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Small Fresh Fruit and Vegetable Growers in Tennessee: Factors Associated With Their Use of Commercial Outlets

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Consolidation and technological change are restricting the marketing alternatives for independent, small-volume produce growers. The following are some of the forces restricting small growers: contracting, bar coding, precut processing, increased globalization, HACCP, and efficient consumer response (Epperson and Estes, 1999; Kaufman et al., 2000 forthcoming; Shaffer, 1999). As a result of these and other forces, small-volume produce growers tend to be limited to direct outlets (for example, farm stands, PYO, farmer's markets).

The proliferation of farmer's markets has been examined by the USDA and reported as a growing segment of direct sales. For example, the number of farmer's markets in the United States increased 20 percent between 1994 and 1996 (Burns and Johnson, 1996), with a further 10 percent increase during the next two years (U.S. Dept. of Agriculture, 1998). Johnston, Lewis, and Bragg (1996) identified 50 farmer's markets in Tennessee. Most farmer's markets have been seasonal operations that use unoccupied parking lots without any buildings or operations in locations with little investment in physical structures (for example, open-air sheds). Some of the markets, however, are located in multimillion dollar facilities constructed with funds from one or more governmental entities (examples in Tennessee include the Agricenter in Memphis, the Nashville Farmer's Market, and the Knox County Regional Farmer's Market).

The prevalence of smaller growers in many states and the associated difficulties of selling through brokers and wholesalers has made it necessary to learn more about growers' decisions to use or not to use commercial outlets. Most states have been actively promoting locally grown fresh produce, and

a variety of studies have focused on consumer acceptance and consumption of these products (for example, Eastwood, Brooker, and Gray, 1998; Govindasamy and Nayga, 1997; Kezis et al., 1998; Kuches et al., 1999).

Little attention, however, has been given to the marketing choices made by small-volume growers (an exception is Estes, 1985). The focus of this paper is a study that examines the characteristics of the farmer's operations and their choices of market outlets. The objective of that study was to generate information about the marketing activities of small-volume growers who had, as one of their options, access to organized farmer's markets.

The Grower Sample

Organized farmer's markets are locations at which groups of farmers and other vendors lease or rent space and where emphasis is given to the sale of fresh farm products. These sites are supported, at least in part, by public funds and/or agencies. Facilities and length of operation at each site vary. Six Tennessee farmer's markets were selected to represent the range of markets in which growers sell their produce. Two of the outlets were seasonal, of which one was an open-air shed over a gravel parking area. Three of the four year-round sites were relatively new and had been constructed with public funds.

Market managers indicated that nearly all the farmers came from the counties in which the markets were located or from contiguous counties. Thirty-eight counties were targeted for sampling—six in which the farmer's markets were located and 32 contiguous counties surrounding the sites. During the late spring of 1997, extension leaders in the counties were asked to provide lists of all the produce growers located within their respective counties. Grower lists were obtained from 29 of the 38 counties, comprising 639 operations that had had full- or part-time produce production during the previous year. Both owned and rented land were considered part of an enterprise.

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A questionnaire was developed and pretested.¹ Its purpose was to gather information about farming practices and marketing activities related to fresh produce. Items were drawn from previous surveys of growers in Tennessee and from questionnaires used to gather information from nurseries and turfgrass operations (Brooker, Eastwood, and Brenchley, 1990; Brooker, Turner, and Hinson, 1995). The questionnaire was evaluated by managers of the farmer's markets and by extension agents in the counties where it was distributed.

The instrument was mailed during the fall of 1997 to the 639 producers, and it focused on that year's harvest. A cover letter explained the purpose of the survey, and a prepaid envelope for return mail was provided. A follow-up letter and survey were distributed two weeks after the first contact to encourage participation.

