2021). If a farmer was connected to a lender, the PPP application process was relatively easy.

However, several farmers felt the funds available through the SBA, once received, were insufficient. One farmer highlighted the difference be-

tween their needs and what was available, as well as the difference between a PPP and SBA loan (EIDL):

> Well, see the trick was, PPP, they give you two times your payroll, and they stop. So, what do you get? If your payroll is $4,000 a month, you get $1,000. What's that's going to do? Nothing. So, okay, we're going to waive it. But I look at it as it's not even worth the aggravation. […] SBA loan [EIDL], just payable back on a 10-year note, but when you need a million dollars, and they give you $80,000, you got $920,000 in difference, and then they limit you to like $150,000 or $200,000. (Farmer Interview, 016)

It is possible that those criticizing the inadequacy of the SBA loan did not get all the money to which they were entitled. Farmers were permitted to include rent and utility costs in their SBA application, but according to Demko et al. (2021), this was not clearly communicated. Considering the structure of disaster relief programs that entail loans instead of grants is critical. While PPP was a forgivable "loan," EIDL is a traditional loan that requires repayment and adherence to terms that can be counterproductive to farm businesses. The blanket security agreement found in EIDL loans more than $25,000 requires the farmer to involve the SBA in any future transaction of assets used as collateral. This can constrain how farms and farmers buy and sell equipment and land that they used as loan collateral, creating far-reaching implications for farm businesses that may warrant policy changes (McEowen, 2021).

Nonparticipation in Federal Relief Programs

Just over one-half (51%) of the farmers surveyed did not participate in a federal relief program, a finding similar to that of McElrone et al. (2022). With an eye to future policies that promote small and mid-size farm resilience, we were interested in examining this issue. In general, the farmers who did not participate in federal relief programs had a lower pre-COVID revenue than relief program participants. Nonetheless, 44% of these farmers indicated a lack of interest in participating, and 20% reported not being eligible. They indicated that sales were good and they did not need financial aid. For example, one farmer shared: "We knew they [relief programs] were there. And they were available, but we just didn't find the necessity for it. We were fine without" (Farmer Interview 02).

However, 42 of the farmers who received no federal support indicated that they were unable to determine their eligibility for relief or how to apply for aid. This is consistent with recent findings showing that the smallest business are often unaware of available government assistance (Demko et al., 2021; Humphries et al., 2020) and that smaller PA farmers often lacked a connection to loan and grant providers (Econsult Solutions Inc.; 2021). These 42 farmers had remarkably low pre-COVID revenues. While 76% of them had an annual revenue less than US$50,000, half of them had pre-COVID revenues of US$1,000–24,999. In that subset, almost 60% of farmers reported a COVID-related revenue loss, compared to 42% of the full sample reporting a loss. It is unknown whether this group would have been eligible for a CFAP grant or PPP forgivable loan, or whether those funds may have mitigated their losses. We also do not know whether these farmers had off-farm income and, if so, how much a loss in farm income affected them. Yet, these farmers with likely the greatest need for assistance were unable to pursue federal aid due to lack of information. Possibly, these farmers live in a community without an SBA-affiliated bank or lender or, in the case of CFAP, are unfamiliar with the local FSA staff who could share grant availability, answer questions, or assist those without internet access. For smaller regional farmers, extension agents, Farm Bureau staff, and other farm-facing organizations may be best positioned to reach farmers with needed information, and this outreach should be supported in future policy interventions and emergency aid programs.

