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Assessing Small Farmers' Adaptation and Management Strategies to Navigate the Risks and Uncertainties: The Case of Missouri

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Abstract

Investing in the agricultural sector exposes producers to numerous risks and uncertainties. The COVID-19 pandemic exacerbated these challenges, and their impacts are still being felt globally. Our study aims to evaluate and describe the risk management strategies employed by small farmers in Missouri to mitigate and adapt to the impact of the COVID-19 pandemic on their farm operations. We analyzed 141 survey responses, and our findings indicate that most respondents employed multiple strategies, including using savings, diversification, reducing inputs, donating output, delaying investment, gaining off-farm employment, and utilizing government relief programs. However, apart from the COVID-19 stimulus checks, which were automatically disbursed to eligible households, few farmers were aware of or participated in other federal relief programs aimed at supporting small businesses and producers. We recommend that Extension specialists collaborate with other stakeholders and agencies responsible for federal relief programs to enhance small farmer awareness and participation in the future. Additionally, further research is necessary to understand the coping strategies employed by small farmers to remain resilient and maintain personal and mental health during the pandemic.

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Introduction and Problem Statement

Producers invest in the agricultural sector with the expectation of a profitable return. However, these investments carry risks and uncertainties that are beyond their control. As a result, farmers must continuously innovate and adapt to changes in the dynamic external environment. These changes may include governmental policy, weather, climate, price fluctuations, market uncertainty, and disease outbreaks such as the COVID-19 pandemic. Among other developments, the pandemic increased the cost of production and contributed to food wastage because of labor shortages and market shutdowns as the result of stay-at-home measures to promote physical distancing (Lahath et al., 2021; Litkowski & Giri, 2023; McElrone et al., 2021; Seidel et al., 2021), which impacted production and profitability. Further, although consumer food prices soared during the pandemic, farm-gate prices declined, and regional food shortages were reported (Mucioki et al., 2022).

Since the declaration of the COVID-19 outbreak as a pandemic by the World Health Organization on March 11, 2020 (Cucinotta & Vanelli, 2020), numerous studies have investigated its impact on the agricultural sector (Pu & Zhong, 2020). Additionally, several investigations have explored the adaptations made by small farmers during the pandemic, typically in a local or regional context, such as northwest Arkansas (Florick & Park, 2022) or western Washington (Ladyka et al., 2022). This descriptive study extends previous research on farmers' adaptations by focusing on risk management strategies employed by small farmers in the state of Missouri. The lessons learned from our research will inform policy and Extension programming in Missouri and could potentially be transferable to other regions, depending on the specific contextual factors.

Theoretical and Conceptual Framework

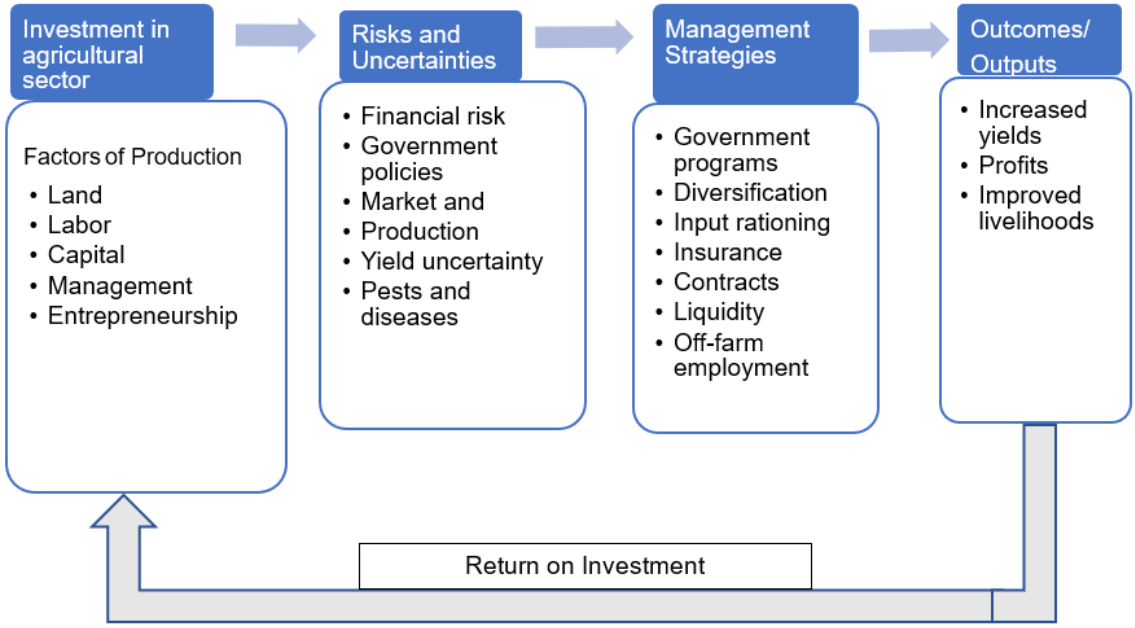
The production of goods and services in the agricultural sector involves the investment and combination of various factors of production, such as land, labor, capital, and entrepreneurship, to create value. Investing in these factors of production entails undertaking certain risks and uncertainties that producers must manage or mitigate to achieve the desired outcome, such as generating a return on investment for the farmer (see Figure 1).