Altogether, 128 usable questionnaires were returned, which amounted to a 20 percent response rate. Responses were received from operations in 27 of the 29 counties (six farmer's market counties and

21 others). Some limited comparisons can be made with the 1997 *Census of Agriculture* data. Average farm size was 163 acres for the sample and 145 acres for the state. For the sample, the average number of acres in produce production was 23.5 acres, with a range of .2 to 259 acres. The average number of acres per produce commodity per farm was 11.6 acres. This suggests that, although the typical respondent farm was slightly larger than the average for Tennessee, produce production of individual commodities, on average, involved small acreages.

Respondents were asked to list the crops grown in 1997 along with the acreage. Their responses are listed in Table 1. The results suggest that the sample of growers is more heavily concentrated (that is, at least twice the state's average acreage) in apples, cabbages, peaches, pumpkins, and watermelon, whereas the respondents are less involved with beans and peas. Aside from cabbages and pumpkins, the average acreages per crop for the sample suggest small volumes of production that are less likely to enter the commercial wholesale distribution system.

Table 1. Number of Growers and Acreage by Produce Commodity.

Crop	Sample		Tennessee Average Acreage ^a
	Number of Growers	Average Acreage	
Apples	29	10.2	2.7
Beans	8	3.1	37.4
Berries ^b	30	1.9	2.3
Cabbages	11	15.9	5.3
Cantaloupes	8	3.8	2.9
Corn	43	8.5	6.3
Cucumbers	9	1.1	1.5
Grapes	11	2.9	1.5
Greens	4	1.0	10.5
Okra	9	.3	.6
Peaches	16	12.5	2.1
Peas	7	2.0	74.2
Peppers	11	7.1	2.3
Potatoes	10	3.2	1.6
Pumpkins	21	18.4	9.7
Squash	19	10.0	8.8
Strawberries	17	6.4	2.9
Tomatoes	34	9.0	8.8
Watermelons	16	13.6	2.9
Other ^c	18	6.6	nc ^d

^a 1997 *Census of Agriculture*.

^b Excluding strawberries.

^c Includes beets, broccoli, eggplant, lettuce, nectarines, onions, plums, turnips, and peanuts.

^d Not calculated.

¹The questions are available from the authors.

The number of crops grown by the sample farms ranged from 0 to 16, with an average of 3.2 per operation. Five respondents indicated that they grew no crops in the summer of 1997, and one person listed 16 crops.² Three-fourths of the growers raised from one to four produce commodities that summer. The most frequent response was a single crop (one-third of the sample), and just under 20 percent raised two produce commodities.

To learn about marketing practices, respondents were asked to indicate market outlets that they used for each fruit and vegetable crop grown in 1997. The choices were farmer's markets, on-farm sales, and wholesale (that is, commercial). More than one-half of the growers used on-farm sales for at least one of the produce commodities grown that summer. Almost 40 percent used farmer's markets as the only outlet type to sell at least one produce item, and 30 percent did the same with respect to wholesale. Few respondents were involved with multiple outlets. Growers in Tennessee typically function independently with respect to marketing. There was only one grower that used all three outlet types for a single produce commodity.

Growers used a variety of market outlets to sell their production. Wholesaling was used by at least one grower for each of the 16 commodities. A preliminary analysis of the relationship between the size of an enterprise's production of produce and market outlet was conducted. The number of acres in produce production was divided by the number of produce commodities marketed by the grower to

arrive at an average number of acres per crop for each grower. For the sample, the average ranged from a quarter-acre to 150 acres. Farm operations were then grouped according to whether they were smaller or larger than 10 acres, with the result that 77 percent had 10 or fewer acres and 23 percent had more. A dummy variable was created on the basis of whether a wholesaler was used to market some or all of any produce commodity. The results of a test of independence between two factors are presented in Table 2: the size of the operation and marketing through wholesalers. The inference to be drawn is that there was a tendency for smaller growers not to use the wholesale type of outlet and the larger ones to use it.