Direct-to-Consumer Trends and Resiliency

One way that farmers and food businesses may have maintained or enhanced resiliency was by leveraging DTC relationships and shorter supply chains during the pandemic (Perrin & Martin, 2021; Thilmany et al., 2021). We found that about

one-half of the farmers surveyed maintained or increased their DTC sales. Those farmers who did not participate in DTC sales or who decreased DTC sales were more likely to report significantly greater losses than those who maintained or increased their DTC sales. Food systems with short supply chains facilitate a connectedness between the stakeholders that better position the systems to adjust to market disturbances. In our study, gathering data from a wide range of farmers in PA offered a natural way to explore the potential of regional food systems to offer competitive advantages over transnational, globalized food systems through regional relationships. We found that while some of the regional farmers may be locked into production and marketing channels and thus unable to pivot and redirect product, the farmers who were able to adopt more DTC marketing channels experienced less revenue loss during the first year of the COVID-19 pandemic. Both PA farmers and food systems experts appreciate the potential for DTC and robust regional distribution networks to meet current and anticipated food supply chain challenges.

Thilmany et al. (2021) argued that the supply chain relationships between laborers, producers, and consumers in local and regional food systems enabled an increased focus on DTC sales with the ability to bypass the intermediaries (institutions, restaurants) that were most affected by COVID-19. However, they argued, broadband access, e-commerce education, and technical support for these platforms are key to success for DTC sales. Likewise, in a recent ethnographic study of farmers and food system actors in North Carolina, O'Connell et al. (2021) described the ways in which regional farmers were able to adapt quickly while other regional actors were able to leverage relationships and networks to help alleviate supply chain challenges. Assuring these regional systems are viable during times of shock requires more than support for farmers on the national and multinational distribution level. It requires ongoing investments in maintaining regional marketplaces, regional aggregation, and meat-processing facilities, and providing adequate training and infrastructure centered on more DTC relationships. Borges-Méndez and Caron (2019) encouraged a view of resiliency that looks toward regional actors and growers to maintain and envision food system arrangements following major disruptions after Hurricane Irma and Maria in Puerto Rico. Our work, along with Perrin and Martin (2021), Whitehouse et al. (2023), and Thilmany et al. (2021), suggests that these shorter supply chains may contribute to financial resiliency for farmers. While the disruptions due the pandemic were unique in both the duration and scope of their impact, it is likely that ongoing shocks due to climate change will continue to threaten food system function (FAO, 2013). It may be necessary to consider how government can further financially support the coordination of regional food systems while maintaining the agency and adaptive capacity of regional farms utilizing more direct marketing channels.

Limitations and Future Research

There are several important limitations of this study and some important pathways forward for future empirical work. Firstly, because there was not a pre-existing sampling frame or trustworthy database of all farmers in PA, it was not possible to calculate an overall response rate for our survey. Although our respondents aligned with the demographic profile of PA farmers, the survey responses over-represented larger farms with annual revenues greater than US$250,000 and did not include farmers with revenue less than US$1,000. This may have contributed bias to our data and analysis. Lower-revenue farms, or farms that grew and distributed food directly to their communities, may warrant future examination especially because of their potential adaptability during times of disruption. Additionally, the surveys and interviews relied upon retrospective, self-reported data. We considered these limitations as necessary in order to minimize privacy concerns and any potential risks for participants. Our analysis of semi-structure interviews was primarily deductive and aimed to enhance understanding of our quantitative findings. This qualitative data, and studies of other farmer experiences during the pandemic, could be the subject of more emergent analyses. Additionally, our interview respondents were 50% female, while our survey respondents and the PA census show 35% female farmers. The demographic character-

istics of our respondents closely matched the race/ethnicity characteristics of farmers in PA; however, this meant that there were a small number of respondents of farmers holding non-white identities. This limited further statistical analysis of survey results, and the lived experiences of racially and ethnically diverse farmers in PA should be the subject of ongoing research. This survey focused on farmer owner/operators rather than farmworkers. Though it was outside the scope of this study, future work should examine how the pandemic impacted the lived experience of these important workers.

Conclusion

Our study was uniquely positioned to explore adaptive strategies farmers enacted to weather the pandemic and to explore policy initiatives and aid programs designed to lessen the financial hardships of farmers and preserve the function of the food system during a time of great disruption. We hope that these findings will be useful in informing policies, programs, and initiatives to support farmers during major market disruptions.

