CONSUMER PREFERENCES FOR LOCAL VERSUS OUT-OF-STATE GROWN SELECTED FRESH PRODUCE: THE CASE OF KNOXVILLE, TENNESSEE

David B. Eastwood, John R. Brooker, and Robert H. Orr

Abstract

Consumer behavior with respect to purchase regularity, satisfaction, origin, and willingness to pay for selected local versus non-Tennessee grown fresh produce is examined. Except for origin, consumer behavior with respect to the above is affected by income, household size and age distribution, race, age of respondent, college education, and occupation. The pattern of significant variables changed by commodity. Tomatoes, followed by peaches, had the greatest local market potential. Local promotion of other products may be more difficult. Results suggested consumers have no strong preferences for or against locally grown fresh produce. The prices of locally grown commodities in Knoxville should be less than or equal to those of comparable quality non-Tennessee commodities.

Key words: consumer preference, demand, fresh produce, probit regression.

Significant changes in food consumption patterns have occurred during recent decades. Some foods have experienced increased consumption, while that of others has declined. For example, per capita fresh vegetable consumption increased from 98.2 pounds in 1970 to 112 pounds in 1984; whereas, canned vegetable consumption decreased from 105.6 pounds to 74.9 pounds for the same period (USDA).

Increases in fresh produce consumption have generated a great deal of interest in fruits and vegetables as potential alternative enterprises for financially hard-pressed farmers (Capps). The present study contributes to the existing knowledge of consumer preferences for fresh produce. Consumer preferences for selected local versus out-of-state grown fresh produce (apples, broccoli, cabbages, peaches and tomatoes) were analyzed relative to purchase frequency, satisfaction, concern with origin, and willingness to pay. Data were gathered for Knox County, Tennessee, and probit regressions were estimated.

Results indicate how a survey of a local market can help create a profile of shoppers and their preferences for selected fresh produce. Growers can use this information when making decisions about the types of commodities to plant and about the feasibility of direct market outlets. This is especially relevant for smaller growers who do not use brokers or wholesalers. Retail food outlet operators can make more informed decisions about which types of fresh produce to carry, whether to distinguish between local and out-of-state items, and whom to reach with the provision of relevant advertising. State agencies and other organizations responsible for promoting fresh produce can use the results in ways similar to those used by retail outlet managers. Consumers also can gain through the increased availability of products more in line with their preferences.

MODEL DEVELOPMENT

The research reported here is exploratory in that it centers on consumer perceptions of fresh produce. This study is distinct from Buitenhuys et al.; Jack and Blackburn; Trotter and Brewer; and Vance Research Services (1985a, b and c) in that probit regressions are used for five dimensions of consumer behavior. First is the overall regularity with

David B. Eastwood is a Professor, John R. Brooker is a Professor, and Robert H. Orr is an Associate Professor, Department of Agricultural Economics and Rural Sociology, The University of Tennessee.

The authors acknowledge the expert assistance provided by Morgan D. Gray, Computer Analyst, Department of Agricultural Economics and Rural Sociology, The University of Tennessee.

Copyright 1987, Southern Agricultural Economics Association.

which consumers purchase fresh produce. It is included as a consequence of the shorter shelf life of many commodities, especially if locally grown items are left in the field to ripen longer. Second is purchase regularity for selected items, since this can vary by product. The third area is the level of consumer satisfaction with fresh produce overall and with selected commodities. Fourth, consumer interest in where the product is grown is analyzed to determine the extent to which promotional campaigns that emphasize locally grown commodities may be effective. Fifth, consumer willingness to pay for locally grown versus out-of-state commodities is measured.

Buse has analyzed cross-section household expenditure data for specific meat products. His work shows that consumption of these goods varies by income category.[1] Analyses by Vance Research Services (1985a, b, and c) of fresh produce consumption indicate that varied impacts of income categories on selected produce also occur. These studies show that income categories have effects on marketplace perceptions, but not all categories need to have significantly different effects. Therefore, only some income categories are expected to have effects on perceptions, as opposed to all categories. Furthermore, the effects could be positive or negative for each of the measures of marketplace perceptions.

Consumption of fresh produce is affected by the age distribution of household members. Smallwood and Blaylock found that age effects were different by product category, but the general pattern for fresh produce groups was that as the age distribution increased, consumption increased. Consequently, the hypothesis here is that as the proportion of household members in older age groups increases, regularity of purchase, level of satisfaction, origin consciousness, and willingness to pay for local produce comparable in quality to out-of-state produce are expected to increase.

Food consumption has been found to be affected by race (Adrian and Daniel; Raunikar et al.; Smallwood and Blaylock).[2] Extending this to the present study leads to the expectations that black households purchase fresh produce less frequently, receive lower satisfaction, are less concerned about origin, and are less willing to pay more for comparable local produce than other races.