Based on conversations with growers, extension agents, and agricultural production economists, nine factors that could limit a grower's ability to expand operations were listed.³ Respondents were asked to indicate where each was on a scale of 1 (not limiting) to 5 (very limiting). The responses are summarized in Table 3.

Land was the most frequently selected "not limiting" factor, and labor was the most frequently checked "very limiting" factor. Even though the acreage of many producers is small, the results suggest that the amount of land is not particularly limiting, which may reflect the ability to rent parcels, if desired. Market outlets do not stand out as a constraint. This result could reflect their marketing practices in that, given the sizes of the operations, growers chose outlets that accommodated their production.

Table 2. Farm Size Versus Use of Wholesale Outlets.^a

Size of Produce Operation ^b	Use of Wholesale Outlets			
	No		Yes	
	Actual	Expected	Actual	Expected
10 acres or less	76	70	23	29
More than 10 acres	14	20	15	9
	90	90	38	38

^aChi square = 8.72 (significant at .01 level); n=128.

^bAverage acreage per crop per grower—that is, combined acreage of all crops divided by the number of crops.

²No produce production farms were included in the modeling described below.

³The factors are land, labor, production cost, equipment, insects, price received, market outlet, weather, and diseases. Weather was included because of a lack of irrigation for most growers.

Table 3. Factors Limiting Growers' Ability to Expand.

Factor ^a (n=128)	Not Limiting		Very Limiting		Average	
	Percent ^b	Rank	Percent ^c	Rank	Average	Rank
Land	60.9	1	13.3	3	2.05	8
Labor	16.4	9	37.5	1	3.49	1
Production Cost	31.3	6	10.9	4	2.64	3
Equipment	47.7	2	3.9	9	2.03	9
Insects	37.5	3	7.0	8	2.20	7
Price Received	35.2	4	7.8	6	2.42	5
Market Outlet	34.4	5	9.4	5	2.45	4
Weather	25.8	8	14.8	2	2.84	2
Diseases	27.3	7	7.8	6	2.41	6

^aFactors listed in same order as presented in the questionnaire.

^bPercent of sample indicating that the factor was not limiting (=1).

^cPercent of sample indicating that the factor was very limiting (=5).

Anticipating that labor could be a problem, growers were asked to indicate their sources of labor for production, harvesting, and marketing activities. Choices were yourself, spouse, children, and hired labor. Results are summarized in Table 4. Nearly all who returned a questionnaire provided their own labor in the three activities, and roughly one-half of the spouses did the same. The most frequent use of hired labor was for harvesting. Given the size of the typical operation, these results indicate that the farm operator was actively involved in all phases of the enterprise, with spouses and children helping out.

Further insight into the labor situation was gained through comparing responses to labor as a limiting factor and the use of hired labor for production, harvesting, and marketing activities. Results are presented in Table 5. The inferences are that responses to labor as a limiting factor and use of hired production and harvest labor are

related, whereas hired marketing labor and its being a limiting factor were not related. An interpretation is that, since only a small proportion of respondents used hired labor for marketing, it was not a constraint for this activity. However, for production and harvest work, those who indicated that labor was very limiting hired fewer than expected workers, which is consistent with their difficulty in finding employees.

Preparation of produce for markets can affect the outlet used for sales. In particular, the commercial outlets tend to want produce that is already graded and may even want specific grades. Mixed grades are more likely to be sold via direct outlets. Almost 60 percent of the growers who responded to this question indicated that they sold fruits and vegetables in mixed grades and sizes, which is consistent with the high use of farmer's markets and on-farm outlets. Almost 44 percent graded and packed produce according to buyer specifications.

Table 4. Sources of Labor for Production, Harvesting, and Marketing Activities.

