

Understanding small- and very-small-scale meat processors in Missouri to strengthen the local supply chain

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Abstract

Promoting local food systems is crucial to providing a more viable economy, eco-friendly production, and equal opportunities for producers, consumers, and communities. Meat processors are critical to local meat producers and the meat supply chain. However, various barriers have restricted small-scale meat processors and challenged the local meat supply chain. Although local food systems have gained enormous scholarly attention, little attention has been devoted to specifically exploring the meat processing sector. This study investigated the characteristics and challenges of small-scale

(<750 employees) and very-small-scale (<200 employees) meat processors in Missouri. Twenty-six meat processors participated in an online survey through Qualtrics, a mail survey, or a structured phone interview between May 2021 and March 2022. We identified the characteristics and constraints related to their businesses. The analysis revealed that 76% of meat processors perceived that their business was in better or much better condition than before the COVID-19 pandemic, reflecting their adaptability to the disrupted meat supply chain. However, small-scale meat processing facilities were limited by the labor shortage, complicated regulations and high regulatory compliance costs, a lack of consistent supply, and limited access to tools and equipment. More integrated work is

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Disclosure

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needed to aid smaller processors in positively impacting the local community and environment through locally sourced meat production. This study contains helpful implications for state-level policymaking, extension programs, and future research directions.

Keywords

Small-scale meat Processors, Challenges, Local Meat, COVID-19, Pandemic, Meat Processing Industry

Introduction

Promoting local food systems is crucial to supporting community vitality and sustainability (Allen, 2010). Various entities in the U.S. have supported local food systems to provide a more viable economy, eco-friendly production and distribution, and equal opportunities for all producers, consumers, and members of the communities (Feenstra, 1997). The development of local food systems positively impacts communities by addressing food insecurity, reducing food safety risks (Peters et al., 2009), preserving natural resources and the environment, and increasing job opportunities and incomes for residents (Swenson, 2009).

Following the rising global demand for local food production, locally sourced meats have gained much attention from consumers (Darby et al., 2008). Nevertheless, the lack of slaughtering and processing facilities limits small- and medium-sized meat producers' access to the local meat market (Johnson et al., 2012). Small-scale meat processors have limited resources to innovate and realize more sustainable meat production (Mason et al., 2021). This situation raises concerns about the growth of local meat production and economic development for small and medium ranchers and meat processors.

Few studies have focused on the meat processing sector, although the local food system has gained enormous scholarly attention (Jie et al., 2013). More specifically, there is a dearth of literature exploring barriers small-scale meat processors encounter (Charlebois & Summan, 2014). Little research has explored the issues, challenges, and possible problem-solving strategies that confront them (Okpala et al., 2021). Thus, the objectives of this

study are to explore the characteristics and challenges of small- and very-small-scale meat processors in the local meat supply chain in Missouri. This study provides information for scholars, extension specialists, and policymakers to help local meat processors overcome barriers, improve efficiency and profitability, and better serve the local food system.

Missouri Meat Processing Industry: An Overview

The meat industry has been an economic driver for the state of Missouri. The meat processing and value-added industry generated US\$9.5 billion in sales (Missouri Department of Agriculture, 2021) and nearly 100,000 jobs in 2021 (Missouri Agricultural and Small Business Development Authority, 2021).

Big meat processors like Tyson Foods, Cargill Food, and Smithfield Foods have multiple processing facilities in Missouri, handle millions of animals, and do business very differently from small processors. Therefore, this study does not cover the large players in the meat processing industry. As of 2021, 217 meat and poultry slaughtering or processing facilities operated in Missouri, with 161 of them being USDA-inspected and 56 state-inspected. Ninety were slaughtering facilities, and 107 were processing facilities (Missouri Agricultural and Small Business Development Authority, 2021).

Previous Research on Small-Scale Meat Processors

Small-scale meat processors are challenged by various factors, from technical to financial barriers (Johnson et al., 2012). Typical constraints include a lack of appropriate infrastructure, facilities, and space for killing, storing, and cooling carcasses to expand their production (Charlebois & Summan, 2014; Gwin, 2009). These issues make it difficult for small-scale meat processors to obtain state or federal inspections in order to sell their meat within or across state lines. For this reason, the USDA launched the Meat and Poultry Processing Expansion Program and the Meat and Poultry Inspection Readiness Grant under the American Rescue Plan. Its goal was to help small and medium-sized processors increase their capacity, efficiency, and competitiveness as well as improve supply chain resili-

ency (USDA Rural Development, 2022).

Small-scale meat processing facilities are also hindered by organizational challenges. High employee turnover and deficiency of skills in the professional workforce are prominent in small and medium-sized meat processors (Partners, 2009). This problem is exacerbated by the difficulty in accessing financial support from the government (Thompson, 2012).

Lack of financial support could potentially limit smaller processors from expanding their facilities, complying with food safety regulations, obtaining a state or federal inspection, conducting effective marketing, and broadening their markets. Pretty et al. (2010) noted that small processors often identify capital investments as barriers to expanding their markets. Limited financial power impedes the processors from implementing Hazard Analysis and Critical Control Point (HACCP) standards and upgrading their facilities to produce high-quality products.

The high compliance cost for regulations is another burden for small processors. Marsden (2004) explained that adhering to standardized food safety regulations increases the per-unit cost of processing for small facilities. Charlebois and Summan (2014) identified that small firms are often overburdened when trying to comply with the regulations concerning environmental laws.

Another issue facing small processors is inconsistent supply. They often face a boom-and-bust cycle throughout the year, fully occupied during peak seasons but experiencing a lack of supply during the low season. This cycle increases their average cost and decreases profit. Moreover, these firms often face undersupply because of no-shows and canceled appointments (Gwin et al., 2013).

We are interested in the challenges, constraints, and barriers facing small Missouri meat processors. Findings will help extension specialists, scholars, and policymakers tailor their education, research, and regulations to serve small-scale meat processors more effectively and promote the development of local meat food systems and the rural economy.