Individuals employ different strategies to manage risks and uncertainties, including acceptance, avoidance, transferring, and mitigation (Project Management Institute, 2013). Farmers, for example, use various techniques to guard against risks and uncertainties (Komarek et al., 2020), such as government programs, diversification of farm enterprises, input rationing, insurance, financial leverage, futures contracts, liquidity marketing contracts, off-farm employment, options contracts, and production contracts (Johansson, 2020; Kahan, 2008; Prager et al., 2020; Tsiboe & Turner, 2023). Drawing on our literature review, we established relationships between these factors to formulate a conceptual framework (Grant & Osanloo, 2014; Van der Waldt, 2020) that guided our understanding of the challenges farmers face when investing in the agricultural sector and the management decisions they make. A conceptual framework such as

the one presented in Figure 1 “lays out the key factors, constructs, or variables, and presumes relationships among them” (Miles & Huberman, 1994, p. 440).

Figure 1

Study’s Conceptual Framework



Note. The conceptual relationship between investment in the agricultural sector, exposure to risks and uncertainties leading to the deployment of risk management/adaptation strategies, and outcomes/outputs and return on agricultural investment.

Purpose

Our study aimed to describe, assess, and understand the adaptive and management strategies used by small farmers in Missouri to navigate the risk and uncertainty associated with the COVID-19 pandemic. Specifically, seven objectives undergirded this study:

1. Describe input cost changes for small farmers in Missouri during the pandemic.
2. Evaluate on-the-farm management strategies used by small farmers in Missouri to respond to the COVID-19 pandemic.
3. Describe the awareness and participation of small farmers in Missouri in federal relief programs.
4. Describe the sales channels used by small farmers in Missouri used to market products to consumers before and during the pandemic.
5. Describe changes in farm revenue based on the sales channels used by small farmers in Missouri before and during the pandemic.
6. Describe changes in total farm revenue following the COVID-19 pandemic.
7. Describe the future farm aspirations of small farmers in Missouri.

Methods

To address the above objectives, the research team developed an online survey instrument to describe and evaluate the changes in small farmer decisions and outcomes following the outbreak of the COVID-19 pandemic. During the design stage, we received input from extension specialists and local farmers to ensure the study's practical relevance. A panel of experts from the Division of Applied Social Sciences at the University of Missouri and a faculty member from the College of Agricultural and Natural Sciences at Lincoln University of Missouri assessed the survey instrument for content and face validity (Creswell, 2014). Upon receiving approval from the University of Missouri's Institutional Review Board, we distributed the online survey invitation to small farmers in Missouri through two approaches. First, we emailed the invitation directly to farmers who were registered with the Missouri Grown program and the Missouri Farm Bureau's Missouri Meat Producer Directory. Second, Extension specialists in the state of Missouri disseminated the invitation link through program newsletters, email lists, and social media. The programs include the Small Ruminant Program, Innovative Small Farmers' Outreach Program (ISFOP), Agricultural Economics and Marketing program, Missouri Farmers' Market Association, and Exceed-Regional Economic and Entrepreneurial Development. We collected survey responses from April 2022 to July 2022. We used Microsoft Excel and Stata to organize, analyze, report, and illustrate the data. For this study, only descriptive statistics such as percentages are reported in the tables and the figures.