Source of Labor	Production	Harvesting	Marketing
	n=117	n=110	n=108
	-----percent-----		
Yourself	94.0	86.4	94.4
Spouse	45.3	50.0	51.8
Children	33.3	32.7	18.5
Hired Labor	37.6	56.4	18.5

Table 5. Labor as a Limiting Factor Versus Use of Hired Labor.^a

		Is labor a limiting factor?									
		Not limiting (1)		(2)		(3)		(4)		Very limiting (5)	
		Actual	Expected	Actual	Expected	Actual	Expected	Actual	Expected	Actual	Expected
<i>Hired Production Labor</i>											
No		15	10	8	9	8	12	9	14	34	29
Yes		1	6	6	5	11	7	14	9	12	17
		$\chi^2 = 18.16^*$									
<i>Hired Harvest Labor</i>											
No		12	8	5	7	5	9	7	11	27	22
Yes		4	8	9	7	14	10	16	12	19	24
		$\chi^2 = 14.05^*$									
<i>Hired Marketing Labor</i>											
No		16	13	10	9	15	16	17	19	38	38
Yes		0	3	2	2	4	3	6	4	8	8
		$\chi^2 = 4.79$									

^a * = significant at .01 level.

Respondents were asked to report their sources of 1997 farm income. The information is summarized in Table 6. The first column lists the sources, and the second gives the number of respondents who indicated that the respective item was a source of farm income. Most had diversified operations. Of the 116 respondents who answered the question, 19 recorded fruits as the only source, and 12 did so for vegetables. The average percent of farm income attributable to the respective source is given in the last column. Fruits and vegetables were first and second with respect to the source. Taken together, 61 percent of their farm income was obtained through the combined sales of fruits and vegetables. Other crops accounted for 20 percent of the total. Some enterprises also had income from livestock and other operations.

Modeling the Market Outlet Decision

One way to focus on a grower's choice of market outlets is to consider whether the operator sells through a commercial channel or relies on direct outlets exclusively. This binary choice is consistent with the decision between selling produce on the basis of standards imposed by the commercial distribution system or via direct outlets where consumers typically select items that may or may not have been graded according to USDA standards.

A grower was assumed to make a choice about marketing based upon some characteristics of the farm operation. The choice outcome was considered to be a function of the variables described below. Double- or triple-cropping was expected to have a positive effect on the probability of wholesaling

because the grower would be able to spread production over a longer period of time and, therefore, be more suitable for the commercial distribution system. The importance that a grower placed on a factor limiting the operation was hypothesized to have a negative effect on the use of wholesale outlets because these factors could keep output relatively small and, therefore, more difficult for entrance into the commercial system.

Use of hired labor for production was hypothesized to have a positive effect because larger operations would be more apt to need additional labor to grow the produce, and the subsequent larger production would be sold via wholesalers and brokers. Similarly, hired harvest labor was expected to have a positive effect because these workers would be more likely to work in grading and packaging activities.

As the percent of farm income from produce operations increased, the probability of growers using wholesale outlets was hypothesized to increase, and USDA grading was expected to have a positive effect on the likelihood of wholesaling.

Since wholesalers prefer to handle larger quantities, two measures of the size of an operation were included. One was the total number of produce acres for 1997. This measure was assumed to have a positive effect on the choice of the wholesale market channel. The other was the number of produce acres divided by the number of produce commodities grown. This was to adjust for producers who grew a variety of commodities. That is, for a given size farm, the more commodities that were grown, the smaller the harvest of a specific item and, therefore, the less likely the operation would sell through the commercial system.

Table 6. Sources of 1997 Farm Income.

Source	Number of Respondents With the Source	Percent
Crops		
Fruits	74	32.8
Vegetables	71	27.8
All Other Crops	48	19.5
Livestock	40	12.5
Other ^b (n=18)	18	7.4
Total	116	100.0

^aUnweighted simple average.

^bNoted activities: custom work, eggs, honey, and greenhouse products.