Data and Methods

This study targeted a population of 151 small- and very-small-scale meat processors in Missouri using publicly available data. The U.S. Small Business Administration defines food manufacturing business size by the number of employees. A small poultry or meat processing business has fewer than 750 employees (U.S. Small Business Administration, 2022). We define a processor as very small if it has fewer than 200 employees. The data were collected through a survey conducted from May 2021 to March 2022.¹ First, all processors were called, and those willing to participate were interviewed. The link to the survey (which was created in and conducted through Qualtrics) was then emailed to the rest, and two email reminders were sent to those who had not responded. We also mailed the survey to those who had not responded in the first two rounds, and a reminder was mailed a week later. Thirteen processors participated in phone interviews, five responded to online surveys, and 16 mailed back the survey. After removing incomplete surveys, 29 valid responses were received, for a 19.21% response rate. Three processors were eliminated from the analysis because they did not meet our criteria as small enterprises. Thus, the final sample consists of 26 meat processing facilities.

Results

Characteristics of Small-scale Meat Processors

Table 1 summarizes the demographic characteristics of the managers, owners, or CEOs of the 26 small- and very-small-scale meat processors from the data. The majority (60.00%) were 35–64 years old. The next-largest group was 65 years and older (24.00%). Males (85.19%) accounted for a much larger proportion than females (14.81%). White respondents were the dominant racial group (25 out of 26); only one was Black, and no other races were identified.

Business Profile

Information regarding the business profile of meat processing enterprises is illustrated in Table 2. Overall, most firms had been recently formed. The

¹ The project was approved by the Lincoln University of Missouri Institutional Review Board (IRB) number IRB F2020-01.

Table 1. Demographics of the Managers, Owners, or CEOs of the Meat Processors

Categories of Personal Attributes	n ^a	Percentage (%)
Age		
18-34	4	16.00
35-64	15	60.00
65 and over	6	24.00
Gender		
Male	23	85.19
Female	4	14.81
Race		
White	25	96.15
Black	1	3.85

^a The number of responses in each category can be more than 26 because some firms were headed by two people of different genders.

newest was established in 2020 during the COVID-19 pandemic, and the oldest was established in 1935. Limited liability companies (LLC), limited liability partnerships (LLP), or partnerships accounted for 80.77% (21 out of 26) of the organizational forms. Business ownership status was largely dominated by family-owned enterprises (25 out of 26).²

Overall, 61.54% of meat processors ran their facilities at full capacity, while the rest of the firms (38.46%) operated below full capacity. On average, these processors employed seven full-time-equivalent employees, with two as the minimum and 40 as the maximum. In terms of the range in annual sales, eight businesses had sales of US\$300,000 to US\$1,000,000, while three had sales less than US\$50,000 (see Table 2 for details).

Services and Revenue Sources

There were six major species of animals processed by small-scale meat processing facilities: cattle, hogs, poultry, goats, sheep, and game animals (Table 3). Most of facilities processed multiple species of animals. Twenty-one of the 26 processors processed cattle and hogs. The maximum number of cattle processed was 1,700 head per year, and the minimum was 75. The maximum number of hogs processed was 1,500, and the

² The U.S. Small Business Administration (SBA) defines a family-owned business as a company that is managed by two or more family members and is controlled by the family.

Table 2. Business Characteristics of Small- and Very-Small-Sized Missouri Meat Processors

Variables and Categories	n ^a	Percentage (%)
Year of Establishment		
1935–1950	3	11.54
1951–1965	1	3.85
1966–1980	2	7.69
1981–1995	5	19.23
1996–2010	6	23.08
2011–2022	9	34.62
Legal Form of Organization		
Corporation	3	11.54
LLC/LLP/Partnership	21	80.77
Sole Proprietorship	2	7.69
Business Ownership Status		
Family-owned	25	96.15
Non-family-owned	1	3.85
Capacity Utilization		
Full capacity	16	61.54
Below full capacity	10	38.46
Gross Sales (US\$)		
Less than \$50,000	3	13.64
\$50,000–\$100,000	1	4.55
\$100,001–\$150,000	2	9.09
\$150,001–\$200,000	2	9.09
\$200,001–\$300,000	2	9.09
\$300,001–\$500,000	3	13.64
\$500,001–\$1,000,000	5	22.73
>\$1 million	4	18.18
Number of Full-Time Employees		
Maximum	40 workers	
Average	7 workers	
Minimum	2 workers	

^a The number of responses in some categories may be less than 26 due to missing data.

minimum was only four. Fourteen of the processors processed sheep or lamb, but only nine processed goats. The maximum number of processed sheep/lamb was 1,000 head, but only 25 for goats.

Table 3. Processors Processing Different Animals

	Animal Species					
	Cattle	Hog	Sheep	Game Animal	Goat	Poultry
Number of processors	21	21	14	12	9	3
Average number of animals processed per year	671	394	101	787	8	1,225

The minimum of sheep and goats processed was one head per year.

More cattle and hogs were produced than goats and sheep in Missouri. In 2021, Missouri had 1.9 million beef cattle and 3.4 million hogs but only 75,000 meat goats and 97,000 sheep and lambs in inventory (USDA NASS, 2022). Only three facilities in the study processed chickens, and none processed turkey. The maximum number of birds processed was 2,500 per year, and the minimum was 100. Twelve processed game animals, and only two processed other domesticated animals. As shown in Table 3, game animals (e.g., deer and elk), cattle, and hogs were popular among meat processors, with an average of 787 deer and elk, 671 cattle, and 394 hogs processed yearly. On average, each of the three surveyed chicken processors processed 1,225 birds yearly.

These processors offered additional services to customers to broaden their markets and accommodate the needs of buyers or customers. Nineteen of the 26 offered custom processing,³ and 12 offered custom labeling for their customers to resell the products (55.56%). These processors were critical to the local meat food system to provide processing services for livestock producers who market their meat directly to consumers or participate in other channels of the local food system.

We also asked for the percentage of revenues from processing different animals, as processors could process more than one species. Figure 1 demonstrates the average proportion of revenues generated from different animals. The majority of the sales were obtained from cattle processing (57.26%), followed by hogs (28.67%) and game animals (21.29%). Some small percentages of

revenue were derived from poultry (8.33%), other animals (e.g., alpaca and bison) (5.50%), sheep (4.76%), and goats (3.58%). These numbers aligned with the number of animals each business processes.