Findings

We received a total of 141 responses. Following the deletion of respondents who self-identified as "medium" or "large" farmers, we analyzed 121 responses. Because of the descriptive nature of the data analysis, we did not delete observations with partially missing data. Regarding the demographic characteristics of our survey respondents, the majority (57%) identified as female, and 43% identified as male. The average age of respondents was 51 years. The majority of our survey participants (59%) were livestock producers, while 46% reported growing fruits and vegetables, and 28% had crops. It is worth noting that the percentages for the type of farming operation are higher than 100% due to respondents selecting multiple choices. Additionally, most of the survey respondents (70%) reported owning the farm land, 21% reported owning and renting, and 6% reported farming on rented land.

Table 1 displays the distribution of our respondents in terms of revenue categories. The largest category comprised respondents (44%; n = 51) who earned up to $10,000 per year in farm revenue. Eighty of the respondents (69%) make less than $30,000 per year.

Table 1

Number of Respondents by Revenue Category

Category	*n*	*%*
Less Than $10,000	51	44
$10,000 - $20,000	15	13
$20,000 - $30,000	14	12
$30,000 - $40,000	7	6
$40,000 - $50,000	6	5
$50,000 - $100,000	15	13
$100,000 - $150,000	4	3
More Than $150,000	4	3

Objective 1: Changes in Farming Costs of Inputs used by Farmers During the Pandemic

A majority of respondents reported a significant increase of approximately 70% or more in the costs of variable inputs such as feed, fertilizer, seed, energy, and equipment These findings suggest that farmers faced significant cost pressures in multiple aspects of their operations, which could have implications for their overall profitability and financial viability. It is important for farmers to carefully monitor their input costs and explore strategies to manage and reduce these expenses where possible. Regarding the classic factors of production (i.e., capital, labor, land), almost 50% or more of farmers indicated that their costs did not change much during the COVID-19 pandemic (see Table 2). However, relatively few respondents observed a cost decrease in any expense category.

Table 2

Changes in Input Costs during the COVID-19 Pandemic

Category	Decreased		No Change		Increased	
	n	*%*	*n*	*%*	*n*	*%*
Feed	1	1.19	11	13.10	72	85.71
Fertilizer	1	1.12	12	13.48	76	85.39
Seed	1	1.08	15	16.13	77	82.80
Energy	2	1.75	27	23.68	85	74.56
Equipment	2	1.90	30	28.57	73	69.52
Labor	5	5.56	53	58.89	32	35.56
Equity/Capital	22	22.92	47	48.96	27	28.13
Land	1	1.12	64	71.91	24	26.97

Objective II: On-Farm and Household Management Strategies in Response to the COVID-19 Pandemic

Our survey asked respondents about 11 different farm and household management strategies in response to the outbreak of the COVID-19 pandemic. The results showed that 66% of respondents used their savings, indicating the significant financial impact of the pandemic on small farmers. Furthermore, 46% of farmers indicated that they had diversified their farming activities as a risk management strategy against the uncertainties and risks of the pandemic . Other strategies employed by farmers included the reduction of input use (39%), donation of output (38%), delayed or canceled investments (37%), off-farm employment (31%), and decreased output (25%), among others (see Table 3). Further, more than one-fifth (21%) of the respondents delayed harvesting or sold assets to mitigate losses. Some farmers stopped production altogether (14%), while others destroyed their output/produce (11%).