An initial regression was calculated using all the independent variables described above. Variables whose coefficients were small relative to their standard errors were deleted, and a new equation was estimated. Results for the new equation were compared to those of the initial regression with respect to the overall fit and the estimated coefficients and respective standard errors. If there was little change in the overall fit (McFadden's R^2 , AIC, Chi square) and in the coefficients relative to their counterparts in the initial equation, the variable was left out of the equation.⁴

Information about the variables in the final regression is presented in Table 7. Respondents who did not grow produce or who did not answer some of the questions associated with the estimation reduced the sample size to 99 observations. Of the regression subgroup, one-third indicated that they had used a commercial outlet. The average produce acreage was nearly the same as for the entire sample (22.1 versus 23.5, see Grower Sample section), and the average acreage per crop was 9.5 acres versus 11.6 acres for the entire sample. More than one-half used hired labor, and less than one-fifth used USDA grading standards. Nearly 56 percent of farm income was derived from produce.

Regression results are displayed in Table 8 for three of the estimated equations. Significant overall fits were found, as inferred from the computed chi squares. With respect to event classification, the estimated equations correctly classified 75, 77, and 75 percent of the responses. Notice that none of the limiting factor measures is present. Each was insignificant in the initial regression, and the sequential deletion did not generate notable changes in overall fit measures. The inference drawn is that no limiting factor by itself had a significant effect on the probability of using a wholesaler.

The equation with the best overall fit had ACRES and AVGACRE as independent variables. Separately, each had an insignificant coefficient when included with the other independent variables. Furthermore, the Chi square and McFadden's R^2 improved when both were in the equation. The simple correlation between the two variables was .71. An implication is that both the overall produce acreage and the number of acres per produce commodity per farm affected the probability of using a wholesaler. The remaining discussion focuses on equation (1) results.

Table 7. Variable Definitions and Sample Statistics.^a

Variable	Definition	Mean	Standard Deviation
WHSL	Whether the respondent used an outlet of the commercial distribution system (0=no; 1=yes)	.33	.47
ACRES	Produce acreage reported by the respondent.	22.13	46.29
AVGACRE	ACRES divided by the number of produce commodities	9.51	20.19
HIRED	Whether the respondent used hired harvest labor (0=no; 1=yes)	.56	.50
USDA	Whether the respondent used USDA grading (0=no; 1=yes)	.18	.39
INC	Produce income as a percent of farm income	55.64	39.67

^aThere were 99 complete sets of responses that were used.

⁴This may introduce a pretest bias, but the statistical checks for deleting variables were an effort to minimize the bias.

Table 8. Logistic Regression Results.^a

Variable	Equation		
	(1)	(2)	(3)
Constant	-2.807** (.670)	-2.892** (.659)	-2.796** (.603)
ACRES	.040* (.024) [1.040]		.006 (.007) [1.006]
AVGACRE	-.074* (.038) [.929]	-.022 (.014)	
HIREL	1.689** (.574) [5.416]	1.911** (.569) [6.756]	1.574** (.542) [4.826]
USDA	1.516* (.807) [4.553]	2.184** (.750) [8.881]	.985 (.692) [2.678]
INC	.012* (.007) [1.012]	.013** (.007) [1.013]	.012* (.006) [1.012]
AIC	104.160	128.030	133.473
Log L	-46.08	-63.02	-65.74
Chi square	33.87**	27.97**	26.45**
McFadden's R ²	.27	.22	.20

Classification Tables

Predicted Percent	Equation:	Actual Percent					
		(1)		(2)		(3)	
		0	1	0	1	0	1
0		59.6	7.1	58.6	8.1	62.3	6.6
1		18.2	15.2	15.2	18.2	18.9	12.3

^a**=significant at the .10 level, **=significant at the .01 level. Standard errors are in parentheses, and odds ratios are in brackets.