Looking Back at 2020

After this period of substantial upheaval in nearly every sector of the food system and unprecedented investments by the federal government to support farmers, it is important to report and reflect on the empirical impacts on farmers, their strategies for maintaining viable operations, and the reach of federal funding programs. With a full year (2020) look-back at PA farmers, we found that the early predictions of severe financial losses for regional farmers did not hold true. In our sample, less than half of farmers (42%) reported a negative revenue change, 21% no change, and 37% a positive change in revenue due to the pandemic compared to previous years. Additionally, almost one half of our farmers took advantage of federal farm relief offered nationwide, with those farmers with higher pre-COVID revenues more likely to participate. Conversely, a subset of lower-revenue farmers, who also experienced a drop in revenue due to the pandemic, was unsure of how to apply for aid. A better understanding of the nature of participation and the protective effects of these farm relief programs could help further describe which types of food systems are able to persist in the future. The pandemic and other ecological disturbances highlight pain points in the food system and offer an opportunity to leverage the voices and experiences of farmers to describe the nature of support needed to continually respond to current and future disruptions.

DTC marketing channels, a hallmark of regional food systems, may have served a protective role for the smaller farmers, who were able to better leverage these markets or were agile in their marketing and distribution to redirect foods and close important gaps in the food system during the early phases of the pandemic. These channels may mitigate future disruption, regardless of source. In our sample, slightly over half of the farmers reported their DTC sales as remaining the same or increased during 2020, and we found that participating in DTC sales, as well as having an online presence, was revenue-protective.

Policy Implications

To assure the stability of these protective DTC relationships, federal assistance and future investment should focus on enhancing infrastructure and the capacity of regional food systems, which have been shown to be more resilient to disruption than the current food system. This support should range from training farmers in needed computer and marketing skills to supporting the regional food-processing infrastructure to enabling broadband access in all rural communities. It is also likely that direct monetary support to farmers—not a new concept—will continue to be necessary in times of severe disruption from climate change, future pandemics, and more. On the federal level, the type of, scope of, and eligibility for farm aid needs to be re-evaluated to prioritize small and mid-sized farmers (based on revenue), to target those farmers not benefitting from other federal agricultural support, and to base eligibility and funding amounts on metrics meaningful to these non-commodity farm operations. Federal policy should recognize the unique needs of smaller farmers seeking to build a viable farm business and, when necessary, adapt their practices during times of disruption. Targeted outreach to these farmers to both inform them of

available federal aid and to provide application assistance is needed. With the right policies and structures in place, regional food systems can not only be a viable market option during normal times but also may be best positioned to support farmers and consumers during times of disruption and unforeseen challenges.

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APPENDIX A. SURVEY QUESTIONS

ABOUT YOUR FARM

1. This Farm is (select one): ☐ Non-profit ☐ For profit

2. Farm's zip code: _____

3. This farm's location is (select one): ☐ Rural ☐ Suburban ☐ Urban

4. How many total acres does the farm own and/or lease? Please restrict to one decimal point.
   _____

5. How many acres are under agricultural production (owned and/or leased)? _____

6. How many years has the farm been in business? _____

7. Which of these certifications are on the farm? ***Check all that apply.***

   ☐ No Certifications
   ☐ Certified Forest Grown
   ☐ Certified Kosher
   ☐ Fair Trade
   ☐ PA Preferred
   ☐ Other: _____
   ☐ Animal Welfare Approved
   ☐ Certified Halal
   ☐ Certified Naturally Grown
   ☐ Food Alliance
   ☐ Protected Harvest
   ☐ Certified Biodynamic
   ☐ Certified Humane
   ☐ Certified Sustainable
   ☐ USDA Certified Organic
   ☐ Non-GMO Project Verified

8. What is the PREDOMINANT output of your operation? ***Select one.***

   ☐ Dairy
   ☐ Eggs
   ☐ Fruit
   ☐ Row Crop and Grain
   ☐ Hay and Forage
   ☐ Other (please specify): _____
   ☐ Livestock
   ☐ Vegetables

OPERATIONAL CHANGES DUE TO COVID-19

9. For items your farm produces commercially, select whether your production decreased, stayed the same or increased DUE TO the COVID-19 Pandemic.