The age of the head of household and/or the age of the food shopper have been related to food expenditures in general and fresh produce commodities in particular (Buse and Vance Research Services, 1985a, b and c). The age patterns that are observed vary by product. Consequently, the hypothesis is that the age of the respondent has a differential effect on marketplace perceptions, and the effects could be positive or negative depending on the specific product.[3]

Educational attainment of the person who is responsible for food shopping affects marketplace behavior (Adrian and Daniel; Scearce and Jensen). The expectation is that the higher the level of education, the more likely it is that the person is aware of the nutritional content of fresh produce and its relationship to health. Measures of consumer preferences are expected to increase with the level of education.

Another hypothesized determinant is the occupation of the person responsible for food shopping (Capps). Homemakers and retired persons tend to have lower opportunity costs of time and can spend more time in food-related activities. These persons are hypothesized to shop more regularly for fresh produce, have higher levels of satisfaction with the produce they acquire, be more concerned with origin, and be more willing to pay more for local produce of quality comparable to out-of-state produce. Just the opposite would hold if this person is employed in a professional occupation outside the home.

Finally, household size is expected to be positively related to the regularity of purchase (Sexauer and Mann). However, there is no reason to expect that larger households

[1]More importantly, these expenditures do not vary systematically by income for a product, and they do not vary in the same way across products. For example, using the 1972-73 Consumer Expenditure Survey he finds that the percent of at home ground beef expenditures to income levels, in parentheses, were 4.0 percent (< $4,000), 4.2 percent ($4,000-$6,999), 4.2 percent ($7,000-$9,999), 4.4 percent ($10,000-$14,999), 4.7 percent ($15,000-$24,000), and 3.7 percent (≥ $25,000). The corresponding percents for seafood were 2.8, 2.8, 2.7, 2.6, 2.7, and 3.6.

[2]For example, Smallwood and Blaylock estimate that for the 1977-78 Nationwide Food Consumption Survey, *ceteris paribus*, black households would eat on average 8.3 percent less tomatoes than white households; whereas, black households would eat 6.5 percent more fresh vegetables overall and approximately the same amount of fresh fruit.

[3]By way of clarification, the proportion of members in an age group is a different household characteristic than the age of the respondent. The former pertains to the distribution of household members, and the latter refers to the age of a specific person.

have higher or lower satisfaction levels for fresh produce, are more or less concerned with origin, or are more or less willing to pay more for locally grown produce.

Since all dependent variables are qualitative, logit or probit regression could be used. The probit formulation was selected because it assumes that an observable and measured dependent variable is an ordinal scale of an underlying unobservable and unmeasured variable. Underlying variables are assumed to be functions of observed independent variables. McKelvey and Zavoina developed the model.[4] Coefficients obtained from estimating the probit equation pertain to probabilities of observing successively higher categories of the dependent variable.

DATA

Urban consumers in a medium-sized metropolitan area constitute the source of data used to estimate the relationships. Such consumers are considered to be the major market for fresh produce since most of the population live in urban areas and are less likely than their rural counterparts to have access to home-grown produce. Knox County, Tennessee, which had an estimated 1984 population of 329,202 and 175,000 households (Center for Business and Economic Research) comprised the target population.

A questionnaire was developed, pilot tested, and revised.[5] Major sections of the survey instrument focused on consumer satisfaction with fresh produce, questions about selected

TABLE 1. PROBIT MODELS: DEPENDENT VARIABLE DEFINITIONS

Dependent Variable	Definition	Number of Categories		Category Sample Sizes[a] 1	2	3	4
Overall purchase frequency	How frequently the household buys fresh produce (never + occasionally = 1, regularly = 2).	2		43	188		
Selected produce purchase frequency	Number of times during the harvest season the household purchases the commodity (no purchase = 1, 1-6 times = 2, 7-12 times = 3, and over 12 times = 4).	4 per commodity	Apples:	18	70	77	66
			Broccoli:	69	76	61	25
			Cabbages:	54	103	48	26
			Peaches:	51	82	54	44
			Tomatoes:	36	49	50	96
Satisfaction with selected produce	How satisfied the respondent was with purchases of selected produce (unsatisfied = 1, neutral = 2, and satisfied = 3).	3 per commodity	Apples:	24	40	166	
			Broccoli:	16	71	142	
			Cabbages:	9	56	165	
			Peaches:	43	69	117	
			Tomatoes:	70	33	126	
Care where grown	Whether the respondent cared if the commodity was locally or out-of-state grown (no = 1, yes = 2).	2 per commodity	Apples:	163	54		
			Broccoli:	203	21		
			Cabbages:	193	35		
			Peaches:	139	89		
			Tomatoes:	110	119		
Willingness to pay	Given the respondent's impression of a commodity, was that person willing to pay a slightly higher price, the same price, or a slightly lower price (asked by the interviewer in the order presented—lower = 1, same = 2, and higher = 3).	3 per commodity	Apples:	40	108	60	
			Broccoli:	19	100	42	
			Cabbages:	23	108	48	
			Peaches:	27	95	46	
			Tomatoes:	18	77	111	

[a]The sample size totals vary due to different response rates for various questions.

