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SOURCES, PRICING POLICIES AND LIKELIHOOD OF SALE OF MUSCADINE GRAPES IN SUPERMARKETS IN FLORIDA

STEPHEN LEONG
Center for Viticultural Sciences
Florida A&M University
Tallahassee, Florida 32301

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Abstract. **The study investigated selected marketing practices of grocery supermarkets and the effects of marketability factors on fresh fruit market potential of Muscadine grapes in Florida. Most of the stores that sold Muscadine grapes obtain their supplies from Florida growers. Marketability factors such as quantity of grapes, frequency of supply, and delivery to stores, significantly affect the willingness of store managers to purchase the grapes. Estimated probabilities from a linearized logit function show that Muscadine grapes have a relatively good market potential as fresh fruit in supermarkets.**

Grapes are becoming increasingly popular as a high value alternative crop in Florida. Muscadine grapes (*Vitis rotundifolia* Michx), because of their unique flavor and taste, cater to the needs of an increasing number of consumers. Renewed interest has been expressed by investors because of Muscadine grape potential in wine, juice, and fresh fruit markets [5]. In Florida, an increasing number of farms and rural households are beginning Muscadine grape production either as a business venture or a hobby. As a result, acreage and production have increased steadily during the last few years. However, there is concern about the market potential of Muscadines as fresh fruit. Also unknown are the marketability factors that promote the sale of Muscadine grapes in supermarkets.

Supermarkets commonly obtain their fresh fruits and vegetables from volume suppliers on a contractual basis [6, 7, 12] and although Muscadine grapes are sold in the stores, this market is not available to many grape growers because of their low production volume. Small-scale grape growers in Florida have few market alternatives for their grapes [4, 9, 17]. Muscadine grapes are generally sold through U-pick operations and local wineries. In 1986, about 7% of the grapes produced in Florida were used for making wine and about 64% were sold as fresh fruit through U-pick markets [8]. A study of small-scale grape growers and hobby farmers in North Florida in 1989 showed that the U-pick market is a major outlet for Muscadine grapes [18].

Objectives

The objectives of the study were (1) to determine the sources of supplies, (2) to determine pricing policies (3) to analyze the effects of marketability factors on the willingness of supermarkets to purchase Muscadine grapes and (4) to determine the fresh fruit market potential for Muscadines. The emphasis of the study was on the impact of marketability factors on the market potential of Muscadines as fresh fruit.

Economic And Statistical Considerations

The market potential for Muscadine grapes as fresh fruit in supermarkets was determined by the probability (likelihood) of their purchase as estimated with a linearized logit function. The relationship between marketability factors and probability of purchase was studied under the following assumption: the probability of purchase is a function of marketability factors such as quantity of grapes, frequency of delivery, terms of sale, packaging preference, varietal preference and place of delivery.

Probability of purchase projections (market potential) can be estimated in a variety of ways, including single and multiple equation regression models. A single equation linear probability model is the simplest, however, this technique suffers from various statistical limitations [3]. The logit model circumvents many of the OLS problems encountered in the estimation of a linear probability model when dichotomous responses are involved in the estimation process. Examples in logit analysis can be found in Debertin, et al. [3], Berkson [1] and Sanathanan [16]. The functional model used in this study is shown below.

Eq. 1 PBUY = F(QTY, DEL, D1*FREQ, D2*FREQ, TERM, VAR, Z1*PKG)

Where PBUY = 1 if supermarket is willing to purchase Muscadine grapes, 0 otherwise.
QTY = Minimum quantity of Muscadine grapes desired by store.
DEL = 1 if delivered to store, 0 otherwise.
FREQ = Frequency of delivery to store.
TERM = 1 if sale by contract, 0 otherwise.
VAR = 1 if selected varieties preferred, 0 otherwise.
PKG = Type of packaging desired by store.
D1 = 1 if FREQ is once a week, 0 otherwise.
D2 = 1 if FREQ is twice a week, 0 otherwise.
Z1 = 1 if packaging is 20 pound lug, 0 otherwise.

Methodology

The theoretical and conceptual framework of the logit function is available from Debertin, et al., Montgomery and Peck [14], Kmenta [11], Intrilligator [10] and Pindyck and Rubinfeld [15]. The technique of estimating the logit function involves transforming the functional model (Eq. 1) into the standard logit model (Eq. 2) to estimate the desired structural parameters and probability of purchase.

Eq. 2

$$P = E(Zi) = F(Bo + BiXi) = \frac{\exp(Bo + BiXi)}{1 + \exp(Bo + BiXi)}$$

Where P = Probability of a supermarket store willing to purchase Muscadine grapes.
Xi = Marketability factors, i = QTY, DEL, TERM, FREQ, VAR.

Bi = Estimated structural parameters for Xi.
E(Zi) = Expected value of PBUY given the occurrence of Xi.
exp = Exponent.

By categorizing the 'no' (0) and 'yes' (1) responses of PBUY into different cell frequency of QTY, it was possible to derive the initial probability estimate of Pi. This approach of estimating the probability level is asymptotically equivalent to the maximum likelihood procedure [13]. More specifically, the estimation of Pi could be expressed as:

$$Pi = Ci/QTYi$$

Where Ci = Number of 1s of PBUY in ith category of QTY.
QTYi = Total number of observations of QTY in ith cell category.