Source of Animals

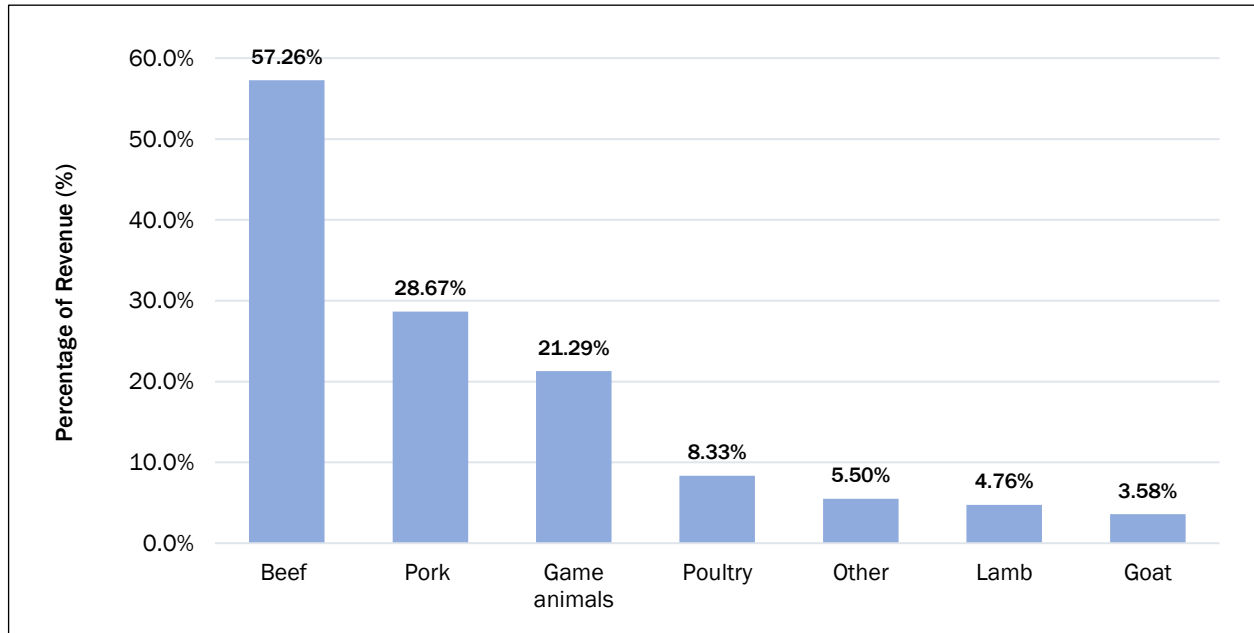
To ensure a consistent supply for a steady business, meat processors need to understand the sources of animals. As shown in Figure 2, cattle, hogs, sheep, goats, game animals, and other domesticated animals were supplied mainly by producers or customers from the county where the meat processing facilities were located or from counties adjacent to the plants. Surprisingly, all the poultry (100%) processed by the three processors in Missouri came from bordering states. On average, states contiguous to Missouri supplied 20% of the animals for processors. This is understandable because of transportation costs (Gwin et al., 2013). Both buyers and sellers prefer to source their animals or process them close to their production or processing facilities, regardless of state borders.

Distribution and Marketing

The meat processors used three major marketing channels to sell their products: direct consumer sales, wholesale and institutional sales, and sales to restaurants. Twenty processors sold their products directly to consumers, and two only sold directly to consumers. Seven processors had wholesale or institutional sales, and two sold to catering businesses or restaurants.

³ Custom processing refers to the slaughtering, eviscerating, dressing, or packaging of animal carcasses or meat products. These products are returned to the owners of the animals only for personal use in their households and for nonpaying guests. This process is exempt from federal inspection, so custom-exempt processors may not buy or sell carcasses or meat products other than poultry unless they pass federal inspection (USDA Food Safety and Inspection Service, 2022).

Figure 1. Percentage of Revenues from Different Animals (N=26)



The meat processors' customers came from various locations (Figure 3). A large portion was from the same county where the plant was located, especially for retail (32.88%) and restaurants or caterers (47.00%). Retail was the primary and most profitable marketing channel for the proces-

sors. Consumers from counties adjacent to the meat processing facilities appeared to shop through retail (27.90%). Most of the customers for these 26 processors were from Missouri. However, 42.42% of the wholesale or institutional customers lived in a different state.

Figure 2. Sources of Animals (N=26)