[4]Let Z_i be the unmeasured dependent variable, Y_i be the measured categories (of which there are M), and Z_i^* be values of Z_i which comprise bounds for the Y_i. X is the vector of independent variables, β is the vector of coefficients, and ϵ is the error having a standard normal distribution. The log likelihood function for a sample of size T is:

$$\log(\beta, Z^* | Y,X) = \sum_{t=1}^{T} \sum_{i=1}^{M} Y_{ti} \log[\varphi(Z_i^* - X_t'\beta) - \varphi(Z_{i-1}^* - X_t'\beta)], \text{ where}$$

$\varphi(a)$ is the standard normal density function

$$\varphi(a) = \int_{-\infty}^{a} \frac{1}{\sqrt{2\pi}} \exp \frac{-\epsilon^2}{2} \, de.$$

[5]Copies of the questionnaire can be obtained from the authors.

fresh produce commodities of interest in Tennessee, and basic socioeconomic information. Apples, broccoli, cabbages, peaches, and tomatoes were the commodities; and their selection was based on personal contacts with local wholesalers, retailers, USDA inspectors, and extension personnel.

Early summer 1985 was the sample interview period. The timing of the survey was set to coincide with a period when consumers should have the most positive attitudes toward locally grown fresh produce due to heightened awareness through the media and the availability of some produce from personal or friends' gardens. Altogether, 231 completed questionnaires were gathered, and the response rate was 83 percent. Descriptive analyses of the socioeconomic data gathered indicate that a representative sample of the Knox County area was obtained (Eastwood et al.). Thus, the results presented below can be interpreted as a case study for a specific medium-sized metropolitan area.

Table 1 provides information about the specific measures of consumer preferences used. For example, the overall purchase regularity model has a binomial probit form, and there are 43 households in category one and 188 in category two.[6]

The remaining columns of Table 1 present the frequencies for the various categories of the models. Most consumers (188) purchased fresh produce regularly. With respect to the number of times selected commodities were bought, the distributions indicate that apples and tomatoes had the fewest "no purchase" responses, and cabbage purchases were concentrated in category two. Inspection of the satisfaction with selected produce frequencies revealed that the majority of consumers were satisfied with each commodity, and a chi square analysis indicated that satisfaction levels with peaches and tomatoes were significantly lower than with apples, broccoli, and cabbages (Eastwood et al.). Most respondents did not care where the product was grown, except for tomatoes. The most frequent choice for the willingness-to-pay question was that consumers were willing to pay the same price for locally grown produce, except for local tomatoes where the majority of consumers were willing to pay slightly more.

Table 2 presents the independent variables used in the regression analyses and indicates how each variable was measured. The omitted categories are noted. Each variable's expected relationships to the dependent variables are indicated. For ease of presentation, a single heading for purchase frequency applies to overall and selected commodity purchase frequencies in the table.

RESULTS

Discussion of the estimates of the probit models are presented in the order in which they appear in Table 1. Asymptotic t-ratios were used to determine the significance of each coefficient. Four measures of overall fit were used to assess the equations. Two were the log likelihood value and the chi square as conventionally calculated. Third was McFadden's R^2. The fourth was the percent of the sample correctly predicted. It was calculated as follows. Predicted probabilities for belonging to categories in a probit model were computed. Households were assigned to the category for which they had the highest probability of membership. Actual household categories were compared to the predicted categories, and the percent correctly predicted was calculated.

The hypotheses which were tested here were somewhat different from those in more conventional situations. Previous studies, as noted above, had found that income, age, and occupational categories were associated with significantly different consumption of specific food items, but not every category was significantly different. With respect to the present measures of consumer behavior, these considerations led to the expectation that for each independent variable only a subset of its categories would have the hypothesized effects, and these categories would vary by preference dimension and produce item. Furthermore, there is no *a priori* basis for

[6]Willingness to pay was measured through a series of responses. The question began with "given your impression of locally grown (product), would you purchase them rather than out-of-state (product) if they were for sale at . . ." Thus, the willingness-to-pay incorporates the consumer's perception of locally versus out-of-state grown produce. The question was completed with "at a slightly higher price?" If the respondent said "yes," the interviewer went to the next part of the questionnaire. If the consumer said "no," the interviewer asked "at the same price?" If the respondent said "yes," the interviewer went on to the next part of the questionnaire. If the respondent said "no," the interviewer said "at a slightly lower price?" This sequence of questioning permitted the measurement of an ordinal ranking of the willingness-to-pay for local produce vis-à-vis out-of-state.