Table 3

Farm and Household Management Strategies in Response to the COVID-19 Pandemic

Decision	*n*	*%*
Used savings	79	66
Diversified output	55	46
Reduced input	47	39
Donated output	45	38
Delayed/canceled investment	44	37
Gained off-farm employment	37	31
Decreased output	30	25
Delayed/canceled harvest	25	21
Sold assets	25	21
Stop production	17	14
Destroyed output	13	11

Objective III: Small Farmer Awareness of and Participation in Federal Relief Programs

To inform farm-level and household-level federal assistance to small farmers in Missouri, we first asked our survey participants to indicate their awareness of nine federal relief programs. Secondly, we asked them if they had participated in any of the listed programs. Out of the nine programs, the survey participants were most aware of the stimulus check (81%, as shown in Table 4), which was sent by the U.S. government to households with an income of up to $150,000. Seventy percent of the small farmers in our survey received the check. Only 21% of the respondents indicated participating in the Paycheck Protection Program or the USDA Direct Pandemic Assistance for Producers. Other farmers (17% -18%) participated in the two rounds of the Coronavirus Food Assistance Program. Although the respondents seemed to be aware of the other four federal relief programs, their participation remained low.

Table 4

Small Farmer Awareness and Participation in Federal Relief Programs

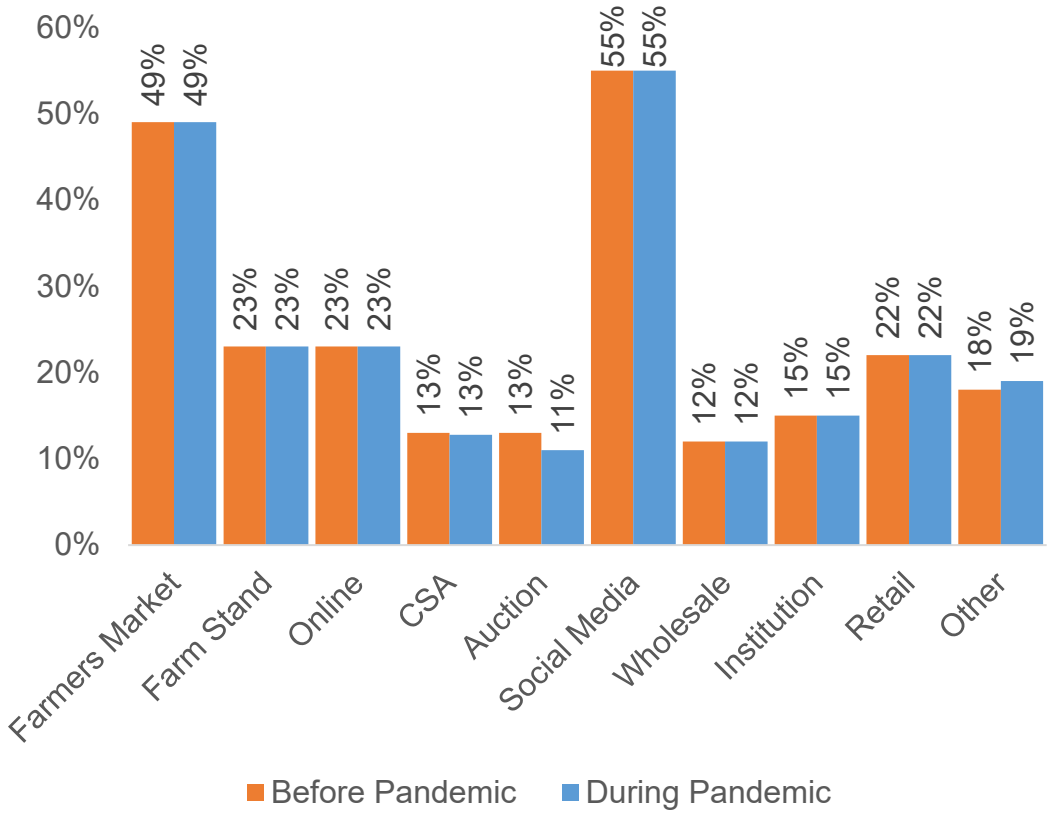
Federal Program	Awareness		Participation	
	n	*%*	*n*	*%*
COVID-19 Stimulus Check	97	81	84	70
Paycheck Protection Program	60	50	25	21
USDA Direct Pandemic Assistance for Producers	37	31	25	21
Coronavirus Food Assistance Program	25	21	22	18
Coronavirus Food Assistance Program 2	20	17	20	17
Mortgage Relief	19	16	5	4
Unemployment Insurance	26	22	4	3
Food Stamp and Meal Programs	25	21	2	2
Rent Assistance and Eviction Moratorium	36	30	1	1