The direction of causality for each of the independent variables is reflected in the sign of the coefficient. AVGACRE is the only variable that has a negative impact on the probability of using a wholesale outlet. The odds ratios are the factors by which the probability, that a wholesale outlet was used, increased or decreased due to a one-unit change in the respective independent variable. According to these measures, hired labor had the greatest effect on the probability of wholesaling, followed by USDA grading. Just in-

creasing average acreage decreased the likelihood of using this type of outlet.

The coefficients (and marginal effects described below) of ACRES and AVGACRE are interpreted as separate effects. Changes in ACRES without changes in AVGACRES happen when the enterprise adds another produce commodity and expands its acreage by the average acreage per produce commodity. Changes in AVGACRES with changes in ACRES occur when there is no change in

the produce acreage but a change in the number of produce commodities grown.

As the overall size of the typical operation increases by one acre from 22.1, the estimated probability of using a wholesaler increased by a factor of 1.04. This is consistent with a larger output because commercial outlets are better able to accommodate the increased production. However, as the average acreage per produce commodity increases by one acre from 9.5, the likelihood of using a wholesale outlet decreased by a factor of .93. This incremental acreage, given the average of 9.5 acres, is not enough to prompt the typical grower to sell the additional production through a direct outlet. Thus, increases in overall produce acreage were more likely to have resulted in sales through a wholesaler, whereas increases in the acreage per produce commodity grown were apt to be sold via a direct outlet. Odds ratios are also presented for HIRED and USDA. But they are dummy variables, so these ratios should be interpreted in terms of whether harvest labor was used or USDA grading standards were followed. In either instance, the likelihood of using a wholesale outlet increased by factors considerably greater than 1.

Marginal effects are displayed in Table 9. These depend on the levels of the independent variables. In the top part of the table, marginal effects for the continuous variables are given, based on several situations. The first uses the average values of the variables, and the others are different combinations of the dummy variables. Increased overall produce acreage per farm has the largest positive effect on the use of a wholesale outlet. Marginal effects are smaller (that is, closer to zero) for the presence of both dummy variable situations than they are for the other situations.

The bottom portion of the table presents the estimated marginal effects for the dummy variable combinations. An estimate of the change in probability of using a wholesale outlet—given the average values of the continuous independent variables and the use of both hired harvest labor and USDA grading—is estimated to be 0.682. Intermediate situations have smaller positive effects. The presence of hired harvest labor, but no USDA grading, is estimated to have a larger marginal effect (0.425) on the probability than the situation of USDA grading, but HIRED=0.

Table 9. Estimated Marginal Effects.

Variable	Average	Based on			
		HIRED=0 USDA=0	HIRED=0 USDA=1	HIRED=1 USDA=0	HIRED=1 USDA=1
ACRES	.010	.006	.010	.009	.004
AVGACRE	-.019	-.012	-.018	-.017	-.008
INC	.003	.002	.003	.003	.001

Dummy Variable Alternatives	Change in Probability
HIRED=1, USDA=1, versus HIRED=0, USDA=0	.682
HIRED=0, USDA=1, versus HIRED=0, USDA=0	.335
HIRED=1, USDA=0, versus HIRED=0, USDA=0	.425

Summary

Results of the survey provide useful information about typical produce operations located near six farmer’s markets in Tennessee. These farms, on average, had small acreages per commodity to grow produce. A variety of produce commodities was grown on these operations. Both rented and owned land were used for fruits and vegetables. Although a variety of market outlets was involved in selling

the output, farmer’s markets and direct sales seemed to be more prevalent than wholesale (commercial) channels. No single limiting factor was found to be pervasive, but availability of hired labor did appear to be the most problematic. Less than 20 percent of the producers used USDA grading standards.

One implication of the results pertains to market development. Efforts of extension agents and other stakeholders in generating additional market opportunities for produce production depend, in

part, on having sufficient product to attract buyers. Land does not appear to be a significant limiting factor. Availability of harvest labor and USDA grading standards are estimated to have the greatest impact on a grower's decision to enter the commercial distribution system. Thus, commercial development activity for small growers should address these two factors.

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