determining which categories of a variable to include in the estimated equations.[7]

Consequently, an initial probit equation for each of the models depicted in Table 1 was calculated using all the independent variables contained in Table 2.[8] Consistent with the literature, many of the coefficients had insignificant asymptotic t-values, and the computed chi squares were less than the corresponding critical values. One possibility was that the insignificance of some coefficients was due to collinearity among the independent variables. This was examined by estimating probit models in which the income categories were grouped into low (≤ $20,000), middle ($20,000–$39,999), and upper (≥ $40,000), and the age of the respondent was grouped into younger (15–34), middle (35–54), and older (≥ 55). Overall fits were inferior to those of the initial equations, and the pattern of significant coefficients continued to be consistent with the hypothesis that only some categories of an independent variable affect behavior and that these categories vary from variable to variable.[9]

Results obtained from these initial passes were used to delete variables from subsequent regressions using the criteria outlined below. But further estimation necessitated implementation of a careful procedure in an effort to reduce the presence of a pretest bias. Variables whose asymptotic t-values were small in absolute value were omitted and a new probit equation estimated. Coefficients in

TABLE 2. INDEPENDENT VARIABLES HYPOTHESIZED TO INFLUENCE CONSUMER BEHAVIOR

Variable	Measurement	Frequency[a]	Expected Relationship: Selected Produce Purchase Frequency	Satisfaction with Selected Produce	Care Where Grown	Willingness to Pay
	Total household income					
INC1	= 1 if $0–$9,999; = 0 otherwise (omitted category)	53				
INC2	= 1 if $10,000–$19,999; = 0 otherwise	47	+	+	+	+
INC3	= 1 if $20,000–$29,999; = 0 otherwise	43	+	+	+	+
INC4	= 1 if $30,000–$39,999; = 0 otherwise	22	+	+	+	+
INC5	= 1 if $40,000–$49,999; = 0 otherwise	19	+	+	+	+
INC6	= 1 if $50,000 or more; = 0 otherwise	27	+	+	+	+
	Proportion of the household in specific age groups					
PP1	= Proportion 10 and under (omitted category)	.08[b]				
PP2	= Proportion 11 through 18	.08[b]	+	+	+	+
PP3	= Proportion 19 and older	.84[b]	+	+	+	+
BLACK	= 1 if the respondent is a member of the black race; = 0 otherwise	29	–	–	–	–
	Age category of the respondent					
AGE1	= 1 if 15–24; = 0 otherwise (omitted category)	11				
AGE2	= 1 if 25–34; = 0 otherwise	51	+	+	+	+
AGE3	= 1 if 35–44; = 0 otherwise	46	+	+	+	+
AGE4	= 1 if 45–54; = 0 otherwise	36	+	+	+	+
AGE5	= 1 if 55–64; = 0 otherwise	34	+	+	+	+
AGE6	= 1 if 65 or older; = 0 otherwise	53	+	+	+	+
COLL	= 1 if the respondent attended college; = 0 otherwise	115	+	+	+	+
HSW	= 1 if the respondent is a housewife; = 0 otherwise	56	+	+	+	+
RET	= 1 if the respondent is retired; = 0 otherwise	42	+	+	+	+
PROF	= 1 if the respondent is employed in a professional occupation; = 0 otherwise	56	–	–	–	–
SIZE	The number of persons residing in the household	2.5[c]	?	?	?	?

[a]Frequency of 1s for the respective independent variable for the entire sample.

[b]Average value of the proportion rather than frequency.

[c]Average household size.

[7]For example, income affects preferences for fresh produce, but the expectation is that not every income category has a significant impact.

[8]These estimated equations are available from the authors.

[9]These estimated equations are available from the authors.

the new equation were compared to their initial counterparts to determine whether there were large changes in estimated values. If this occurred, multicollinearity was suspected, and the corresponding variable was reintroduced.

A final statistical test was employed for each model. Once a model was obtained which included all the significant variables, adjusted for multicollinearity as noted above, a nested hypothesis test was performed. The null hypothesis was that the omitted variables had coefficients of zero, and likelihood ratio tests were conducted. In every instance the results were consistent with using the reduced models which are described below. No elasticities are presented given the predominance of categorical independent variables.