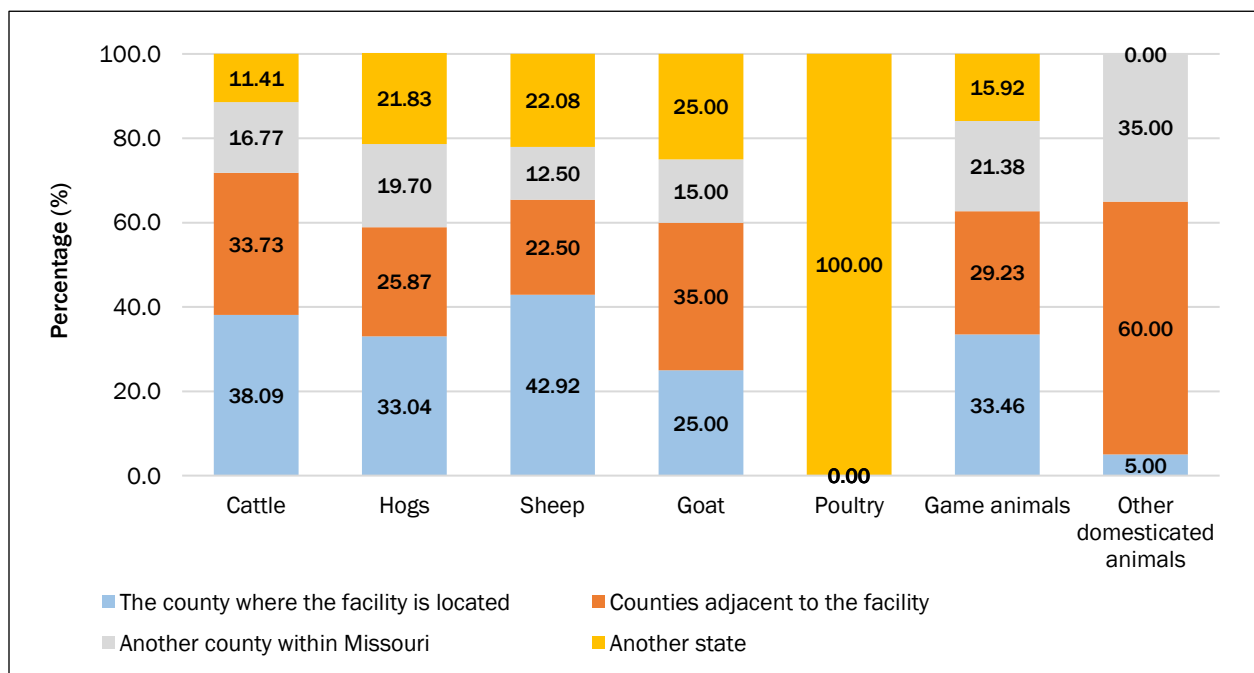
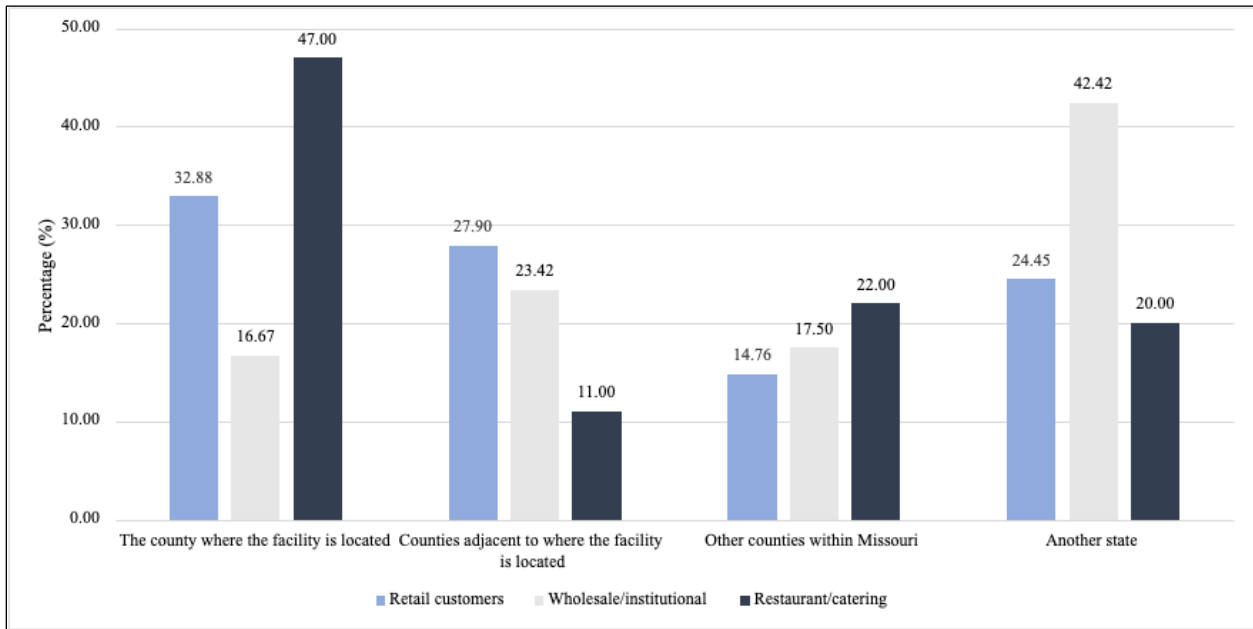


Figure 3. Locations of Customers from Different Distribution Channels (N=26)



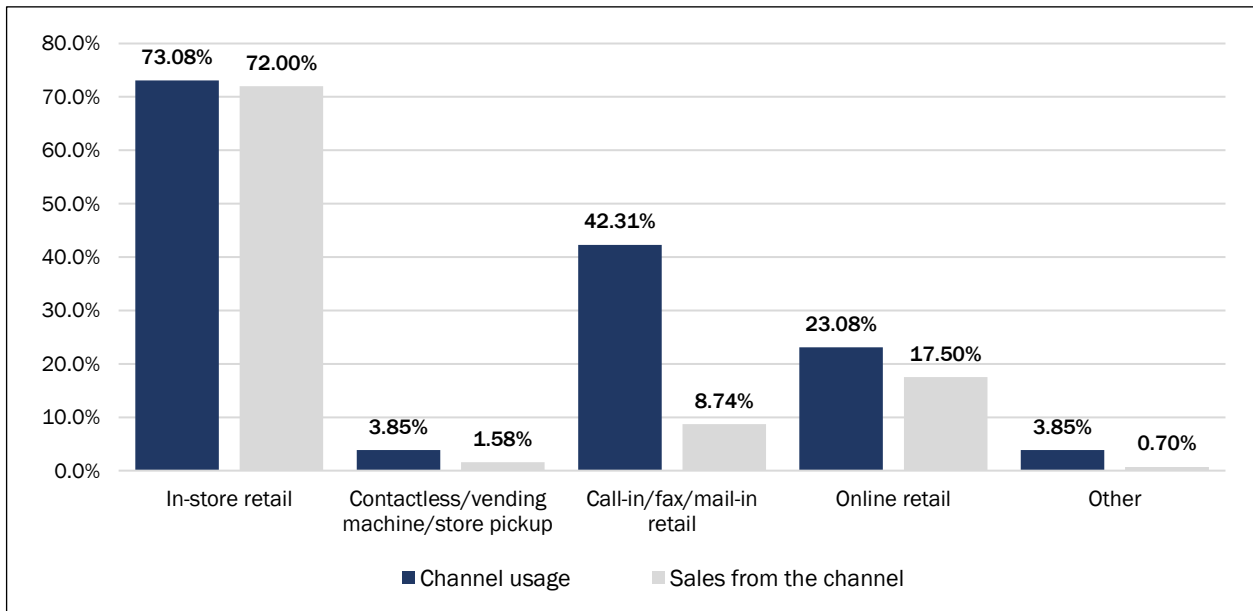
Retail Business

In terms of retail channels, most processors (73.08%) used in-store retail. The second-most popular distribution channel was call-in, fax, or mail-in retail (42.31%), and the third-most popular channel was online retail (23.08%; Figure 4). The

sum of percentages of all channels exceeds 100%, as some processors used more than one distribution channel.

