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Marketing Strategy Selection for Small-Scale Fruit and Vegetable Growers: Lessons from the Mid-Southern United States

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Abstract

This study uses primary data analysis to investigate market outlet choices of small-scale fruit and vegetable growers in the Mid-South region. Factors such as distance to market, marketing costs, sales volume, and production methods significantly influence growers' decisions. Policy implications include the need for industry-specific guidelines and networking opportunities for wholesalers, streamlined regulatory processes, support for local sourcing by restaurants, and support for educational efforts. Overall, this study sheds light on the market outlet choices of small-scale fruit and vegetable growers, offering guidance for policy makers to foster the success of these growers in the Mid-South and beyond.

Keywords: small-scale growers, market outlet choices, Mid-Southern United States, K-means cluster analysis

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Introduction

Local food growers face the dual imperative of producing quality products and identifying profitable markets to sell products before they spoil. It is impossible to overstate the importance of the second part of this dual mandate, as it directly affects the growers' profitability and the availability of fresh, adequate produce for consumers. Perhaps with the recent experiences of supply shortages at the retail level during the COVID-19 pandemic, diverse and growing consumer concerns toward overseas or large-scale production systems give locally produced food a comparative advantage as local food systems can generate economic benefits for the community (Maples et al., 2013; Miller et al., 2019). Identifying why certain growers choose a specific marketing strategy is critical to the viability and continued access to fresh local produce. Indeed, once growers successfully harvest agri-food products on a farm, the choice of market outlet can dictate the selling price and what kind of product quality and quantity standards growers must meet. Hence, growers' marketing channel decisions have become as significant and intricate as production decisions concerning product quality and costs to ensure customer satisfaction (Krafft et al., 2015; Jablonski et al., 2022).

Local governments and communities make many efforts to sustain small-scale fruit and vegetable growers; these efforts reflect in the subsidies, loans, education, and market information made available to farmers by the U.S. Department of Agriculture, Small and Mid-Sized Farmer Resources (USDA, 2023) and other regional organizations. In Northwest Arkansas, for example, the Walton Personal Philanthropy Group and the Northwest Arkansas Land Trust support local farmers from food cultivation to commercialization, including facilitating access to education, land, technical expertise, and financial resources for established and emerging farmers; these organizations also strive to enhance farmers' access to outlets, product certification, and processing services (Northwest Arkansas Food Systems, n.d.). Such philanthropic activities benefit consumers, growers, grocery stores, and wholesalers. The latter gain access to local supplies that may be less prone to supply disruptions in comparison to sourcing internationally. As such, the marketing stage is of utmost importance for growers since it is how they recoup the resources invested in the production process, create local employment, and provide consumers access to fresh produce (Hall, 2002; Andreatta and Wickliffe, 2005).

This work examines market outlet choices of small-scale fruit and vegetable growers, with gross cash farm income less than $350,000 (USDA-NASS, 2023), by identifying common traits that constitute how they think about their marketing channel selection. By identifying these traits, decision makers can better understand the factors influencing growers' market outlet choices. Specifically, we examine revenue, marketing cost, production, and demographic factors by detailing reasons for including these variables in our description of the survey conducted. A comprehensive understanding of these traits is important, as attempts to increase locally grown healthy food alternatives in retail outlets for access by consumers that do not frequent farmers' markets, buy on-farm, or participate in community supported agriculture (CSA), hinges on a better understanding of barriers to producer adoption of wholesaling. At the same time, intermediaries benefit from knowing what services they may need to offer to encourage small-scale growers to become larger volume growers that supply to them.

By examining the underlying decision-making process of small-grower marketing channel choices and associated opportunities, we seek to contribute to the food distribution strategy literature. The remainder of the article is organized as follows. First, we connect the background literature on small farm marketing strategy literature to a stylized map of localized agri-food supply chains. We then describe our methods, which involve multinomial logistic modeling and k-means cluster analysis to classify responses from a grower survey of small farms in the Mid-South. The third section provides results indicating that small-scale grower marketing strategies are clustered into three groups. The final section concludes with implications from our current study, along with a discussion of recommendations for future research.

Background

Farmers have many direct-to-consumer and intermediary marketing options, and making a good choice(s) is the key to success (Uva, 2002; Park, Mishra, and Wozniak, 2014). For many growers, direct marketing is a way to brand their product, collect direct consumer feedback, and evaluate their advertising effectiveness (Hunt, 2007). Direct marketing is often the first step for beginning growers (Bauman, McFadden, and Jablonski, 2018; Jablonski et al., 2022). Further, norms and standards that different customers desire and are willing to pay for vary by market outlet. These standards have cost and revenue implications and impact market outlet choice (Hardesty and Leff, 2010). The decision to determine where to sell the product thus requires knowledge about product certification, packaging standards, and cost of transportation for every outlet so that growers choosing that outlet can meet the needs of customers or intermediaries. Opportunity evaluation is mission-critical for agricultural and food businesses (Bylund and Malone, 2023). Figure 1 provides a stylized example of different aspects of the decision-making process for a local food marketing strategy.