Equation 2 was linearized by the logit transformation technique outlined by Montgomery and Peck (14) and expressed as:

$$\text{Eq. 3} \quad Pi^* = \ln\{E(Zi)/[1-E(Zi)]\} = \ln\{Pi/(1-Pi)\}$$

The linearized model (Eq. 3) was estimated by weighted least squares with weights Wi = Pi*QTYi(1-Pi). Expressed in terms of the original units, the model may be expressed as:

$$\hat{P} = \frac{\exp(\hat{B}o + \hat{B}iXi)}{1 + \exp(\hat{B}o + \hat{B}iXi)}$$

Source of Data

Data for the study were collected from a survey of supermarkets in Tampa, Tallahassee, Jacksonville, Orlando and Pensacola in the Spring of 1989. Questionnaires were sent to 98 major supermarket, and 26 (26.5%) responded to the survey; only 23 were used in the analysis. The supermarket managers were asked a series of structured questions designed to reveal sources of supplies, pricing policies and willingness to purchase Muscadine grapes. They were also asked what marketability factors promote sale of Muscadine grapes as fresh fruit. Results of the survey and subsequent data analysis are discussed below. For convenience, the term stores, used hereafter, refer to the surveyed supermarkets.

Survey Results

Sources of Supplies: Eighteen of 23 supermarkets that replied to the survey had sold Muscadine grapes. Twelve reported selling Muscadine grapes from Florida, four from south Georgia, and one each from Alabama and Mississippi. Ten of the stores did their own purchasing, but eight were supplied by their head offices. Thirteen stores were willing tc purchase Muscadines, and ten were unwilling or undecided (Table 1).

Pricing Policies: Several pricing methods were used by the stores for purchasing and selling Muscadine grapes. Ten stores used prevailing market prices and six used formula pricing (cost + margin). The retail price was generally determined by formula pricing. Only one store used the prevailing market price to determine its retail price for Muscadine grapes (Table 1).

Table 1. Selected marketing practices for Muscadine grapes by supermarket stores in Florida.

Marketing practice	Supermarket Number	Supermarket %
1. Have sold Muscadines:		
Yes	18	78.30
No	5	21.70
2. Willing to purchase Muscadines:		
Yes	13	56.52
No or undecided	10	43.48
3. Sources of Muscadine grapes:		
Florida	12	66.66
S. Georgia	4	22.22
Alabama	1	5.56
Mississippi	1	5.56
4. Method of purchase:		
Purchased at store	10	55.56
Supplied by head-office	8	44.44
5. Purchase price determined by:		
Formula pricing	6	33.33
Open-market pricing	10	55.56
Contract	0	0
Informal agreement	2	11.11
6. Retail price determined by:		
Formula pricing	17	94.44
Open-market pricing	1	5.56
Contract	0	0
Informal agreement	0	0

Marketability Factors: Details of marketability factors are shown in Table 2. Thirteen surveyed stores indicated

Table 2. Marketability factors of Muscadine grapes in supermarket stores in Florida.

Marketing practice	Supermarket Number	Supermarket %
1. Term of purchase:		
Contract	5	21.7
Cash	18	78.3
2. Production volume:		
a) 100- 250 pounds	5	21.74
b) 250- 500 pounds	2	8.69
c) 500-1000 pounds	3	13.04
d) 1000-1500 pounds	4	17.40
e) 1500-2000 pounds	6	26.09
f) 2000-2500 pounds	3	13.04
4. Frequency of delivery:		
a) Once a week	7	30.44
b) Twice a week	8	34.77
c) Once in two weeks	1	4.35
d) Within two to three days	7	30.44
5. Varietal preference:		
a) Yes	4	17.39
b) No	19	82.61
6. Packaging size desired:		
a) 40 pound lug	1	4.35
b) 20 pound lug	15	65.22
c) 10 pound lug	4	17.39
d) 5 pound package	1	4.35
e) 1 pound package	2	8.69

they prefer to purchase Muscadine grapes on a cash basis but *five* prefer a contractual arrangement.

Thirteen stores replied that growers should have 1,000 pounds or *more of* Muscadine grapes before they would consider purchasing from them. However, seven stores were willing to purchase Muscadine grapes from growers even if the quantity is between 100 and 500 pounds.

Fifteen stores indicated a desired frequency of delivery of once or twice a week while seven indicated a period of two to three days from order. One store desired to be supplied once in two weeks. Twenty store managers wanted the Muscadine grapes delivered to their stores.

Most store managers were not familiar with the different varieties of Muscadines, however, they felt the name 'Muscadine' should not be changed. Fifteen (65.2%) stores indicated that the name 'Muscadine' should be retained for promotional purposes. Fourteen store managers had no preference for particular varieties, so long as the grapes were saleable.

The most popular packaging size was the 20 pound lug. Fifteen stores favored the 20 pound lug, four favored the 10 pound package and only one store favored the 40 pound lug. Two of the stores favored the 1 pound package.