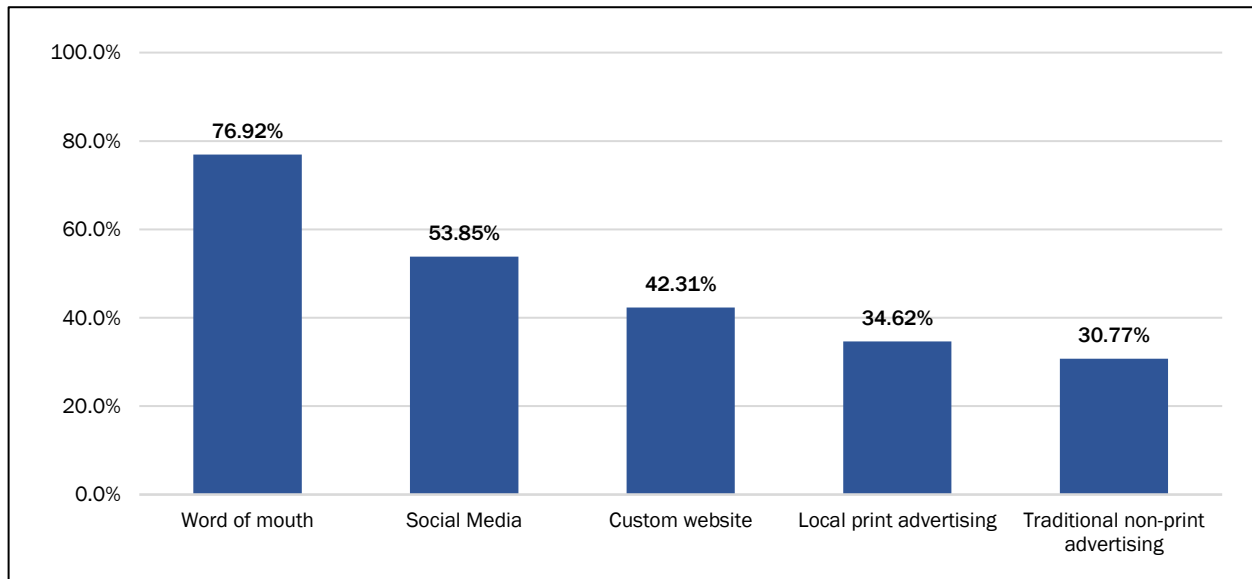
Different retail channels generated different revenues. On average, in-store retail accounted for 72.00% of revenue for individual processors. Due

Figure 4. Retail Channels Used by Small-Scale Meat Processors (N=26)



Note: The sum of retail channels used is greater than 100%, as meat processing firms used more than one retail channel.

Figure 5. Marketing Strategies Used by Small- and Very-Small-Scale Meat Processors (N=26)



to the pandemic, some processors started to use contactless pickups by taking orders online or by phone. These firms offered online checkouts and provided a delivery option for buyers who were not able to come to the store or facility. Online orders contributed 17.50% of sales, and call-in, fax, or mail-in retail contributed 8.74% of sales.

Marketing Activities

Small and very small meat processors in Missouri employed several strategies to market their processed meat (Figure 5). Word-of-mouth was the most popular marketing activity, used by 76.92% of processors. Social media (e.g., Facebook, Instagram) was the second-most popular and was used by 53.85% of processors. Other marketing avenues processors used were custom websites (42.31%), local print (e.g., newspaper, 34.62%) and traditional nonprint advertising platforms (e.g., television and local radio channels, 30.77%).

Competition

These small processors not only competed with other small processors but also with retailers in their areas. Twenty-three out of 26 sold directly to consumers. Eighteen processors (69.23%) indicated that they had at least one competitor in meat-processing services. Five out of 26 processors indicated that Walmart was one of their biggest com-

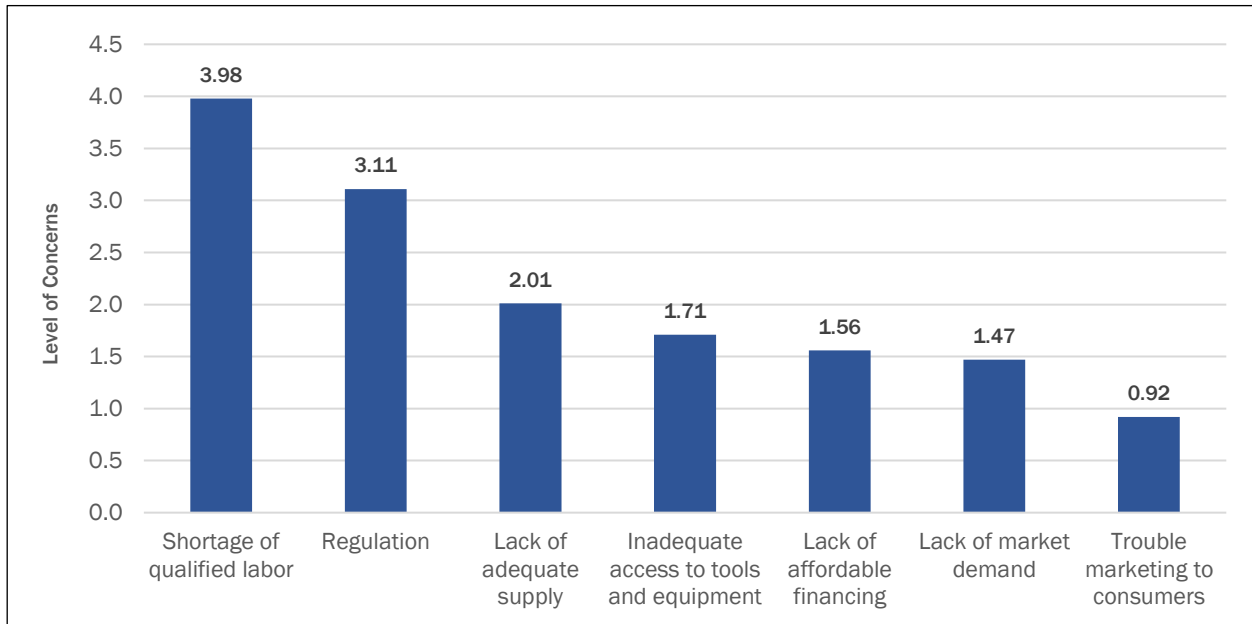
petitors. Some mentioned that ALDI and other big and small grocery stores were also competitors. However, eight of the processors surveyed provided no examples of business competitors.