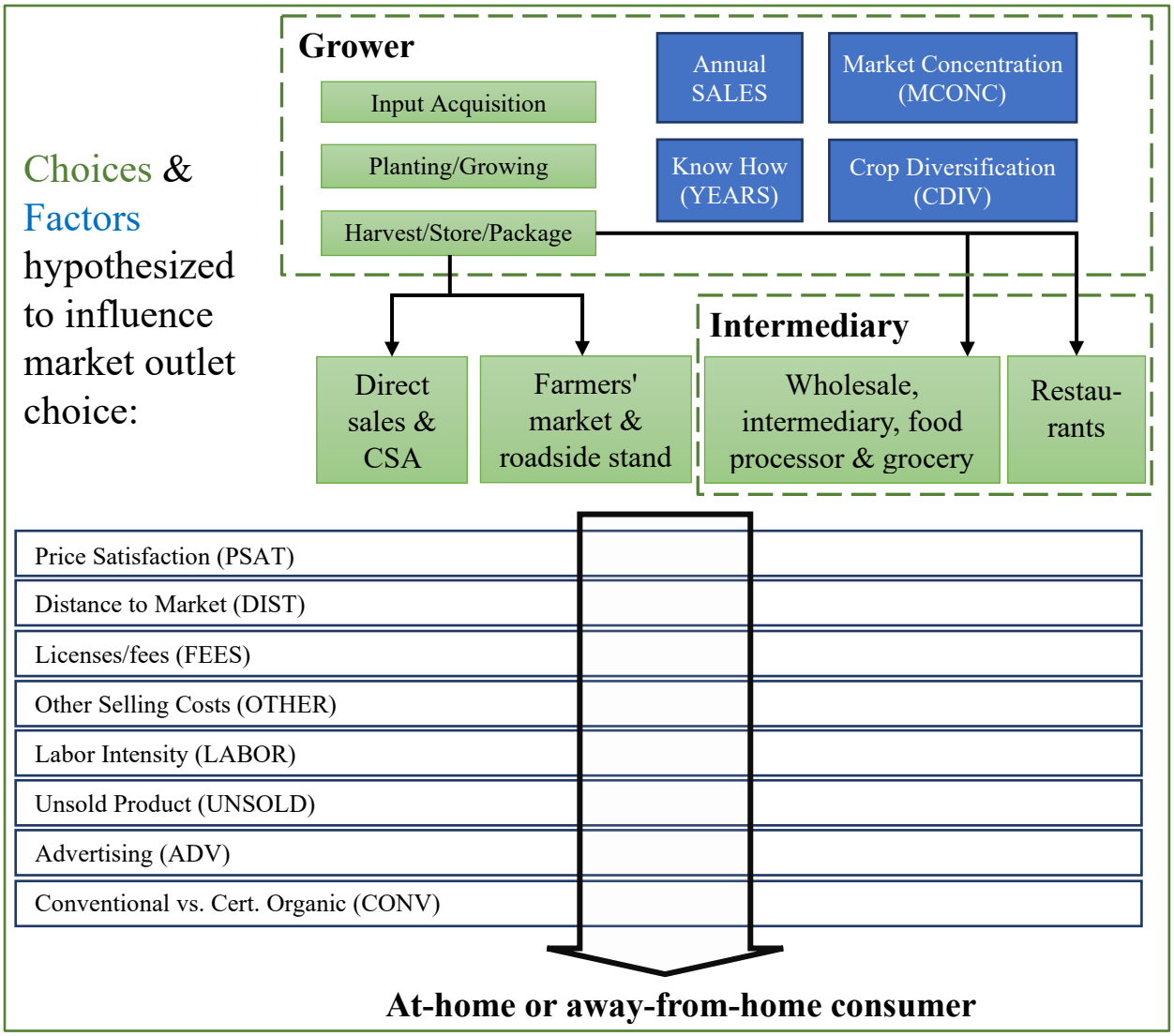

Figure 1. Marketing Outlet Choices and Factors Expected to Drive Market Outlet Choice

Note: See Table 1 for variable name definitions and differences in grower responses across market outlet choice.

Economies of scale are heavily linked to the marketing outlets that might be most appropriate for a grower. Growers can diversify sales by growing various products or focusing on fewer products to meet market outlet-based quantity requirements (Monson, Mainville, and Kuminoff, 2008). Indeed, Bauman, Thilmany, and Jablonski (2019) find that scale, product specialization, and expenditure management significantly affect growers' financial efficiency when using intermediate and direct-to-consumer outlets. Their results suggest that focusing on a few products is a difficult strategy to adopt given the unsteady cash flow associated with this lack of diversification across production season and product, hindering the producer's objective of creating regular income to ensure survival.

While the number of outlets available to growers varies depending on their geographic location, improvements in online marketing have created opportunities for small growers (Hobbs, 2020). Food supply chains are developed through relationships between growers and critical downstream entities, such as supermarkets, restaurants, and wholesale distributors, to foster regional food systems that improve economic outcomes (Maples et al., 2013). Small farmers sell food they grow in farmers' markets organized by local communities to support regional agricultural activity (CSA), and, less commonly, locally grown food is also supplied to wholesale markets for resale to other vendors (Uva, 2002; Hunt, 2007; Monson, Mainville, and Kuminoff, 2008; LeRoux et al., 2010; Low and Vogel, 2011).

Every outlet requires specific product quantity and quality standards, packaging costs, product processing (e.g., cold storage, order picking, washing), travel distance, and licensing and market access fees that impact profitability (Hardesty and Leff, 2010). Wholesale channels, for example, typically require consistent product size and quality, as well as packaging to standardized case weights, which can be a barrier to access for growers, as choosing this channel can lead to additional stress. Wholesaling contracts often stipulate such quantity requirements, leading to a preference for farmers' markets for those growers unable to meet the volume needs of wholesalers.

Regulatory burdens have been well-documented as impediments to the development of regional food systems (Malone and Hall, 2017; Staples, Chambers, and Malone, 2022). As a proxy of difficulty for market access, growers were asked to indicate how many licenses, fees, and certifications are required to sell to a particular market outlet.

Direct marketing via farmers' markets, on-farm sales, and CSAs are often a common way for small-scale growers to commercialize their operations (Uva, 2002; Monson, Mainville, and Kuminoff, 2008). At the same time, CSA channels may require high product volume throughout the production season, with fewer processing and packaging requirements and fewer consumers, which can make this outlet quite profitable (LeRoux et al., 2010). In comparison, direct marketing methods may be less stressful as product availability dictates what products consumers can choose. It is also important to remember that non-quantifiable factors, such as marketing and management skills, are essential in selecting market opportunities and on-farm performance (Park, Mishra, and Wozniak, 2014).

Methods

Data for this study came from an internal review board approved survey (IRB#2008276843) of small-scale fruit and vegetable growers in the Ozark Mountain Region (comprising Arkansas, Southern Missouri, and Eastern Oklahoma). The first e-mail contact occurred on November 14, 2022, with a follow-up reminder on November 28, 2022. The survey closed on December 6, 2022. Approximately 300 fruit, nut, and vegetable farm owners were invited to participate in an online Qualtrics survey. Survey participants were identified by the Center for Arkansas Farms and Foods and University of Arkansas Cooperative Extension agents. As an incentive to participate, respondents were eligible for entry into a random drawing of two coolers valued at less than $500. The survey took 15–25 minutes to complete. Given the rather large set of questions and relatively

small grower population, a low response rate was expected. Aside from e-mail contact, the survey was also promoted at extension grower meetings. Using Forcino et al.'s (2015) guidance on requiring at least 58 responses, we wanted to get at least 25 grower responses where each grower was expected to sell to at least two different market outlets for a sample size of 50 or more market outlet choice responses. While this sample may not be representative of all small-scale grower populations, it does allow for a sound discussion of small-scale growers and their marketing behavior in the Mid-South, which can provide marketing and behavioral information for other small-scale producers and regional markets similar to Hunt (2007), which is limited in the literature.

Survey Design

The survey was organized into four parts (Mahamba, 2023). The first section of the survey explored marketing outlet choice, overall sales, and the rationale for choosing a market outlet. Market outlet variables included i) on-farm direct sales and produce sold via CSA; ii) farmers' markets and roadside stands; iii) wholesale, intermediary, food processor, and grocery outlets; and iv) chefs and cooks at restaurants. Since growers often diversify their marketing strategies, we pooled a variable that summed each respondent's total number of market outlets used (*MDIV*). Respondents could also choose "Other" and define alternative outlets, such as food banks, florists, craft fairs, or online sales.

To gain further insight on the revenue side of the profitability equation, we asked about the size of the operation in terms of annual overall produce sales for the farm (*SALES*) to capture scale economies. To measure diversification in marketing channel selection, the ratio of sales by market outlet (*MSALES*) to overall farm sales (*SALES*) or (*MCONC*) provides a more specific measure than the above-mentioned number of marketing channels pursued (*MDIV*).

REASONS was the number of checkmarks a respondent selected to choose a particular market outlet. Reasons ranged from no reason provided (*REASONS* = 0) or choosing a market for the following reasons relative to other market outlet choices: high prices, high customer traffic, least labor intensive, the only choice available, dealing with preferred customers, large sales per customer, and "Other" to allow respondents flexibility to answer this question. A final measure in the revenue category was the level of satisfaction with prices received (*PSAT*).