	Not applicable	Decreased production	Stayed the same	Increased production
Alternative energy	☐	☐	☐	☐
Animals (fiber)	☐	☐	☐	☐
Bees	☐	☐	☐	☐
Compost	☐	☐	☐	☐
Cut flowers	☐	☐	☐	☐
Dairy (cow)	☐	☐	☐	☐
Dairy (goat/sheep)	☐	☐	☐	☐
Eggs	☐	☐	☐	☐
Grains	☐	☐	☐	☐
Hay/forage	☐	☐	☐	☐
Herbs (culinary)	☐	☐	☐	☐
Herbs (medicinal)	☐	☐	☐	☐
Hops	☐	☐	☐	☐
Meat—poultry	☐	☐	☐	☐
Meat—beef	☐	☐	☐	☐
Meat—goat/sheep	☐	☐	☐	☐
Meat—pork	☐	☐	☐	☐
Meat—other	☐	☐	☐	☐
Mushrooms	☐	☐	☐	☐
Non-tree fruits & berries	☐	☐	☐	☐

Nursery plants/ ornamentals	☐	☐	☐	☐
Nuts	☐	☐	☐	☐
Timber	☐	☐	☐	☐
Tree fruit	☐	☐	☐	☐
Vegetables	☐	☐	☐	☐
Value-added products	☐	☐	☐	☐
Other:	☐	☐	☐	☐

10. Indicate whether each item on the list below decreased, stayed the same, or increased DUE TO the COVID-19 Pandemic.

Activity	Not applicable	Decreased	Stayed the same	Increased
Events—education	☐	☐	☐	☐
Events—private (wedding, …)	☐	☐	☐	☐
Events—public (open farm day, festivals, etc.)	☐	☐	☐	☐
Lodging	☐	☐	☐	☐
Restaurant	☐	☐	☐	☐
You-Pick	☐	☐	☐	☐
Other:	☐	☐	☐	☐

FINANCES, SALES, MARKETING

11. In general, how is your farm doing financially DUE TO the COVID-19 Pandemic?

☐ Much Worse Off ☐ Slightly Worse Off ☐ No Change
☐ Slightly Better ☐ Much Better

12. Please remember this is an anonymous survey and sales information cannot be linked to your specific farm. What were your typical (pre-2020) yearly farm revenues?

☐ Less than $1,000 ☐ $1,000- $24,999 ☐ $25,000- $49,999
☐ $50,000- $99,999 ☐ $100,000- $249,999 ☐ $250,000- $499,999
☐ $500,000- $999,999 ☐ ≥ $1,000,000

13. Please estimate your percent change in revenue DUE TO the COVID-19 Pandemic for your farm in 2020.

☐ > 50% loss ☐ 26-50% loss ☐ 11-25% loss ☐ 1-10% loss
☐ No Change ☐ 1-10% increase ☐ 11-25% increase ☐ 26-50% increase
☐ > 50% increase

14. After the COVID-19 Pandemic began, what changes in sales did you experience from the following channels?

	Not applicable	Decreased	Stayed the same	Increased
CSA	☐	☐	☐	☐
Direct wholesale to retailers or schools/institutions	☐	☐	☐	☐
Farmers markets	☐	☐	☐	☐
On-farm store or farm stand	☐	☐	☐	☐
Restaurant	☐	☐	☐	☐
Traditional wholesale to auction, distributor, co-op	☐	☐	☐	☐
Donated	☐	☐	☐	☐
Other:	☐	☐	☐	☐

15. How did the way you **promote** your farm business change DUE TO the COVID-19 Pandemic? Please respond to the following.