Challenges to Small-Scale Meat Processors

These processors faced serious labor issues (Figure 6). A phone interview respondent mentioned that it took time to train employees, but the employees tended to leave their job a short time after training. This high turnover of skilled labor affects the productivity of these small processors. Schwehofer et al. (2014) reported that seasonality is another factor affecting labor recruitment and skill retention for small-scale meat processors.

Regulation and a lack of supply and facilities were other problems that the processors faced. Marketing concerns were the least problematic, a different finding from Schwehofer et al. (2014), who found that marketing was one of the top challenges. The following may explain why marketing was not a major problem when marketing is defined broadly as finding buyers and customers. First, since the COVID-19 pandemic, consumer demand for local food has increased due to the disruption of the conventional food supply chain (Thilmany et al., 2021). The closure of many large meat-packers due to the outbreak of COVID-19 made some producers seek alternative marketing

Figure 6. Meat Processors' Concerns for Their Businesses (N=26)



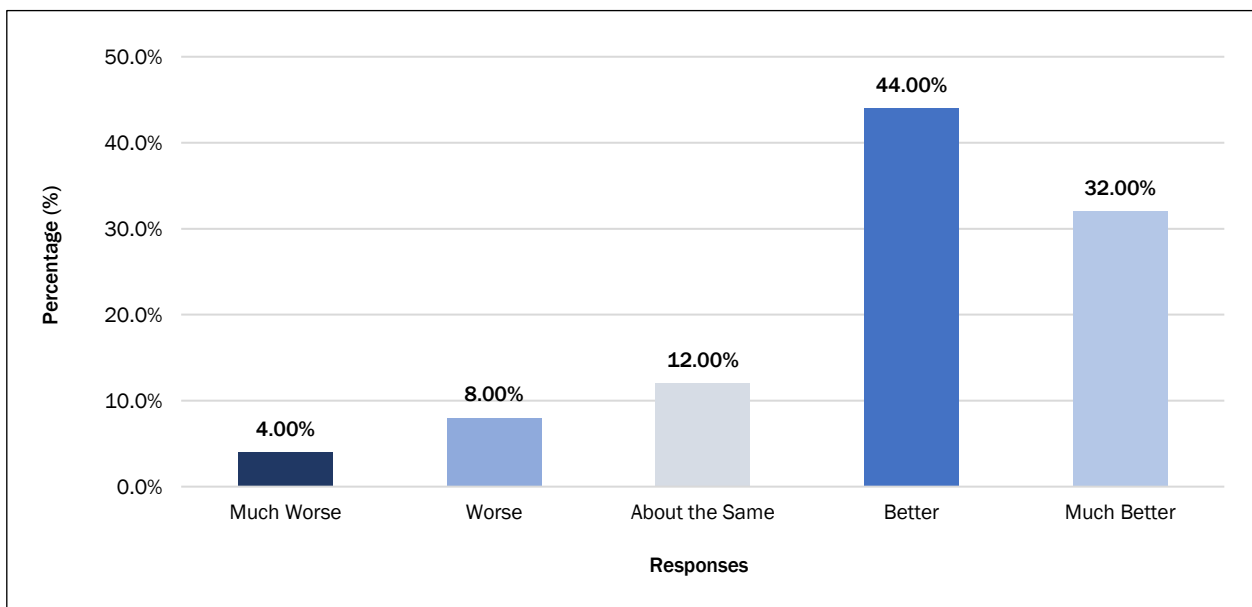
Note: The concerns are evaluated using scores from 0 to 5, where 0 is no concern and 5 is a serious concern.

channels and sell directly to consumers (Helmer, 2020; USDA Economic Research Service [ERS], 2021). Therefore, the demand for meat processing increased. Using their service reservation systems, many of the processors were booked at least one year ahead.

Impacts of the COVID-19 Pandemic on Processors' Businesses

The COVID-19 pandemic had positive impacts on some of these meat processors. As shown in Figure 7, 11 (44%) of the meat processors perceived that their businesses were in better condition than be-

Figure 7. Impacts of COVID-19 on Small- and Very-Small-Scale Meat Processors (N=26)



fore the COVID-19 pandemic, and eight (32%) felt they were in much better condition. However, three processors (12%) reported that their situations were worse or much worse. Two of these three processors had a serious labor issue (with a score 5 out of 5), and the other one had a moderate labor issue (score 3 out of 5). Hobbs (2021) proposed that small-scale meat processors can maintain resilience because they are more adaptable than larger firms. These meat processors who were able to increase their production by applying their underutilized capabilities could take advantage of the increased demand for local meat.

Discussion

Meat processors play important roles in the local meat food systems. Using primary data collected through a survey, this study explored the characteristics and challenges of small- and very-small-scale meat processors in Missouri to improve the efficiency of these processors and streamline the coordination of the local meat food supply chain.