Objective IV: Sales Channel used by Farmers Before and During the COVID-19 Pandemic

As we illustrate in Figure 2, social media platforms, such as Facebook Marketplace and Twitter, were the most popular sales channels (55%) before and during the COVID-19 pandemic among our respondents. The farmers' market constituted the second most popular sales channel (49%). Relatively few small farmers in our survey had access to sales channels at the downstream segment of the food value chain (12% with wholesalers, 15% with institutions, and 22% with retailers). When comparing the two time periods, our respondents made almost no changes in terms of the use of the channels. Auctions were the only sales channel to experience a slight decrease in usage (from 13% to 11%), probably due to restrictions on public gatherings, and may have been unable to switch from in-person to online platforms to facilitate transactions.

Figure 2

Sales Channel used by Farmers Before and During/After the COVID-19 Pandemic

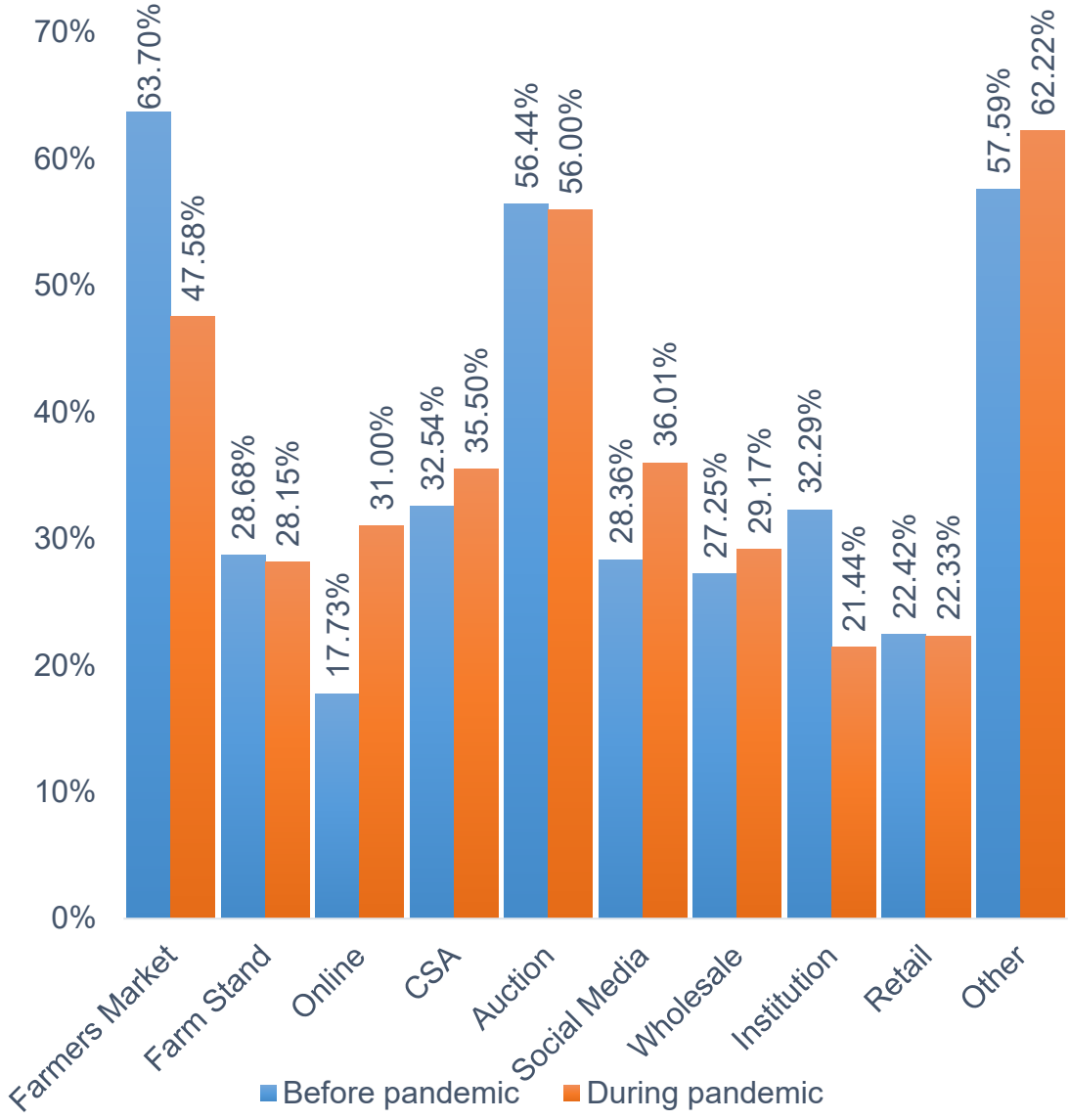


Objective V: Changes in Farm Revenue by Sales Channel Before and During the COVID-19 Pandemic

While sales channel contribution remained more or less identical, the actual importance of each sales channel to farm revenue changed (as shown in Figure 3). We asked respondents who used a given sales channel to indicate what percentage of farm revenue it facilitated. It is noticeable that sales channels with physical components (such as