Purchase Regularity

The first column of Table 3 presents the estimated probit equation for overall purchase regularity. A significant chi square, the R^2, and the percent correctly predicted suggested the estimated equation represented a significant improvement over the intercept alone model. All of the included income categories were significant, but no other hypothesized determinant was significant. The interpretation was that relative to the lowest income group, a higher income household had a

TABLE 3. REGULARITY OF PURCHASE PROBIT REGRESSIONS

Independent Variables	Commodity					
	Overall	Apples	Broccoli	Cabbages	Peaches	Tomatoes
Constant	.509*[a] (2.75)[b]	.919* (4.93)	−.734 (1.40)	.777 (1.54)	−.241 (.90)	.938* (5.46)
INC2	.533* (1.96)				−.451* (2.36)	
INC3	.475* (1.72)				−.376* (1.89)	−.612* (3.19)
INC4	.801* (1.96)			.436* (1.73)		−.569* (2.30)
INC5	.744* (1.79)				.469* (1.66)	
INC6	.938* (2.40)		.383* (1.65)			
PP2						.545 (1.11)
PP3			.894* (2.01)	−.934* (2.05)		
BLACK		−.297 (1.32)				
AGE3			.620* (3.09)			
AGE4				.724* (3.27)	.509* (2.30)	
AGE5				.437* (1.86)	.610* (2.65)	
AGE6				.693* (3.06)	.923* (4.12)	
COLL		.381* (2.46)	.191 (1.25)		.480* (3.11)	
PROF				−.413* (2.04)		
SIZE		.161* (2.88)	.108 (1.48)	.194* (2.58)	.270* (4.10)	.096* (1.57)
Log likelihood	−103.33	−286.32	−292.37	−273.61	−292.66	−292.52
χ^2	11.59*	16.60*	19.70*	33.00*	36.51*	16.21*
McFadden R^2	.053	.028	.033	.057	.059	.027
Percent predicted correctly	82	39	38	49	39	41

[a] *Significant at the .05 level.

[b] Asymptotic t-values are shown in parentheses.

greater probability of purchasing fresh produce regularly.

A mixed pattern of overall fit and significant variables is shown in the remaining columns of Table 3. Although each equation had a significant chi square, suggesting significant overall relationships, the values were much higher for cabbages and peaches. The percentages correctly predicted display a similar pattern within the context of a four-way dependent variable categorization and differing regularities among the categories. This suggests that the frequency of cabbage and peach purchases had larger systematic variations resulting from the socioeconomic variables included in the probit models.

With respect to apple purchases, higher income groups did not purchase them any more or less regularly than the lowest income group. The age distribution of the household, race, and age of respondent did not have significant effects. Respondents who attended college had a higher probability of regular purchases, as did larger households.

The probability of regular fresh broccoli purchases was significantly greater for the highest income group and for households with higher proportions of adults. If the food shopper was between 35 and 44 years old, the household was more prone to purchase broccoli regularly. None of the other hypothesized independent variables had a significant coefficient.

Cabbage purchases were affected by several variables. Households with incomes in the $30,000 range were more likely to purchase cabbages than households in the other income categories. As the proportion of adult household members increased, the probability of regular purchases declined. Respondents aged 45 or older were more likely to purchase cabbages regularly. These results suggested that as the income and age distributions of households rise (leading to more shoppers in the older categories) cabbages would be purchased more frequently. If the respondent had professional employment outside the home, the household was less likely to purchase cabbages regularly. This is partly due to cabbages not being a convenience food, since additional preparation is usually required. Increases in household size increased the probability of regular cabbage purchases.

Peaches were less likely to be purchased regularly by households with incomes between $10,000 and $30,000 than by households with the lowest income; whereas, households with incomes in the $40,000 range were more likely to purchase them regularly. Age distribution and race did not have an effect on the probability of purchase. Respondents 45 or older were more likely to purchase peaches regularly than those in the 15–24 age group. Larger households and households in which the food shopper attended college had higher probabilities of regular peach purchases.

The regularity of tomato purchases had the fewest number of significant independent variables. Households with incomes between $20,000 and $40,000 had a lower probability of purchasing fresh tomatoes regularly than those in the lowest income group. Larger households were more likely to purchase tomatoes regularly. None of the remaining independent variables included in the regression analysis had a significant effect. An inference is that tomatoes are used in consumer diets regardless of socioeconomic group.

Satisfaction with Purchases

Table 4 presents the trinomial probit regressions regarding satisfaction with purchases. Each of the computed chi squares was significant, leading to the inference of significant overall relationships. The R^2 values, although low, were reasonable for cross-section household level data. The percentages correctly predicted were for three-way classifications having unequal frequencies.

Three variables were significant determinants of apple satisfaction. Households in the highest income group had a significantly lower probability of being satisfied than households with lower incomes. Respondents in the 45–54 age group had a higher probability of being satisfied, and apple purchasers were more likely to be satisfied if they had attended college.

Households with incomes in the $20,000 range or with incomes at least equal to $50,000 had higher probabilities of being satisfied with fresh broccoli than the lowest income group. As the proportion of teenagers in a household increased, the likelihood of being satisfied with broccoli declined. If the respondent was between 25 and 34 years old, the probability of being satisfied was higher. Retired respondents were more likely to be satisfied with fresh broccoli.