Labor Shortage was a Key Limiting Factor for Small-Scale Meat Processors

Findings indicated that only 61.54% of meat processors were operating their plants at full capacity. Similarly, in a study by Johnson et al. (2012), only a small fraction of New England meat processors were operating at full capacity. One factor accounting for this situation was the labor shortage, a long-lasting problem even before the COVID-19 pandemic. The scarcity of skilled labor and the seasonality in the livestock industry (e.g., periods of low and high demands) constrained small slaughterhouses in New England (Johnson et al., 2012). Meat processing is a strenuous job because of its intensity and environment. Meat processing facilities typically have an unpleasant working environment. Workers need to deal with dangerous conditions, such as exposure to cutting tools (e.g., blades, saws, etc.) and working in cold temperatures to comply with food safety regulations. Also, meat-processing jobs are considered to be low-quality since workers need to perform repetitive work such as cutting, trimming, lifting, and stretching (Romanov et al., 2022). This situation, coupled with risks of injuries in the plants, makes attracting

more labor challenging for meat-processing enterprises (Romanov et al., 2022). Dias et al. (2020) also elaborate that the limited opportunities to develop meat-cutting skills aggravates the problem of retaining workers. Some meat processors reported having difficulties attracting and retaining employees, especially during hunting season. The result is similar to the findings of Partners (2009), who concluded that the meat-processing industry had a high turnover rate and faced difficulties recruiting skilled labor. Our findings are also consistent with Ijaz et al. (2021), who found that meat-packing facilities were forced to shut down due to the labor shortage caused by the COVID-19 outbreak.

Another potential obstacle to finding qualified workers is the sparse population in rural areas. The agricultural food industry competes with other industries for workers in these rural communities (White & Rahe, 2020). Meat processing does not require a high education, but does demand significant on-the-job training. As a result, it takes six months to a year for a meat processor to train a skilled worker. The high employee turnover rate not only increases the cost of labor for meat processors but also affects their productivity. Some interviewed meat processors in the sample cited that if they were to retain employees, they would have to offer them more competitive wages, between US\$15 and US\$20 per hour. Miller (2017) found that some processors paid their employees even when they were underutilized to avoid turnover. According to the U.S. Bureau of Labor Statistics (2021), the national average wage rate of employees in animal slaughtering and processing was US\$15.31 per hour in 2021. This wage rate will not be sustainable for small- and very-small-scale meat processors, as it increases production costs and reduces profitability.

Two approaches can help meat processors solve labor issues. One is to reduce their dependence on labor by investing capital in automation measures. The USDA has launched two grant programs since the outbreak of COVID-19 to increase the capacity of local meat processors. The Meat and Poultry Inspection Readiness Grant helps small- and midsized meat and poultry processors improve their capacity and efficiency and obtain a Federal Grant of Inspection or participate in the

Cooperative Interstate Shipment program, depending on the state (USDA, 2021). Another program is the Meat and Poultry Processing Expansion Program, which funds meat processors to expand their capacity and efficiency (USDA Rural Development, 2022). Applicants of both programs can seek technical assistance through the Meat and Poultry Processing Capacity Technical Assistance Program. In addition, the State of Missouri provides a meat and poultry processing grant to support small-scale meat and poultry processing establishments. Fifteen of the 26 processors in this survey would like to receive assistance in applying for federal or state grant funding. We encourage state extension specialists to reach out to processors and provide workshops as well as training on grant information and writing tips to help them succeed in these programs.

Another approach is to provide free training to potential laborers through university extensions or cooperative agreements to reduce the cost of labor for small-scale meat processors. Universities or vocational schools can consider offering programs in training and certifications for meat processing. The same approach was suggested by Miller (2017). This could alleviate the burden of training new employees for small- and very-small-scale meat processors. For example, the University of Wyoming Extension provides free video courses for youth and the general public about processing beef, pork, and lamb carcasses into different meat cuts (Miller, 2021).

Regulation Compliance Is a Key Challenge to Small-Scale Meat Processors

Among the challenges small processors face, regulation was the second-most serious problem after the labor shortage. Regulations related to food safety and employee safety incur high compliance costs for processors (Charlebois & Summan, 2014). Ollinger and Moore (2009) found that it costs more for small and diversified meat processors than large firms to comply with food safety regulations. Half of the 26 processors in this survey were state-inspected, and the other half were federally inspected or custom-exempt facilities. The regulations are not only costly for small-scale meat processors to comply with but also complex

to understand (Dimock et al., 2021).

It is critical for small processors to understand the regulations and build strong relationships with inspection agencies. Missouri is one of the states that offers a state inspection and participates in the Cooperative Interstate Shipping Program. Regular workshops, free training from the Missouri Department of Agriculture officials and extension specialists, and on-demand consultation would be helpful for these processors to understand the regulations, choose appropriate inspection programs, and reduce their compliance costs.

Local Meat Processors Compete with Other Processors and Retailers

As expected, the major competitors of the small- and very-small-scale meat processors were other meat processors. We found that these meat processors had competitors in the retail business, which was the most popular marketing channel for these processors, with in-store retail as the most important revenue source. The two most mentioned retail competitors were Walmart and ALDI. In addition, due to the processors' inability to provide a consistent supply to wholesalers and institutions, small processors are forced to be independent retailers (Kolodinsky et al., 2014).

However, when choosing the in-store retail method, processors also need to consider the retail economy of their region, such as the number of stores, population density in the store's location, and the market size and opportunities, because these factors will affect their potential sales and profitability directly (Kolodinsky et al., 2014). Walmart and other mass merchandisers have created new competition for smaller processor retailers and can dominate a local or regional market due to their cost efficiency. Given the competition from larger grocery stores and discount stores, meat processors can consider differentiating their products and services to attract potential customers and increase sales. Some have already diversified their products to non-meat production and retail to explore the economies of scope. In addition, exploring multiple retail channels, such as online orders through Facebook or a website, can be a means to reach more markets and customers.