	Not applicable	Reduced	No change	Enhanced	Added in 2020
Business website	☐	☐	☐	☐	☐
E-Commerce (online sales)	☐	☐	☐	☐	☐
Marketing emails	☐	☐	☐	☐	☐
Facebook page	☐	☐	☐	☐	☐
Other social media (Twitter, Instagram, etc.)	☐	☐	☐	☐	☐

16. Did you have more product waste in 2020 DUE TO the COVID-19 Pandemic?

☐ No
☐ Not sure
☐ Yes (if yes, please explain below)

17. What were your total estimated costs to the nearest dollar amount for additional COVID-19 Pandemic-related expenses?

- Safety supplies like masks, gloves, plastic sheeting: _____
- Additional farm or market labor: _____
- Additional marketing expenses: _____
- Additional equipment like refrigerators, hand-washing units, field production, etc.: _____
- Other? Please list and give estimated cost: _____
- No additional costs _____

18. Have you participated in any farm or small business relief programs since the COVID-19 Pandemic began? (*e.g., Payroll, Protection Program, CFAP, private foundation grants, etc.*)

    ☐ No
    ☐ Yes. Please list programs:

19. In the question above, if you indicated that you have ***not*** participated in any farm or small business relief programs since the COVID-19 Pandemic began, please indicate why not.

    ☐ I participated in a relief program ☐ Not eligible ☐ Not interested
    ☐ Unable to determine if I was eligible or how to apply ☐ The funding ran out
    ☐ Other: _____

LABOR

20. I had difficulty hiring the specialized labor (tractor or machine operators, etc.) I needed during the 2020 season DUE TO the COVID-19 Pandemic.

    ☐ Yes ☐ No ☐ Not Applicable

21. I had difficulty hiring the number of Visa Program workers I needed during the 2020 season DUE TO the COVID-19 Pandemic.

    ☐ Yes ☐ No ☐ Not Applicable

22. I had difficulty hiring the number of **other** non-Visa Program workers (apprentices, hourly workers, etc.) I needed during the 2020 season DUE TO the COVID-19 Pandemic.

    ☐ Yes ☐ No ☐ Not applicable

23. How did your farm work hours, including owner/operator hours, change in 2020 DUE TO the COVID-19 Pandemic?

    ☐ Decreased ☐ No Change ☐ Increased

24. By what percentage, if any, did your labor payroll expenses change DUE TO the COVID-19 Pandemic?

- ☐ >50% decrease
- ☐ 26-50% decrease
- ☐ 11-25% decrease
- ☐ 1-10% decrease
- ☐ No Change
- ☐ 1-10% increase
- ☐ 11-25% increase
- ☐ 26-50% increase
- ☐ >50% increase

25. What changes, if any, might you make to your workforce for the 2021 season?

PERSONAL IMPACT

26. What has been the impact of the COVID-19 Pandemic on your personal/family well-being? ***Check all that apply.***

- ☐ A family member or friend has passed away
- ☐ I have been sick, which has impacted my household and/or ability to farm
- ☐ My care-giving responsibilities (children, loved ones, self, other) have increased
- ☐ My non-farm household income (mine or family member's) has decreased or been eliminated
- ☐ My non-farm household income (mine or family member's) has increased
- ☐ I've enjoyed more time with family
- ☐ I've changed my farm operations for the better
- ☐ I've connected more with my community
- ☐ Other:

27. Looking towards 2021, what steps are you taking to improve your farm business?

INFORMATIONAL/EDUCATIONAL NEEDS

28. How do you prefer to receive farm/business-related information/education? ***Check all that apply.***

- ☐ Webinars
- ☐ Tele/video conference meetings (like Zoom)
- ☐ Short Instructional videos
- ☐ Factsheets or printed guides
- ☐ Emails
- ☐ In person event or conference
- ☐ Other: _____
- ☐ No information/education needed

29. What type of marketing assistance do you need? ***Check all that apply.***

- ☐ Identifying and setting up an online platform
- ☐ Setting up ordering and distribution systems
- ☐ Marketing, promotion, how to reach new customers
- ☐ Sourcing suppliers (bags, boxes, twist-ties, etc)
- ☐ Identifying and contacting new wholesale markets
- ☐ Other: _____
- ☐ No assistance needed