A second section tracked marketing costs to provide insight into market access and license fees (*FEES)*, personnel at sales events, packaging and labeling costs, market stand, and refrigerated storage requirements (*OTHER*) and a combined variable (*MCOST* = *FEES* + *OTHER*) to capture relative marketing cost differences across each market outlet. More specific measures by market outlet captured advertising expenses (*ADV*) as a percentage of sales and the distance traveled in 10-mile increments to indicate transport cost (*DIST*). Finally, the percentage of unsold produce information was available for all farm sales (*%UNSOLD*), and growers could indicate which of their market outlets were among the worst two in terms of most unsold produce. Multiplying *%UNSOLD* with a binary variable for a market outlet leading to most unsold produce thus added market outlet-specific information to *%UNSOLD* and was labeled *UNSOLD*.

The third section of the survey encompassed measures related to the production methods employed. A respondent could choose whether they followed mainly conventional production methods using herbicides and chemicals (*CONV* = 1), were certified organic, were in the process of certification, were a certified natural grower, or relied on herbicides rarely (*CONV* = 0). The growers were also asked how many crops they grew annually (*CDIV*). Finally, we collected data on location, acreage, and number of employees. Except for labor and acreage, which were deemed unreliable by the authors, please see Table 1 for a summary of these variables across market outlets.

Table 1. Variable Description, Frequency Distribution and Average Response by Market Outlet

	Market Outlet[a]					
	DCSA	**FARMER**	**WIFG**	**Restaurant**	**Overall**	***P*-value[b] (*n*[c])**
SALES[f]						
Avg.	$48,611A[d]	$30,104A	$49,375A	$58,026A	$44,855	0.21 (69)
MSALES[g]						
Avg.	$21,911A	$15,293A	$8,002A	$7,062A	$14,057	0.29 (69)
MCONC[h]						
Avg.	40.78AB	63.04A	20.89B	24.12B	41.40	< 0.001 (70)
MDIV[i]						
1	11.1[e]	32.0	0.0	0.0	14.3	
2	27.8	32.0	36.8	25.0	31.4	0.14 (70)
3	44.4	28.0	36.8	50.0	37.1	
4	16.7	8.0	26.3	25.0	17.1	
Avg.	2.67AB	2.12B	2.89A	3.00AB	2.57	0.02 (70)
REASONS[j]						
None	5.6	0.0	15.8	12.5	7.1	
1	38.9	28.0	31.6	12.5	30.0	
2	16.7	24.0	36.8	50.0	28.6	
3	33.3	28.0	10.5	12.5	22.9	0.18 (70)
4	5.6	16.0	5.3	0.0	8.6	
5	0.0	0.0	0.0	12.5	1.4	
6	0.0	4.0	0.0	0.0	1.4	
Avg.	1.94A	2.48A	2.89A	2.12A	2.06	0.11 (70)
PSAT[k]						
Not satisfied (-1)	11.1[d]	0.0	15.8	25.0	10.0	$P = 0.10$ (70)
Satisfied (0)	44.4	48.0	68.4	50.0	52.9	
Very satisfied (1)	44.4	52.0	15.8	25.0	37.1	
Avg.	0.33	0.52	0.0	0.0	0.27	na[d]
FEES[l]						
None	70.6[e]	45.8	47.1	62.5	54.6	
1	23.5	37.5	35.3	25.0	31.8	0.85
2	0.0	12.5	11.8	12.5	9.1	(66)
3	5.9	4.2	5.9	0.0	4.6	
Avg.[d]	0.44A	0.75A	0.75A	0.50A	0.64	0.60 (66)

Table 1. Continued

	Market Outlet[a]					
	DCSA	**FARMER**	**WIFG**	**Restaurant**	**Overall**	***P*-value[b] (*n*[c])**
OTHER[m]						
None	35.3	0.0	11.8	25.0	15.2	
1	11.8	4.2	11.8	12.5	9.1	
2	11.8	37.5	35.3	25.0	28.8	0.10
3	11.8	41.7	5.9	12.5	21.2	(66)
4	23.5	12.5	23.5	12.5	18.2	
5	5.9	4.2	11.8	12.5	7.6	
Avg.	1.94A	2.75A	2.56A	2.13A	2.41	0.32 (66)
MCOST[n]						
None	17.7	0.0	11.8	12.5	9.1	
1	17.7	0.0	5.9	12.5	7.6	
2	17.7	20.8	17.7	37.5	21.2	
3	17.7	37.5	17.7	12.5	24.2	
4	17.7	25.0	23.5	12.5	21.2	0.49 (66)
5	11.8	12.5	11.8	0.0	10.6	
6	0.0	0.0	0.0	0.0	0.0	
7	0.0	0.0	11.8	12.5	4.6	
8	0.0	4.2	0.0	0.0	1.5	
Avg.	2.39A	3.50A	3.31A	2.63A	3.05	0.18 (66)
ADV[o]						
Avg.[d]	7.33B	15.64A	3.82B	5.25B	9.05	< 0.001 (62)
DIST[p]						
0 (0)	66.7[e]	0.0	0.0	0.0	17.9	
< 10 (10)	11.1	33.3	41.2	25.0	28.4	
11–20 (20)	5.6	25.0	17.7	0.0	14.9	< 0.001 (67)
21–30 (30)	11.1	16.7	5.9	0.0	10.5	
30 + (40)	5.6	25.0	35.3	75.0	28.4	
Avg.	7.8B	23.3A	23.5A	32.5A	20.3	< 0.001 (67)
%UNSOLD[q]						
Avg.	7.36A	6.20A	6.18A	5.00A	6.36	0.74 (66)
UNSOLD[r]						
Avg.	1.67A	2.61A	1.62A	1.25A	1.93	0.83 (66)
CONV[s]						
Yes (1)	16.67	28.0	15.79	0.00	18.57	0.33
No (0)	83.33	72.0	84.21	100.00	81.43	(70)

Table 1. Continued

	Market Outlet[a]					
	DCSA	**FARMER**	**WIFG**	**Restaurant**	**Overall**	***P*-value[b] (*n*[c])**
CDIV[t]						
Avg.	12.17A	13.76A	14.16A	13.76A	13.70	0.81 (70)
YEARS[u]						
Avg.	8.33A	7.98A	9.26A	7.69A	8.39	0.93 (70)