Online Marketing and Social Media Advertising Could Be a New Trend

Although in-store retail is still the dominant marketing channel for small-scale meat processors, online and phone order retail has become more popular due to social distancing requirements since the outbreak of COVID-19 (Tyrväinen & Karjaluoto, 2022). More than 40% of the processors used phone order retail, and more than 20% used online orders. About 30% of their revenues were from these orders. However, many food retailers are worried that the consumer demand for online grocery shopping will disappear when the COVID-19 pandemic is over. Research has shown that consumer online purchase behavior might be sustained even after COVID-19 (East, 2022; Shen et al., 2022). Therefore, processors may want to continue using their online marketing tools to reach more markets that are out of their counties or states. University extension specialists can assist farmers in learning more online marketing strategies with inexpensive and reliable online marketing platforms.

Promoting Coordination between Producers and Processors Can Improve the Efficiency of the Local Food Supply Chain

A lack of adequate and stable supply was the third challenge that Missouri small-scale meat processors faced. The result was similar to the research findings of Johnson et al. (2012). The animal supply for many small processors is inconsistent—high in the hunting season but low in other periods (Gwin et al., 2013). Some processors have been contracted for their services for more than a year out due to the increased demand since the outbreak of COVID-19, while others still struggled to find enough animals. The average score concerning the supply shortage for all 26 processors was only 2 out of 5, which indicated that the supply was not a serious problem. One reason was the increased demand for local meat processing due to the shutdown of large processors and the disruption of the conventional meat supply chain early in the pandemic (Bina et al., 2022). Compared to large meat processors, small ones are more flexible and resilient to shocks and can adjust their production plans as well as meet the increasing demand in a relatively short period (Ma & Lusk, 2021).

Paradoxically, some livestock producers, especially producers of small ruminants such as goats and sheep, cannot locate reasonably priced processors. A study from New England showed that small-scale meat processors faced a similar issue, as there was a financial risk if they expanded their coverage to reach smaller livestock producers (Johnson et al., 2012). One reason was the high cost of offal disposal, and the other was the lack of information-sharing between producers and processors. Therefore, promoting sharing of information among the participants of the local meat supply chain through multiple channels is important to balance supply and demand while maintaining consistent supply. In fact, some meat processors already serve as mediators between consumers and producers. The meat processors' associations, producers' associations, or extension specialists can all promote information-sharing along with the local meat food system. In addition, vertical coordination among livestock producers, processors, wholesalers, and retailers is critical to address issues in production, processing, and distribution (Ding et al., 2014).

How to Sustain the Local Meat System Over the Long Term

Smaller meat enterprises are also restricted by their distribution and marketing processes because they target niche markets (Hinrichs, 2003). Their market size depends on the population where their facility is located. Thus, meat processors need to find ways to sustain their businesses, especially amid the consolidation of larger plants in the meat industry (Hendrickson et al., 2020). Our study indicates that Missouri meat processors performed better during the post-pandemic era compared to the pre-pandemic period. Approximately 76% believed their business was in more manageable condition than before the COVID-19 pandemic. Maintaining the growth of the industry over the long run requires some consideration. One strategy might be to go beyond their own local supply chain and coordinate regionally for a greater scale. Increased consumer demand was the driving force for growth during COVID-19 due to the disruption of the conventional supply chain. Therefore, strategies to increase customer reten-

tion are essential to maintaining the industry's success.

Small- and very-small-scale meat processors could also utilize governmental financial aid to improve the disrupted locally sourced meat supply chain. The American Rescue Plan funds allocated by the Biden-Harris Action Plan open a new opportunity for independent meat processors to develop processing capacity, increase diversity in the meat and poultry products, and provide health, safety, and training for workers (USDA, 2021). This aid will not only help meat processors' competitiveness with large players in the industry but also increase their resiliency in the new era after the COVID-19 pandemic.


Conclusions

Local food systems are vital to boosting the rural economy, improving community well-being, and sustaining the environment. Missouri has participated in developing locally produced food through the Food, Beverage, and Forest Products Manufacturing Initiative. One of the program's objectives is to support the production of locally grown meat and value-added activities by small- and medium-sized producers and processors. Nevertheless, smaller meat processors face labor and regulation challenges. This study sought to understand the characteristics of small-scale meat processors and explore the challenges they faced in promoting the local food systems.

Our study is among the first to explore the needs of small- and very-small-scale meat processors in the state of Missouri. Through various methods of data collection (e.g., online and mail surveys and interviews) of 26 small-scale meat processors, this study yielded interesting findings. Some aspects that prevented smaller meat processing firms from growing their business were related to labor shortages, regulations, inconsistent supply, access to tools and equipment, and market demand. Thus, we proposed integrated alternatives to address these issues, including developing comprehensive marketing strategies such as online marketing (e.g., through social media or a website) and labor training. We also recommend that smaller meat processing facilities utilize opportunities to obtain financial support from both the state (e.g., Missouri Department of Agricul-

ture) and the federal government (e.g., USDA grants) to expand their plants and invest in equipment. To help sustain a consistent supply and marketing of locally sourced meats, it is also important for smaller meat enterprises to create partnerships with producers and consider vertical coordination. Investment in more advanced technology to save money on labor may not be financially feasible for smaller processors. The use of mobile slaughter units may provide an opportunity for processors to reach local producers who are not able to transport their animals to processing facilities. This can also contribute to maintaining an adequate supply of livestock that need to be processed to maintain the high profitability of the businesses.

One limitation of this study is the small number of responses we received, which may affect the representativeness of our sample. Therefore, careful consideration should be given to generalizing the findings. This also opens possibilities for future studies to develop more integrated work in obtaining more samples and investigation, using the secondary data from these processors' websites, social media, or printed materials.

This study focuses on the challenges that limit small- and very-small-scale meat processors in Missouri. Future work that is not limited to policy research exploring initiatives and interventions to support smaller processors could be directed to address those challenges. Since this study is not specifically directed at exploring locally grown meat marketing, future studies may fill the gap by examining the roles of farmers markets, meat processor associations, and community supported agriculture (CSA) operations in improving the marketing and distribution processes of locally sourced meats. It is also vital to understand the adaptability and resilience of small-scale meat processors during the COVID-19 pandemic and the outbreak's effect on the supply chain in the meat industry. 

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