Satisfaction with cabbage was affected by several socioeconomic variables. Households with incomes in the $30,000 range were more apt to be satisfied than the lowest income

TABLE 4. SATISFACTION PROBIT REGRESSIONS

Independent Variables	Commodity				
	Apples	Broccoli	Cabbages	Peaches	Tomatoes
Constant	1.010*[a] (7.78)[b]	1.219* (7.99)	2.496* (4.34)	1.122* (7.93)	1.085* (6.54)
INC2				−.355* (1.69)	
INC3		.417* (1.86)		−.324 (1.51)	
INC4			.656* (1.66)		
INC5				−.441 (1.49)	
INC6	−.511* (1.82)	.487* (1.74)	−.641* (2.41)	−.637* (2.51)	−.478* (1.81)
PP2		−.895* (1.74)	−1.782* (2.30)		
PP3			−1.269* (2.00)		
BLACK					.840* (2.78)
AGE2		.547* (2.32)			−.483* (2.19)
AGE3		.333 (1.35)	.920* (3.32)		−.534* (2.38)
AGE4	.628* (2.31)		1.411* (4.23)	.159 (.716)	
AGE5			1.179* (3.72)		−.448* (1.83)
AGE6			.838* (3.15)		
COLL	.318* (1.70)				.535* (2.92)
RET		.662* (2.72)			
Log likelihood	−173.31	−183.74	−142.41	−227.34	−201.71
χ^2	8.76*	17.77*	34.09*	8.09*	38.53*
McFadden R^2	.025	.046	.107	.017	.087
Percent predicted correctly	72	62	74	51	62

[a]*Significant at the .05 level.

[b]Asymptotic t-values are shown in parentheses.

households; whereas, households with incomes of $50,000 or more were less likely to be satisfied. Increased proportions of teenagers and adults lowered the probability of being satisfied. However, respondents 35 and older were more prone to be satisfied than younger respondents.

Only two income categories affected peach satisfaction. Households with incomes between $10,000 and $20,000 had a lower probability of satisfaction, as did households in the highest category. No other variable was significant. A poor harvest during the summer of 1985 may have led consumers to be less satisfied with the available peaches relative to previous years.

The highest income group had a lower probability of being satisfied with tomato purchases vis-à-vis the lowest income group. Black households also had a higher satisfaction probability. Respondents between the ages of 25 and 44 and between 55 and 64 were less likely to be satisfied. The college-educated respondents had a higher probability of satisfaction.

Care Where Grown

Estimates of apple, broccoli, and cabbage care where grown probit regressions are not presented because the computer algorithm failed to reach convergence. This lack of convergence is interpreted to mean that respondents, regardless of household socioeconomic

characteristics, were not concerned about where apples, cabbages, and broccoli were grown. The convergence problem did not arise with the peach and tomato equations, and Table 5 presents the estimates for these equations.

The statistical procedures failed to generate results for a peach equation which had a significant chi square. Consequently, the discussion here is with this additional caveat. Households in the $30,000 range were less likely to care whether peaches were locally grown than the lowest income households. Blacks, contrary to expectations, were more likely to care about the origin of peaches. Respondents in age categories three, five, and six were more likely to care about the origin of peaches.

Turning to the tomato equation, only the age distribution and the oldest respondent age categories had significant coefficients. As the distribution of household members in the older age groups (two and three) increased, the probability of not caring about the origin of tomatoes increased. If the respondent was a member of the oldest age category, this person had a higher probability of caring about tomato origin.

Willingness to Pay

Willingness to pay for locally grown produce is the last consumer behavior relationship presented. The resulting trinomial probit equations for each selected commodity are displayed in Table 6. The overall measures of goodness-of-fit led to inferences of significant relationships. These measures were relatively high for cross-section household level data. Apples, broccoli, and cabbages had the highest chi square and R^2 values.

Several socioeconomic variables were significant in the apple equation. Households with incomes in the $10,000–$20,000 range were more likely to pay the same or higher prices than the lowest income category. As the proportion of members under the age of 10 increased, the household was less likely to be willing to pay more for local apples. Blacks were more likely to be willing to pay less. Respondents between the ages of 35 and 54 were more inclined to be willing to pay more for local apples than respondents between 15 and 24.

Only two variables were significant in the willingness to pay for local broccoli equations. Blacks had a significantly lower probability of being willing to pay more for locally grown selected produce. Households in which the respondent was retired also had a significantly lower probability.

Households with incomes in the $20,000–$30,000 range were less likely to be willing to pay more for cabbages than other income category households. Black households were more likely to be willing to pay less. Also, if the respondent was between 25 and 34 years old, or if the respondent attended college, slightly lower willingness-to-pay probabilities were predicted.