Notes:
[a]DCSA = direct sales to consumers on farm or via CSA, FARMER = farmers' market or roadside stand; WIFG = wholesale, intermediaries, food processors or grocery stores; and RESTAURANT = cooks and chefs.
[b]Pearson's χ^2 level of significance of differences across distribution of answers across market outlet or level of significance from ANOVA using post-hoc analysis with multiple pairwise comparisons.
[c]Number of responses collected for a particular variable.
[d]Averages are as defined in the variable description for categorical data. For numerical responses, compact letter rankings (capital letters) indicate statistically significant differences when a particular market outlet does not share a letter ranking at $P = 0.05$ using analysis of variance.
[e]Numbers in response category rows represent response percentages across variable categories.
[f]SALES = total average annual farm sales (2021 and 2022). See Table 2 for a more meaningful scale variable comparison across growers.
[g]MSALES are total average annual sales (2021 and 2022) by market outlet. Multiplying the overall average of $14,057 by 69 responses leads to $970,000 in annual sales across this set of respondents.
[h]MCONC is the percentage of farm sales dedicated to a single market outlet.
[i]MDIV is the number of market outlets pursued by a grower.
[j]REASONS is the number of reasons checked for picking a market outlet among which are getting the highest price (38.6%), access to high consumer traffic (34.3%), being least labor-intensive (38.6%), the only market available (8.6%), selling to preferred customers (41.4%), largest sales per customer (35.7%), or other (8.6%). (Numbers in parentheses above are the percentage of positive responses for a particular reason.)
[k]PSAT measures satisfaction with prices received. (Numbers in parentheses are used for average.)
[l]FEES represents the number of respondent checks among GAP certification (7.6%), license/fee for market access (19.7%), certified organic requirement (13.6%), naturally grown certification (15.2%), a web site requirement (7.6%), or no requirements (54.5%). (Numbers in parentheses are the percentage of positive responses for a particular requirement/fee given.)
[m]OTHER represents the number of respondent checks among other selling expenses, including workers other than self (37.9%), supplies (e.g., packaging, 77.3%), refrigerated storage (45.5%), labeling/advertising (47.0%), order picking (33.3%), or none (15.2%). (Numbers in parentheses are the percentage of positive responses for a particular selling expense.)
[n]MCOST represents the number of respondent checks summed across *FEES* and *OTHER* as a measure of how expensive it is to access a market outlet.
[o]ADV is the percentage of sales used for advertising by market outlet.
[p]DISTance to market outlet measured in miles. (Numbers in parentheses are used for average.)
[q]%UNSOLD is the percentage of unsold produce that differs by producer and thereby market outlet.
[r]UNSOLD is *%UNSOLD* times a binary variable indicated a market outlet to be either the leading or second highest in terms of unsold produce.
[s]CONVentional production practices include chemical use (yes), whereas the alternative (no) either strictly or mostly avoids the use of chemicals. "No" responses are thereby referred to as organic.
[t]CDIV is the number of different crops grown on farm.
[u]YEARS is the number of years of experience a producer had with fruit and vegetable production.

The final set of questions captured demographic information about growers. Included in this category was a question about years of experience with commercial fruit, nut, or vegetable production (*YEARS*). Other variables included gender, age, ethnicity, education (*EDUC*), and farm income as a percent of household income or relative farm income (*RFI*). See Table 2 for summary statistics related to those variables.

Table 2. Description of Grower Market Outlet Choice, Farm Scale, Demographics, and Relative Importance of Farm Income across Grower Group Clusters

	All[a]	Direct Marketeers	Novice Explorers	Experienced Wholesalers	*P*-value (n)[b]
# of growers	27	12	8	7	na
Market outlet choice and scale of production[c]					
Avg. use per farm					
DCSA	27.3%	25.0%	33.3%	25.9%	
FARMER	34.8%	54.2%	33.3%	18.5%	0.14 (66)
WIFG	25.8%	12.5%	20.0%	40.7%	
RESTAURANT	12.1%	8.3%	13.3%	14.8%	
Avg. # of markets used (MDIV)	2.41	2.00A[b]	1.88A	3.86B	0.003 (27)
Avg. farm sales by market (MSALES)					
DCSA	$21,911	$7,900A	$2,600A	$47,714A	0.09 (18)
FARMER	$15,893	$13,296A	$3,540A	$35,000B	0.004 (23)
WIFG	$8,738	$4,667A	$1,993A	$11,705A	0.39 (17)
RESTAURANT	$7,063	$7,875A	$1,750A	$9,313A	0.77 (8)
Total avg. farm sales (SALES)[d]	$35,741	$20,833A	$5,000A	$96,429B	< 0.001
Gender					
Female	40.7%	50.0%	37.5%	28.6%	
Male	48.3%	41.7%	37.5%	71.4%	0.43 (27)
Other/not specified	11.1%	8.3%	25.0%	0.0%	
Ethnicity					
White	74.1%	66.7%	62.5%	100.0%	
Amer. Indian or AK native	7.4%	8.3%	12.5%	0.0%	0.38 (27)
Asian	7.4%	16.7%	0.0%	0.0%	
Other/not specified	11.1%	8.3%	25.0%	0.0%	
Education					
High school graduate	6.9%	8.3%	0.0%	14.3%	
Some college	17.2%	16.7%	12.5%	28.6%	
2-yr. degree	20.7%	33.3%	25.0%	0.0%	
4-yr. degree	20.7%	16.7%	25.0%	14.3%	0.59 (27)
Master's	24.1%	25.0%	12.5%	42.9%	
PhD	3.4%	0.0%	12.5%	0.0%	
Other/not specified	6.9%	0.0%	12.5%	0.0%	
Age (avg.)[e]	50.4	55.0A	52.9A	40A	0.09 (26)
Years	8.6	9.3A	5A	11.4A	0.24 (27)
Farm income/HH income (RFI)	54.6%	44.1a%	45.7ab%	80.0b%	0.04 (25)

Notes: [a]Statistics pertain to 27 growers (66 obs.) as 2 (4 obs.) lacked responses needed to assign to a grower group.
[b]Pearson's χ^2 level of significance of differences across distribution of answers by grower group or level of significance from ANOVA using post-hoc analysis with multiple pairwise comparisons with *n* observations. Capital letters again indicated statistically significant difference across columns when a letter is not shared at $P < 0.05$.
[c]DCSA = direct sales to consumers on farm or via CSA, FARMER = farmers' market or roadside stand, WIFG = wholesale, intermediaries, food processors or grocery stores, and RESTAURANT = cooks and chefs. [d]The product of average market outlet use, average market outlet farm sales, and average number of markets for a grower group amounts to average farm sales as a measure of scale economy across grower groups.
[e]The age variable was generated from responses to age categories of 18–24 (20), 25–34 (30), 35–44 (40), etc., using the numbers in parentheses. The maximum age category was 75–84 (80) with one response.

Empirical Estimation

Two modeling approaches were employed. First, we estimated a multinomial logit model to analyze whether and to what degree the following factors influenced market outlet choice:

$$OUTLET = f(MSALES, MCONC, PSAT, FEES, OTHER, ADV, DIST, UNSOLD, \quad (1)$$

$$CONV, CDIV, YEARS),$$

where *OUTLET* is one of the four outlet choices with the farmers' market, including roadside stands (FARMER) serving as the baseline market outlet choice, and on-farm, direct and CSA sales (DCSA), wholesale and intermediaries (WIFP), and chefs and cooks (RESTAURANT) serving as alternatives. Other variables are described above and summarized in Tables 1 and 2.

To generate grower profiles, we used k-means clustering, which is a common method in the marketing opportunity identification literature (Malone and Lusk, 2018). The Euclidean distance between a specified number of k clusters was minimized among groups' individuals (j) using k-means cluster analysis (Arabiel and Hubert, 1996; Malone and Lusk, 2018) according to factors (x) as follows:

$$\min(distance_x) = \min \sqrt{\sum_{j=1}^{9}(x_j - \overline{X_{Jk}})^2}\,, \quad (2)$$

where $\overline{X_{Jk}}$ is the center of the cluster associated with observations x_j from individuals' responses to a set of questions capturing sales, marketing channel diversification, marketing rationale, marketing cost, production method, and producer experience variables as follows:

$$GG = g(SALES, MDIV, REASONS, MCOST, ADV, DIST, UNSOLD, CDIV, YEARS), \quad (3)$$

where GG is the grower group assignment to one of three clusters that would have common, describable characteristics. Please see Tables 1 and 2 for variable name descriptions and statistics.

To be able to plot the data in a spider diagram that would allow easy visual examination of differences across grower groups (GG) with respect to the above variables, we scaled average responses using an index value where 1 (or 100%) represents the maximum value observed for a response variable across all respondents.