30. What production and/or labor-related needs or interests do you have? ***Check all that apply.***

- ☐ Production planning for farmers market sales
- ☐ Production planning for CSAs
- ☐ Production planning for intermediate and wholesale markets
- ☐ Production planning for online-based sales platform
- ☐ Projecting labor needs
- ☐ Employee physical and emotional well-being
- ☐ Other: _____
- ☐ No production or labor-related needs/interest

31. What type of food safety and/or worker safety information do you need? ***Check all that apply.***

- ☐ How to safely clean, sanitize, & disinfect food contact & high contact surfaces on your farm
- ☐ How to assure consumers that their food supply is secure
- ☐ Employee/employer issues, e.g., paid sick leave or monitoring temperatures
- ☐ Social distancing on farm
- ☐ How to quickly transition to GAP for access to new markets
- ☐ Use PPE (personal protective equipment) on your farm
- ☐ Understanding new OSHA or other guidelines related to the COVID-19 Pandemic
- ☐ Other:
- ☐ No assistance needed

32. What aren't we asking you that you would like us to know about your experience during the 2020 season? Please continue your response on page 10 if needed.

DEMOGRAPHICS

33. Are you Hispanic, Latino, or Spanish origin? (optional): ☐ Yes ☐ No

34. Race- please check all that apply (optional): ☐ White ☐ Black or African American ☐ American Indian or Alaska Native ☐ Asian ☐ Native Hawaiian or other Pacific Islander

35. Age (optional): _____

36. Gender (optional): ☐ Female ☐ Male ☐ Nonbinary

37. Do you consider yourself to be (optional): ☐ Heterosexual or straight ☐ Gay or Lesbian ☐ Bisexual

APPENDIX B. INTERVIEW PROTOCOL

Question Guide:

1. How are you? How are things going for you in light of the Pandemic?

2. Because your survey was done anonymously and I therefore can't connect your survey responses to you, would you briefly share a basic description of your farm so I can get a mental picture? Number of acres under production? What you produce, anything else I should know about your farm in general, unrelated to the Pandemic?

3. **Thinking of the past year—2020—how has the Pandemic impacted your farm business?** Did you make any changes in your farm business due to the Pandemic?

   If so—how did you make those decisions? What were you thinking about? What were you keeping in mind? Challenges? Help?

   As needed, prompt for:

   - Experiences during different phases of the pandemic
   - Changes and how you made some of these decisions

     a. Change in what grown/raised?
     b. Change in market and marketing/customers?
     c. Innovations/adaptations

   - Financial challenges/opportunities
   - Labor challenges/opportunities
   - Supply chain challenges?

4. **If farmer mentioned financial challenges:** You mentioned financial challenges due to the pandemic. How did you address these challenges? Did you use any federal, state or local programs that offered financial help?

   - How did you hear about the programs?
   - How did you decide if a program was a good fit for you?
   - How did it work out—that is, what was the process for you to apply and once you received the funds—thinking back—was it a smooth process? Timely? Give you what you needed? What was still missing? (impact on you?)
   - If you didn't use these federal, state or local programs that have been in the news, can you share why you did not

   If the farmer did NOT mention financial challenges and, indeed, might have said that they did well financially, ask:

   - Glad to hear that you didn't experience financial challenges on the farm -- can you share what might have insulated you from the financial problems others experienced

5. Thinking both about possibly lasting effects of the Pandemic and unknown future challenges, what do you and other farmers - if you are comfortable speaking for farmers—need to stay viable—to stay in business?

    Prompt if needed: policies? Regulations? Training opportunities? Financial supports?...

6. Many people—farmers and others—have experienced physical and/or emotional tolls from the Pandemic. Can you tell me, as a farmer, about the physical and/or emotional impact of the pandemic on you and your farm business?

7. Is there anything else you'd like to leave us with?