Willingness to pay for local peaches did not appear to be affected by the various income categories. Household age distribution and age of the respondent were not significant. Black households had a significantly lower probability, as did households in which the respondent attended college. Employment status of the respondent was not a significant determinant either.

Three variables were significant in the willingness to pay for local tomatoes probit regressions. Black households were more likely to be willing-to-pay less for local tomatoes than other race households. Housewives and those employed in professional occupations were more likely to be willing to pay more.

TABLE 5. CARE-WHERE-GROWN PROBIT REGRESSIONS

Independent Variables	Commodity	
	Peaches	Tomatoes
Constant	−.463*[a] (3.17)[b]	1.288* (2.60)
INC4	−.534* (1.64)	
PP2	−.739 (1.28)	−1.416* (2.07)
PP3		−1.518* (2.76)
BLACK	.486* (1.80)	
AGE3	.432* (1.75)	
AGE5	.418 (1.61)	
AGE6	.373* (1.65)	.661* (2.98)
Log likelihood	−145.68	−150.30
χ^2	11.67	13.73*
McFadden R^2	.039	.044
Percent correctly predicted	63	63

[a]*Significant at the .05 level.

[b]Asymptotic t-values are show in parentheses.

IMPLICATIONS

Consumer concern with the origin of fresh

produce is not high, with the exceptions of tomatoes and peaches for which just over one-half of the respondents indicated caring about tomato origin and a slightly smaller proportion cared about peach origin. There appears to be no strong preferences either for or against the other locally grown commodities considered. The mixed pattern of significant variables in the probit regressions also suggests local promotion needs to be conducted carefully on a product-specific basis, as opposed to a blanket approach for all fresh produce.

The neutrality of consumers with respect to origin suggests that promotion ought to stress specific advantages of locally grown fresh produce. These pertain to freshness and a more vine-ripe condition, since local produce can remain in the field longer and suffer less from transportation. In this regard, tomatoes and peaches are particularly difficult to ship, and this can be emphasized. Concern over quality and competitive price indicates that locally grown produce must be of grades comparable to produce from out-of-state and must be priced similarly.

The majority of consumers in the study area purchase apples, but they are not concerned about the origin. The results also indicate that local apples must be competitively priced vis-à-vis out-of-state apples. Larger households and college-educated respondents have higher probabilities of purchasing apples regularly. An implication is that marketing could be directed toward these population segments, such as by advertising in sections of news-

TABLE 6. WILLINGNESS-TO-PAY PROBIT REGRESSIONS

	Commodity				
Independent Variables	Apples	Broccoli	Cabbages	Peaches	Tomatoes
Constant	.822*[a] (5.84)[b]	1.647* (7.56)	1.686* (9.54)	1.335* (7.62)	1.419* (3.65)
INC2	.515* (2.56)				
INC3			−.427* (1.87)		
INC6		−.375 (1.39)			
PP2	−1.197* (2.29)				
PP3					−.124 (.31)
BLACK	−.728* (2.92)	−.992* (3.25)	−.563* (2.16)	−.861* (3.21)	−.622* (2.57)
AGE2			−.402* (1.76)		−.148 (.71)
AGE3	.385* (1.71)				
AGE4	.379* (1.66)				
AGE5	.336 (1.39)				
COLL		−.033 (.16)	−.496* (2.75)	−.336* (1.87)	
HSW					.372* (1.72)
RET		−.696* (2.64)		−.049 (.20)	.288 (1.12)
PROF					.425* (1.77)
Log likelihood	−198.93	−135.63	−153.63	−156.81	−181.37
χ^2	24.77*	19.02*	22.61*	12.59*	13.79*
McFadden R^2	.059	.066	.069	.039	.037
Percent predicted correctly	54	62	61	57	61

[a]*Significant at the .05 level.

[b]Asymptotic t-values are shown in parentheses.

papers most likely to be read by college-educated persons. In addition, because consumers are satisfied, they ought to be reminded of this in specific advertisements. Promotional efforts should be directed at shoppers who are 35 or older.

Broccoli is not purchased as regularly as apples, peaches, or tomatoes. Households in the higher income group, with higher proportions of adults, or where the respondent is between 35 and 44 are more likely to purchase regularly. In general, households were not concerned about broccoli origin and were not likely to be willing to pay more for locally grown broccoli. Thus, promotion of local broccoli should emphasize satisfaction with purchases and entail a price the same as or lower than out-of-state broccoli.

Cabbages also are not purchased as regularly as apples, peaches, and tomatoes. Respondents 45 and older and larger families are more likely to be in the regular purchaser group. Consumers in the 45 and older age category are also more apt to be in the satisfied category. Lack of concern about cabbage origin and responses to willingness to pay questions indicate that more than a local label and prices comparable to out-of-state cabbages are needed in the promotion of this commodity.