Alternative specifications of equations 2 and 3 were pursued and tested for goodness of fit using appropriate statistics and hierarchical clustering to determine the appropriate number of clusters. We also tested individual categorical variables for differences across market outlets using Chi-square tests and analysis of variance (ANOVA) for numeric responses where separate linear models were computed for each response variable in R. For each response variable, the null hypothesis was that there were no significant differences between market outlets. The null

hypotheses were evaluated at $P = 0.05$. Post-hoc analysis was computed using multiple pairwise comparisons. Statistical differences between treatment pairs were summarized using a compact letter display.

Results

We received responses from 38 growers, with 29 complete and usable responses. Since, on average, respondents sold to 2.57 different market outlets, we had 70 unique market outlet observations regarding outlet choice. For analysis, we pooled four categories: direct sales and CSA (18 DCSA observations), farmers' market and roadside stand (25 FARMER observations), wholesale, intermediary, food processor, and grocery stores (19 WIFG observations), and chefs and cooks (8 RESTAURANT observations).

Single-Factor Observations about Market Channel Selection

Chi-square and ANOVA tests revealed measures of market diversification both in number (*MDIV*) and percentage of farm sales attributed to a particular market outlet (*MCONC*) to vary by market outlet. Most notable, numerically, was that those selling to farmers' markets and roadside stands (FARMER) tended to sell to fewer other market outlets (Table 1).

On the cost side, advertising expenses (*ADV*) were highest with FARMER markets compared to the other market outlet choices (see Table 1). Finally, the distance for growers to travel to make a sale (*DIST*) was smallest for on-farm and CSA sales (DCSA) as expected since more than half of grower sales were on-farm with some CSA sales that required delivery, thereby leading to an average of 7.8 miles for delivery for this market outlet (see Table 1).

Despite few statistically significant results, given the small number of observations, several interesting numerically different results across market outlet choice stood out (see Table 1). From a revenue perspective, DCSA sales were largest, followed by FARMER sales with wholesale, intermediaries, food processors, grocery stores (WIFG), and RESTAURANT sales two- to three-fold smaller in *MSALES* on average. At the same time, growers were most satisfied with prices received (*PSAT*) using FARMER outlets, followed by DCSA.

While price satisfaction and revenue are important, outlet choice costs also deserve consideration. As expected, licensing, certification, and fee requirements (*FEES*) were least for DCSA and RESTAURANT sales and higher for WIFG and FARMER. Other selling fees like order picking, payroll, refrigerated storage, labeling, and advertising (*OTHER*) again reveal FARMER and WIFG to be more onerous than other market outlet choices, which is also evident in the *MCOST* variable.

Surprisingly, market outlet differences in the number of crops grown on farms were nonexistent. *A priori* expectations were that WIFG growers would grow fewer crops to specialize for sufficient volume and associated cost savings. Looking at a combination of several factors provides a logical explanation later. Statistically insignificant were differences in the percentage of unsold produce, even once multiplied by the binary variable indicating leading unsold produce by outlet. Finally, FARMER sales had the highest percentage of conventionally grown produce, whereas restaurants

required organic production. Years of experience with commercial crop production, like the number of crops grown, was also not a distinguishing factor across market outlets.

In sum, the FARMER outlet choice was the costliest but had the highest producer price satisfaction. The highest market-specific sales were achieved using the DCSA and FARMER outlets, suggesting that fruit and vegetable growers interact directly with end consumers, likely to gain marketing feedback from consumers and, to a lesser extent, from WIFG and RESTAURANT sales.

Multivariate Impacts on Market Channel Selection

Table 3 presents the results of the multinomial logit (MNL) regression model (Eq. 1), where marketing outlet was a function of sales, production method, and producer experience variables. With the farmers' market being the baseline market outlet, the multinomial regression on 62 observations resulted in a McFadden R-square, or the coefficient of determination, of 57.4% with several parameter estimates that were statistically significant. The *UNSOLD* variable was dropped from the analysis as it did not contribute to explanatory power.

Table 3. Market Outlet Choice as a Function of Grower Responses to Marketing and Production Response Variables

	Market Outlet[a]								
	DCSA			**WIFG**			**Restaurant**		
Variable	**Robust Coefficient[b]**	**Std. Error**	***P* > z**	**Robust Coefficient**	**Std. Error**	***P* > z**	**Robust Coefficient**	**Std. Error**	***P* > z**
Constant	12.07**	5.21	0.02	1.44	2.90	0.62	1.94	2.75	0.48
MSALES[c]	< 0.01	< 0.01	0.14	< 0.01	< 0.01	0.60	< 0.01	< 0.01	0.38
MCONC	-0.06*	0.03	0.06	-0.07***	0.02	< 0.01	-0.05**	0.02	0.04
PSAT	0.15	1.27	0.90	-2.91**	1.27	0.02	-4.42***	1.58	< 0.01
MCOST	-1.35***	0.54	0.01	-0.21	0.49	0.67	-2.56***	0.87	< 0.01
ADV	-0.13	0.08	0.12	-0.51***	0.21	0.01	-0.18**	0.10	0.05
DIST	-1.75*	0.96	0.07	0.73	0.50	0.15	2.80***	1.12	0.01
CONV	-6.59**	3.08	0.03	-0.70	1.69	0.68	-21.23***	2.57	< 0.01
CDIV	-0.20*	0.12	0.10	0.18**	0.09	0.04	0.36**	0.15	0.02
YEARS	0.02	0.11	0.89	0.18*	0.10	0.09	-0.37	0.28	0.18
Number of observations		62							
McFadden's Pseudo R^2		57.4%							

Notes: [a]The baseline market outlet is the FARMER category with farmers' market or roadside stands in the Ozark Mountain Region, 2022. DCSA = direct sales to consumers on farm and via CSA, WIFG = wholesale, intermediary, food processor, or grocery store, and RESTAURANT = cooks and chefs.
[b]Statistical significance * = 0.1, ** = 0.05, *** = 0.01
[c]Please see variable descriptions in Table 1.

Marginal effects derived from this MNL model are shown in Table 4. A change in any of the variables statistically significantly impacted at least one market outlet choice, as indicated by the bold lettering for marginal effects when statistically significant at $P = 0.05$.

Table 4. Marginal Effects of Grower Marketing and Production Variables on Market Outlet Choice