farmers' markets and institutions/restaurants) decreased, while sales channels with online presence (such as farm websites) and social media increased. Among the respondents who used the farmers' market to sell output, the average contribution to farm revenue decreased from 63.70% before the COVID-19 pandemic to 47.58% during the COVID-19 pandemic. Institutions, including restaurants and other food service establishments, which faced closures and restrictions during the pandemic, contributed less to the farm revenue of small farmers. The online shop channel experienced the largest increase from 17.73% before the COVID-19 pandemic to 31% during the COVID-19 pandemic. Social media marketing increased from 28.36% before the pandemic to 36.01% after the pandemic.

Figure 3

Changes in Farm Revenue Based on Marketing Channels used by Farmers Before and During the Pandemic



Objective VI: Total Farmer Revenue Changes Following the COVID-19 Pandemic.

As shown in Table 5, the impact of the COVID-19 pandemic on the revenue of our survey respondents was mixed. Just over two-fifths of small farmers (41%) reported an increase in their farm revenue. In contrast, 38% reported a decrease in their revenue, and 21% reported no change in revenue.

Table 5

Change in Farm Revenue Following the COVID-19 Pandemic

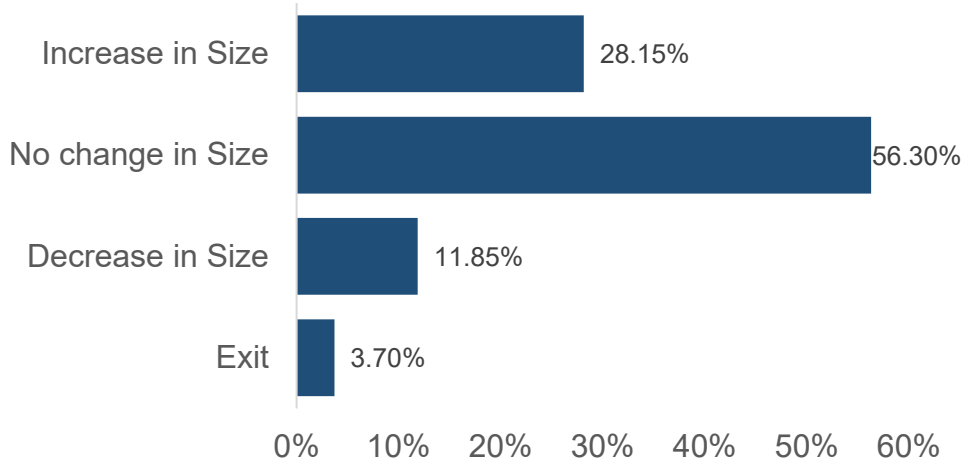
Change in Sales	*n*	*%*
More than 30% Decrease	23	20
0-30% Decrease	21	18
No Change	25	21
0-30% Increase	34	29
More than 30% Increase	14	12