The potential for marketing local peaches is greater than for apples, broccoli, and cabbage. Peaches are more likely to be purchased by older respondents in larger households. Consumers are less satisfied with these purchases than with apples, broccoli, and cabbages. This may be the result of a poor harvest resulting in lower levels of satisfaction. Respondents are more concerned about peach origin than with apples, broccoli, and cabbages. The results suggest that the promotion of local peaches should be directed at larger households in which the food shopper is 45 or older. However, local peaches must be priced at or below the price of peaches from out-of-state.

Tomatoes have the greatest potential for a local market niche in Knox County. They are the most regularly purchased selected commodity, and consumers are most concerned about tomato origin. Housewives and respondents having professional occupations were most likely to be in the group which is willing to pay the same or more for locally grown tomatoes. These results suggest that promotions should be directed at all types of households.

The probit regressions can also be used in another way. The absence of significant relationships or negative relationships represents a challenge. Households with the characteristics that yield these relationships comprise a potential market. The challenge is to develop promotional campaigns directed toward these groups. Other analyses of the data (Eastwood et al.) found that most consumers did not know about the attributes of locally grown vis-à-vis out-of-state selected commodities. There is the further suggestion that unless a local product is differentiated (e.g., by longer vine-ripening and the associated need for special handling) there is little reason to pursue local versus out-of-state marketing. Viewed from this perspective, the local promotion of apples, broccoli, and cabbages should be informative in terms of emphasizing the advantages of attributes of locally grown products. The initial pricing should be slightly below that of comparable grade out-of-state commodities.

REFERENCES

Adrian, J. L., and R. Daniel. "Impacts of Socioeconomic Factors on Consumption of Selected Food Nutrients in the United States." *So. J. Agr. Econ.*, 58(1976):31–38.

Buitenhuys, N. C., A. S. Kezis, and H. W. Kerr, Jr. *Consumer Purchasing Habits, Acceptance and Preferences for Direct Marketed Small Farms' Horticultural Commodities in Maine.* University of Maine Agricultural Experiment Station, Bulletin 797, 1983.

Buse, R. C. "What Is America Eating and What Is Happening to Meat Consumption?" The Demand for Red Meat Symposium sponsored by the Board of Agriculture, National Research Council, October 20, 1986.

Capps, O., Jr. "Changes in Domestic Demand for Food: Impacts on Southern Agriculture." *So. J. Agr. Econ.*, 18(1986):25–36.

Center for Business and Economic Research. *Tennessee Statistical Abstract 1983/84.* Knoxville: The University of Tennessee Press, 1983.

Eastwood, D. B., R. H. Orr, and J. R. Brooker. *Consumer Stated Preferences for Fresh Fruit and Vegetables.* University of Tennessee Agricultural Experiment Station Research Report 86-08, April, 1986.

Jack, R. L., and K. L. Blackburn. *Effect of the Place of Residence on Consumer Attitudes Concerning Fresh Produce Marketed Through Direct Farm Markets in West Virginia.* West Virginia University Agricultural and Forestry Experiment Station Bulletin, 1985.

McFadden, D. "Conditional Logit Analysis of Qualitative Choice Behavior." In P. Zarembka (ed.), *Frontiers in Econometrics*, New York: Academic Press, 1974.

McKelvey, R. D., and W. Zavoina. "A Statistical Model for the Analysis of Ordinal Level Dependent Variables." *Journal of Mathematical Sociology*, 4(1975):103-20.

Raunikar, R., C. L. Huang, and J. C. Purcell. "The Changing United States Food Market." *Journal of Agribusiness*, 3(1985):42-45.

Scearce, W. K., and R. B. Jensen. "Food Stamp Program Effects on Availability of Food Nutrients for Low Income Families in the Southern Region of the U.S." *So. J. Agr. Econ.*, 11(1979):113-20.

Sexauer, B., and J. Mann. "Food Spending in Single Person Households." *National Food Review*, Summer (1979):32-33.

Smallwood, D. M., and J. R. Blaylock. *Household Expenditures for Fruits, Vegetables and Potatoes.* USDA, ERS Technical Bulletin 1690, 1984.

Trotter, C. E., and T. A. Brewer. *Consumer Reactions to Fresh Apples Marketed in Allentown-Bethlehem, Pennsylvania, 1974-75.* Pennsylvania State University Agricultural Experiment Station Bulletin 816, 1977.

United States Department of Agriculture, Economic Research Service. *Food Consumption, Prices and Expenditures 1964-1984.* Statistical Bulletin 736, 1985.

Vance Research Services. *Consumer Profile—Fresh Fruit.* Prairie View, Illinois: Vance Research Services, 1985a.

_____. *Consumer Profile—Fresh Vegetables.* Prairie View, Illinois: Vance Research Services, 1985b.

_____. *Lifestyle Dimensions.* Prairie View, Illinois: Vance Research Services, 1985c.