		Market Outlet[a]			
Variable[b]	**Statistic**	**DCSA**	**Farmer**	**WIFG**	**Restaurant**
MSALES	dy/dx in %[c]	**$1.05 \cdot 10^{-3}$**[d]	$-3.44 \cdot 10^{-4}$	$-3.93 \cdot 10^{-4}$	$-3.10 \cdot 10^{-4}$
	Std. Error	$4.38 \cdot 10^{-6}$	$3.29 \cdot 10^{-6}$	$3.83 \cdot 10^{-6}$	$3.27 \cdot 10^{-6}$
	P > z	0.017	0.297	0.304	0.343
MCONC[e]	dy/dx in %	-0.21	**0.53**	-0.34	-0.03
	Std. Error	$1.98 \cdot 10^{-3}$	$1.07 \cdot 10^{-3}$	$1.97 \cdot 10^{-3}$	$1.07 \cdot 10^{-3}$
	P > z	0.281	< 0.01	0.077	0.80
PSAT	dy/dx in %	14.16	**15.75**	-13.49	**-16.42**
	Std. Error	0.09	0.08	0.08	0.06
	P > z	0.11	0.05	0.08	0.01
MCOST	dy/dx in %	**-8.18**	**10.26**	**11.86**	**-13.95**
	Std. Error	0.03	0.02	0.05	0.04
	P > z	0.01	< 0.01	0.01	< 0.01
ADV[e]	dy/dx in %	0.73	**2.54**	**-4.22**	0.95
	Std. Error	$7.7 \cdot 10^{-3}$	$9.2 \cdot 10^{-3}$	0.02	$7.8 \cdot 10^{-3}$
	P > z	0.345	< 0.01	< 0.01	0.224
DIST[e]	dy/dx in %	**-19.02**	0.70	2.18	16.13
	Std. Error	0.04	0.03	0.04	0.06
	P > z	< 0.01	0.83	0.61	< 0.01
CONV	dy/dx in %	-33.23	**62.09**	**94.62**	**-123.48**
	Std. Error	0.19	0.14	0.16	0.22
	P > z	0.08	< 0.01	< 0.01	< 0.01
CDIV	dy/dx in %	**-2.55**	-0.29	1.10	**1.74**
	Std. Error	$7.4 \cdot 10^{-3}$	$5.2 \cdot 10^{-3}$	$7.8 \cdot 10^{-3}$	$6.7 \cdot 10^{-3}$
	P > z	< 0.01	0.58	0.16	< 0.01
YEARS	dy/dx in %	$-9.7 \cdot 10^{-2}$	$-9.4 \cdot 10^{-2}$	**3.17**	**-2.98**
	Std. Error	$7.0 \cdot 10^{-3}$	$8.4 \cdot 10^{-3}$	0.01	0.02
	P > z	0.89	0.91	< 0.01	0.05

Notes: [a]DCSA = direct sales to consumers on farm or via CSA, FARMER = farmers' market or roadside stand, WIFG = wholesale, intermediaries, food processors, or grocery stores, and RESTAURANT = cooks and chefs.
[b]Please see variable descriptions in Table 1.
[c]For ease of interpretation dy/dx are presented in %. Divide by 100 and standard error to get the *z*-value. For example, targeting a $1,000 increase in market outlet sales increases the likelihood of choosing DCSA by 1% with outcomes for other markets not statistically significant.
[d]Bold lettering adds emphasis to findings that are statistically significant at $P = 0.05$.
[e]The *DIST* variable was modeled as a categorical variable with roughly a 10-mile difference across categories. The marginal effect thus is in increments of 10 miles. Similarly, *MCONC* was modeled as the numeric percentage of total farm sales in a particular outlet as is *ADV* the percent of sales spent on marketing. As such, dy/dx is per 1% increase in market outlet sales concentration or advertising as % of sales. For *MSALES*, *PSAT*, *MCOST*, *CONV*, *CDIV*, and *YEARS* the marginal effect represents a 1-unit change.

On the revenue side, if a producer wanted to increase outlet-specific sales by $1,000, the likelihood that they would choose DCSA increased by 1%. Given DCSA's highest average market-specific

sales (see Table 1), this result suggests that growers and consumers may enjoy the farm setting for sales. For those interested in concentrating their sales on a particular market outlet, the choice of the farmers' market outlet showed the only positive marginal effect. Recall that growers selling to the FARMER outlet were least diversified in sales outlets (see Table 1).

For growers interested in increasing their level of satisfaction concerning prices received, the marginal effects analysis suggested selling significantly more using the FARMER outlet at the cost of RESTAURANT sales. DCSA also had a positive marginal effect, whereas WIFG had a negative effect. In sum, and not surprisingly, better pricing can be obtained when selling directly to end consumers.

On the cost side, marketing costs summarized in the *MCOST* variable, rather than specifically in the *FEES* and *OTHER* variables, showed that for growers willing to take on another cost item, they would increase FARMER and WIFG sales at the cost of DCSA and RESTAURANT sales. When analyzed in conjunction with other variables, this finding is now statistically significant, whereas it was not as shown in Table 1, when analyzing the effect of *MCOST* alone. Likely, the effect of one more cost item has a lesser marginal impact for those market channels where the number of marketing costs was already large.

Adding more advertising costs increased the likelihood that growers would sell to the FARMER outlet, decreasing the likelihood of WIFG sales. This increase is likely a function of margin as *PSAT* with FARMER is higher than *PSAT* with WIFG. In other words, greater margins at FARMER than WIFG outlets may offer the opportunity to build a brand name and pursue more sales at farmers' markets and roadside stands.

As DCSA sales required the least, an average of 7.8 miles (see Table 1), adding greater distance (locating the farm farther from consumers or performing CSA delivery at a greater radius) affected this outlet negatively. At the same time, growers drove the furthest (avg. 32.5 miles) to reach restaurants. Future studies might explore whether this is caused by higher margins from institutional buyers such as restaurants, or from the benefits of larger, more consistent sales that a single customer, such as a restaurant, might provide. Regardless, larger distance to end users is expected to lead to more RESTAURANT sales.

On the production side, *CONV*entional production showed a large marginal effect. Increasing ease of production by using chemicals positively impacted both the FARMER and WIFG outlets and negatively affected RESTAURANT sales. RESTAURANT sales were shown to be exclusively organic, indicating that the chefs connected to these growers prefer to add a premium for organic produce to their local offerings on their menus (see Table 1). These results suggest that conventional chemical applications might limit a grower's ability to sell to chefs and cooks. At the same time, FARMER and WIFG sales may allow for chemicals, validating that food-at-home and food-away-from-home local food decisions are driven by unique consumer utility functions (Bazzani et al., 2017; Printezis and Grebitus, 2018). Adding more crop variety impacts RESTAURANT sales positively and DCSA sales negatively. Since crop diversity was statistically

insignificant across outlets (see Table 1), this finding may be more relevant when discussing grower type or cluster results in the next section.

Finally, commercial fruit and vegetable production experience showed that increased grower experience reduced the probability of a grower choosing to sell directly to a restaurant. This is not surprising, as more experienced growers also owned larger operations, preferring to specialize on production and to outsource marketing choice to wholesale, intermediaries, food processors, or grocery stores.

Growers Grouped by Similar Characteristics

The k-means cluster analysis grouped growers into sets with similar characteristics. The number of clusters was set to three groups after visual analysis of a dendrogram obtained using hierarchical clustering. Analysis of the dendrogram suggested that four clusters would lead to respondent groups with only one observation and that analysis of only two clusters had a larger within-group sum of squares (WSS) than three respondent groups (see Figure 2). Using a generative AI algorithm, we named each cluster based on its characteristics (OpenAI, 2023).