Objective VII: Future Farm Aspirations

We also asked respondents to indicate their future intentions regarding farm size. The results showed that a majority of respondents (56.30%) had no intention to expand their operations (see Figure 4). Meanwhile, 28.15% and 11.85% of respondents reported intentions to increase or decrease their farm size, respectively. Only a small proportion of respondents (3.7%) indicated plans to exit farming in the near future.

Figure 4

Future Farm Size Intentions of Small Farmers in Missouri



Conclusions, Discussion, and Implications for Extension Practice

The study found that most farmers experienced increased input costs, especially for variable inputs such as feed and fertilizer, due to supply chain disruptions and increased demand during the pandemic (Mucioki et al., 2022). To mitigate the impact of these challenges on their production and profitability on farmers' investments, they employed a range of management strategies, including using savings, diversification of output, reduction of inputs, and delayed or

canceled investments (see Figure 1 and Table 3). The need to mitigate risks also led some farmers to gain off-farm employment and rely on federal relief programs (Prager et., 2020; Tsiboe & Turner, 2023). However, despite the availability of federal relief programs, few farmers were aware of or able to access them (McElrone et al., 2021), highlighting the importance of Extension specialists partnering with government agencies and other stakeholders to improve farmer awareness and participation in such programs. To address the information gap, these specialists should consider leveraging traditional and social media platforms to reach farmers and provide them with information on available programs. This approach could decrease the dependence on savings and other informal means to respond to risks and uncertainties.

The desire for farmers to expand or sustain the current farm size necessitates the involvement of Extension specialists in devising educational programs that impart farmers with valuable knowledge and competencies in the context of diverse management strategies, risk and uncertainty management, and on-farm emergency planning. To this end, conducting a thorough assessment of the farmers' needs and identifying the gaps that require attention through a comprehensive training program is crucial. Such an approach would significantly enhance the farmers' capacity to adapt to different situations, foster farm resilience, and ultimately improve their livelihoods.

In this study, while the farmers reported consistency in their sales channels during the pandemic, our analysis revealed a decline in revenue generated from most channels, except for online sales via farm websites, social media, community-supported agriculture (CSA), and wholesale. The pandemic may have presented an opportunity for farmers to expand their market reach, particularly through online sales and social media platforms, given the stay-at-home measures instituted to mitigate the spread of COVID-19. Consequently, promotion of online and social media channels is necessary to enable farmers to capitalize on these opportunities. To this end, Extension specialists in Missouri could design programs to equip farmers with the requisite knowledge and skills to develop online marketing strategies and branding. Such initiatives may include creating farm websites or social media accounts to enhance the farm's online presence and foster engagement with potential customers.

Recommendations for Future Extension Research

This study examined the management strategies adopted by small farmers in Missouri to mitigate the risks and uncertainties associated with the COVID-19 pandemic, focusing on farm-level perspectives. However, it is crucial to note that small farmers in Missouri may have also encountered personal and mental health challenges amid the pandemic (American Farm Bureau Federation, 2020; McElrone et al., 2021). Additional research is required to understand the coping strategies employed by farmers to remain resilient in this regard. Furthermore, future Extension research should consider the role of farm and operator characteristics in promoting on-farm resilience during times of crisis. It is important to note that due to the limited number of respondents in our study, generalizations beyond the sample are not feasible. Thus, a large-scale study would be necessary to determine whether small farmers

across the country have similar experiences and formulate a common, state or region-specific response.

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