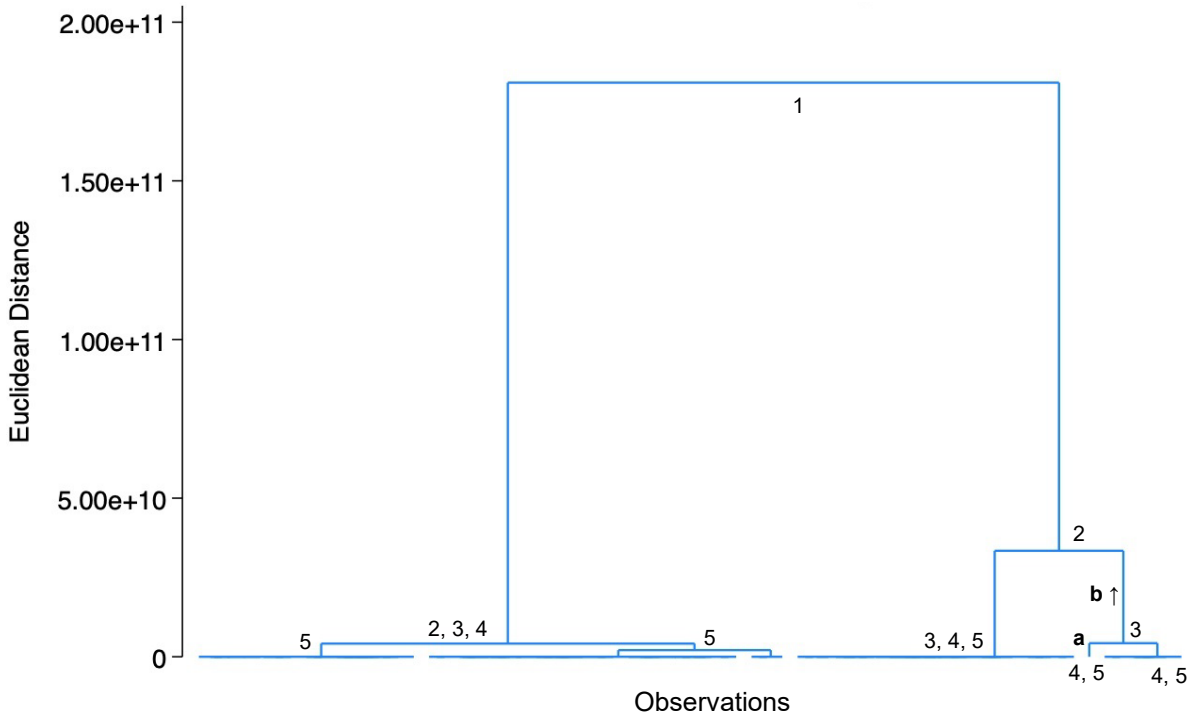

Figure 2. Dendrogram of grower groups employing hierarchical clustering using marketing and production response variables. Four clusters led to groups with few observations or small horizontal bar width (a), and a large increase in within group sum of squares (vertical axis) was observed with two clusters (b). Cluster numbers are shown for each horizontal bar.

Despite significant findings, as shown in Tables 1 and 4, advertising was excluded from Eq. 3 as it had the fewest producer responses and did not change cluster groupings. Using all variables except *ADV* led to producer groups in which cluster differences are portrayed in the top panel of Figure 3. Other descriptive factors across clusters are shown in the bottom panel of Figure 3 and Table 2.

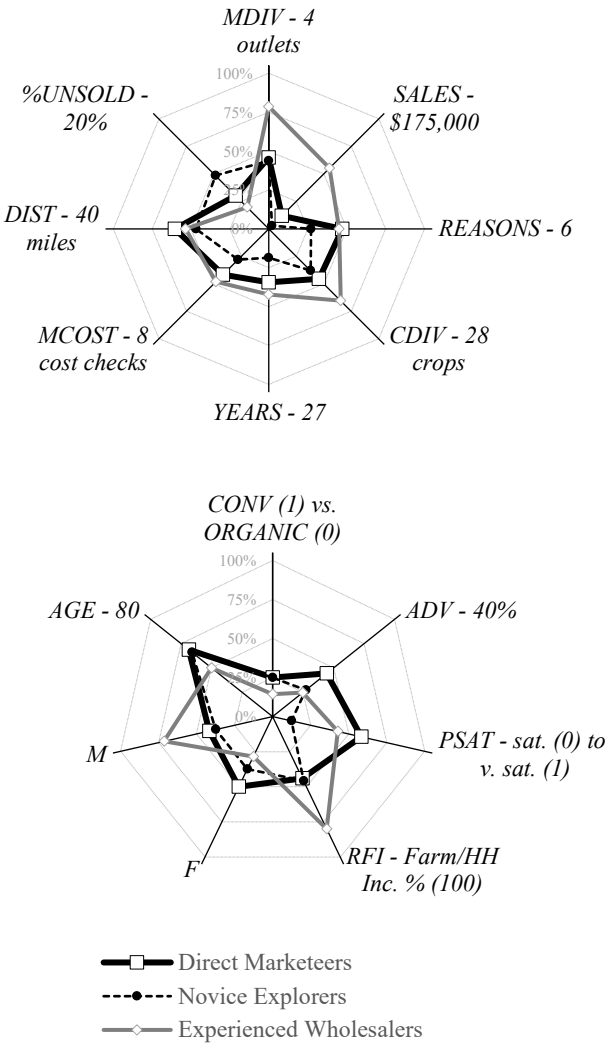

Figure 3. Visual Comparison of Scaled Explanatory Response Variables across Grower Groups (top panel) and Grower Characteristics Not Used for Clustering (bottom panel)

Note: Please see Tables 1 and 2 for variable name definitions. Marker values are scaled to reflect the average response by grower group relative to the overall maximum observed response value reported across all respondents. Maxima are shown for each variable in the graph. For gender variables the maximum would be 100% male or female; for *CONV* the maximum would be 100% conventional production methods that would include use of chemicals. Since the average price satisfaction was 0 = satisfied, the maximum for this variable or 100% responses implies all growers in the group to be very satisfied. Multiplying marker values by the maximum observed values leads to the average response for the grower group.

Group 1 growers with intermediate experience predominantly sold their produce at farmers' markets as a distinguishing feature compared to the second two groups (see Table 2). As such, we deem these individuals to be passionate about selling their products at the farmers' market, so we refer to them as the "Direct Marketeers." This group also invested heavily in advertising their products (see Figure 2). Several factors influenced their selling choices at the farmers' market. They travel the most with the highest price satisfaction and likely enjoy direct consumer interaction. In addition, Direct Marketeers were predominantly female, although not statistically significantly so.

The least experienced growers in Group 2 used the fewest available outlets ($P > 0.05$, Table 2). They advertised sparingly, given both their low farm *SALES* and high reliance on on-farm income as household income. The group's diversity is evident in education achieved, race, and, gender. At the same time, they had the least crop variety, had the most unsold produce, and used conventional production practices as much as the prior group. As such, they appeared least established and also were least satisfied with the prices they received. Hence, we identify them as "Novice Explorers," in part because they did not focus to the same degree on the farmers' market outlet as the Direct Marketeers.

A distinguishing feature of growers in Group 3 was that they identified the most as white males. Numerically, they had the greatest years of production and marketing experience and were statistically significantly the largest farms in terms of sales. Unlike the other groups, they had the lowest use of farmers' markets, although sales using that market outlet were second to DCSA only. Regarding market outlet use, they supplied more heavily to restaurants and WIFG than the above Direct Marketeers and Novice Explorers. In contrast, the fraction of farm sales dedicated to those two outlets still lagged behind DCSA and FARMER outlets. Finally, they used organic production methods the most. These growers also grew a wide range of crops and had the largest marketing costs (*MCOST*) but also the least unsold produce. We refer to them as the "Experienced Wholesalers."

While we had hypothesized that growers, targeting WIFG the most in comparison to the Direct Marketeers and Novice Explorers, would focus on fewer crops to gain sufficient volume, high *CDIV* lowers production and marketing risk while at the same time is likely to lead to a more even or less lumpy distribution of cash flow that would otherwise occur with a more focused or specialized crop production strategy. Enhanced opportunities to manage pests, disease, and weed problems with greater degrees of freedom regarding crop rotation as a function of greater crop variety may also make organic production more attainable, given this group's least observed use of chemicals (*CONV*). Their self-reported satisfaction with prices received was higher than for the Novice Explorers but less than that reported by the Direct Marketeers.

This analysis revealed that WIFG sales increases are difficult to achieve. Growers using these outlets the most had been in business the longest and at the same time were the youngest. Direct, on-farm, and farmers' market sales serve as a base for growers, but they appear insufficient to propel growers to rely on farm sales for most of their household income. On the other hand, using a pronounced strategy to diversify across market channels (high *MDIV*) appears to be a sound risk

management strategy that led to low unsold produce, as is a strategy to grow a high diversity of crops. Both require a scale of production that is not quickly achieved.

Relying on consumers to reach the farm (large DCSA sales) lessens producer time spent on delivery (*DIST*) travel. While the largest sales contributor on Experienced Wholesalers farms, this strategy is difficult to achieve as the farms' proximity to consumers, who may need to travel far to reach farms typically located out of town, limits consumer access unless a brand name, desirable farm setting, and consumer willingness to travel exist. Perhaps as a result of those difficulties, Direct Marketeers use farmers' markets extensively to promote their operations by reducing the need for consumers to travel, increasing brand awareness, and using the opportunity to connect with consumers by showcasing their products and building lasting relationships with them. Nonetheless, using the FARMER outlet was demonstrated to be costly regarding producer time invested and may limit sales potential.

Novice Explorers, despite having the lowest *MDIV* score, showed more even pursuit of all market outlet choices (see Table 2). They were also the highest users of conventional production methods. These growers are likely in the process of building name recognition and testing market outlets before scaling up. Their average years of experience suggested that they may not be able to increase in size given both small sales and large reliance on on-farm income in relation to household income as, on average, they had five years of experience in this production and marketing stage. They also had the highest unsold produce, suggesting that their match between production and consumer needs requires attention.

The Experienced Wholesalers strived to grow as much organic produce as possible. Relative to direct consumer-contact outlets, they focused relatively heavily on wholesalers and restaurants. Even still, they had high market-specific sales on-farm and at farmers' markets, and overall, their sales from farming generated 80% of household income on average. Given their longer production experience, these growers invest less heavily in advertising costs as a percent of sales, as they rely on their local name recognition and have a larger advertising budget with high sales. They also spend less time on average transporting produce than the Direct Marketeers, as they may deliver in larger quantities per sale.

Recommendations and Conclusions

This analysis categorized marketing channels and the strategies of fruit and vegetable growers in the Mid-South. Specifically, we identified factors influencing growers' decisions about what outlet to sell their products. Our cluster analysis led to three distinct marketing strategy profiles for fruit and vegetable growers. The first cluster generally targeted farmers' markets as Direct Marketeers. A second cluster, comprised of Novice Explorers, who were least diversified in market outlets pursued, relying on average on 1.88 markets were the least focused on any of the four market outlets. The last cluster used wholesale, intermediary, food processor, and grocery store market outlets and restaurants the most but also had the highest sales across all market outlets, and derived their leading amount of farm sales from DCSA and FARMER outlets.

Our results imply at least two kinds of small-scale fruit and vegetable production systems with unique infrastructure and policy needs. Experienced wholesalers require industry-specific guidelines, often directed by the businesses they sell to or from the growers themselves (Lagoudakis et al., 2020; Staples, Malone, and Sirrine, 2021). They can create opportunities for growers to network with other growers, buyers, and consumers. Through value chain coordination, policy makers might help growers build lasting customer relationships, increasing market share. In addition, local authorities can help remove regulatory barriers that may prevent small growers from accessing specific markets or lessen difficulties associated with regulatory compliance. Local governments can create a more resilient and sustainable food system that benefits growers and consumers by streamlining regulatory processes and providing guidance on compliance requirements. In addition, local governments can encourage restaurants to source ingredients locally by offering tax incentives or other forms of support.

Chi-square analysis indicated that distance to the market matters significantly for market outlet selection. With distance to the market adding fuel and labor constraints, on-farm sales lost adoption likelihood, whereas restaurant sales gained popularity. Locating further from customers reduced on-farm sales, as the consumers' time and cost to travel to the farm increased. At the same time, statistically insignificant and a marginally small result for WIFG suggested that adding farm produce pickup by wholesalers would not be sufficient incentive for growers to use this marketing channel more aggressively. Greater consumer premiums for "localness" are needed for growers to enjoy higher price satisfaction.

At the same time, a policy to promote sales of local produce among less affluent consumers by doubling the value of SNAP dollars for local produce purchases may enhance WIFG sales by making local produce more affordable. Adding less emphasis on distance in defining local production may also assist with marketing efforts by promoting social connectedness to the product (Farris et al., 2019). Extending that social connectedness in a less time-consuming fashion for growers than attending farmers' markets may be a solution.

Assistance with online marketing and social media marketing efforts and building farmer networks and better avenues for further processing of produce as a value-added proposition for consumers and growers may be fruitful as shoppers increase online food shopping. Local efforts of the Center for Arkansas Farms and Foods and the Northwest Arkansas Land Trust aim to educate future growers with production, business, marketing, and legal know how while at the same time assisting with greater access to land that is otherwise difficult to obtain given urban sprawl. The Market Center of the Ozarks, to begin services in 2024, is expected to serve both as a food hub and as a food processing and innovation center to create value-added opportunities. The former is expected to lessen unsold produce and should reduce the number of produce drop-off locations for growers, which helps to lessen distance to market, whereas the latter adds processing and storability in efforts to enhance online marketing potential. This may be especially effective as consumers have grown more accustomed to online purchasing during COVID-19.

This study sets up important next steps for the literature. In addition to standard agronomic concerns, the prior literature indicates that social identity can often play a role in the most

profitable crop selection (Moreno and Malone, 2021). Future research would benefit from exploring social identity for growers in the Mid-South. Second, we only focused on small-scale vegetable and fruit growers in parts of Arkansas, Missouri, and Oklahoma, which may limit the applicability of the results to other regions (e.g., California or Oregon where fruit and vegetable growers operate at relatively larger scale and greater degree of automation). In addition, the study may not have considered all relevant variables that may influence growers' market choices, such as farm size in terms of acreage farmed, change in market conditions from year to year, and labor. These possibly omitted variables may limit the ability to draw definitive conclusions about the factors determining grower profiles. Future research efforts could focus on conducting comparative studies with other regions. Those future studies might benefit from a more mixed methods approach, including findings from methods such as focus groups or in-depth interviews, to better understand the motivations and factors influencing growers' market outlet choices as low response rates to complex, online surveys for a small population limit statistical analysis and extension of results beyond the sample.

Growers often need help to track labor force efforts and allocate work hours to different production tasks on the farm versus those incurred to sell produce at or post-farm gate. Farm schools and apprenticeship programs, like the Center for Arkansas Farms and Foods, can and do assist with training future growers with accounting know how to track these costs. Government and industry support to allow for this type of education, which is costly given limited local demand, are needed for long-term investment toward local food supply chains that have a hard time competing on price with large-scale production common with WIFG. A less costly solution may be subsidizing online content at least on business, marketing, and legal curricula that are less location-specific than production training.

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