Empirical Results

Although the estimated coefficients of the linearized model have no obvious economic meaning [2] useful inferences can be drawn about their impact on the fresh market potential of Muscadine grapes in supermarkets (Table 3). Among the regressors (marketability factors), QTY, D1* FREQ, D2*FREQ are significant at the 5 percent level while DEL is significant at the 12 percent level. This suggests that quantity of grapes, ability to supply once or twice a week and delivery to the stores influence the probability of purchase of Muscadine grapes (PBUY) by the stores.

Table 3. Estimated structural coefficients of logit model using weighted least squares.

Explanatory variable[1]	Estimated parameter	t-ratio	Standard error
Intercept	–0.26923	–0.8321	0.32353
QTY	0.00405	3.0787*	0.00130
DEL	0.43407	1.6883**	0.25710
TERM	0.20564	0.8711	0.23607
D1*FREQ	0.79125	3.0787*	0.25701
D2*FREQ	0.23496	2.0571*	0.11422
Z1*PKG	0.01057	0.1086	0.09727
VAR	–0.20930	–1.0590	0.19764

r^2 = 0.61
Adjusted R^2 = 0.42
Variance of estimate = 0.13379
F statistic = 3.312 df 7, 15
*Significant at 0.05 level.
**Significant at 0.12 level.
[1]Explanatory variable: QTY = quantity of grapes for sale
DEL = delivered to store
TERM = purchase on contract
D1*FREQ = able to deliver once a week
D2*FREQ = able to deliver twice a week
Z1*PKG = package in 20 pound lug
VAR = preference for selected varieties of Muscadine

The marketability factors TERM, Z1*PKG, VAR and intercept term were not significant. Since the majority of the stores prefer to purchase on a cash basis (TERM = 0), it is not surprising that contract sales (TERM = 1) have no significant impact on probability of purchase. Many stores prefer the 20 pound package, but this preference (Z1* PKG) is not significant at the 5 percent level. Packaging in other sizes is also not significant. This implies that stores are flexible in their packaging requirements since no standard packaging for Muscadine grapes has been introduced into the industry. Another factor that is not significant is varietal preference (VAR = 1).

Projected Market Potential: The estimated probabilities of purchasing Muscadines ranged from 0.51 to 0.81. The higher the probability, the greater the store's willingness to purchase Muscadines. The probabilities do not guarantee sales to specific stores, but do represent the range of probabilities that a grape grower would face should he attempt to market his Muscadine grapes to stores in Florida such as those that replied to the survey. It seems likely that stores that regularly sold Muscadines were more likely to have replied to the survey than those that did not. Because of the low response rate to the survey (26%), the data obtained probably over-estimate the potential for marketing Muscadines to Florida supermarkets in general. The study found that greater quantities of grapes available for sale are associated with higher probabilities of purchase (Table 4). In general, growers have more than a 50% chance of marketing grapes to the respondents. The level of probability is contigent upon growers' ability to satisfy the marketability factors and requirements defined by the store managers.

Concluding Remarks

The analysis of marketability factors found that growers with 100 pounds or more to sell and willing to store-deliver once or twice a week have a high probability of marketing them in supermarkets.

It is recommended that the grapes be packed in 20 pound lugs since it is the most popular packing size for wholesaling nonFlorida grapes. Growers should carefully evaluate the marketability factors identified in the study in relation to their own operations to improve the marketability of their grapes.

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Table 4. Estimated probabilities of purchase associated with quantities of grapes available for sale in supermarkets in Florida.

Quantity of grapes	Probability range
100- 250 pounds	0.6629-0.6957
250- 500 pounds	0.6104-0.7893
500-1000 pounds	0.5144-0.7217
1000-1500 pounds	0.7609-0.8009
1500-2000 pounds	0.7322-0.8111
2000-2500 pounds	0.6957-0.8024

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EVALUATION OF WINE POTENTIAL FROM BREEDING LINES AND CULTIVARS IN FLORIDA

CHARLES A. SIMS
University of Florida, IFAS
Food Science and Human Nutrition Department
Gainesville, FL 32611

JOHN MORTENSEN
University of Florida, IFAS
Central Florida Research and Education Center
Leesburg, FL 32748

Abstract. **The raw fruit and wine quality of promising grape breeding lines and cultivars in Florida were evaluated. The breeding lines CB 9-23 and AD 1-115 had the best color and wine sensory scores of the red bunch (*Euvitis* hybrids) grapes evaluated. Noble had the best color and sensory scores of the red muscadine (*Vitis rotundifolia*) grapes evaluated, although the breeding lines CA 4-46 and NC 15-17 also had good color and sensory scores. The breeding line E 18-63 seems to be the most promising of the white bunch grape breeding lines, but Blanc du Bois and Suwannee had much higher sensory scores. The white muscadine breeding lines AD 3-42 and CA 9-50 seem to offer as much wine potential as several currently used white muscadine cultivars.**

There are currently several commercially acceptable grape cultivars for wine production in Florida, but new and improved cultivars are still needed to improve the competitiveness and product mix of Florida wines (3, 5, 7). For instance, very few red bunch grape (non-muscadine) wines have ever been produced in Florida due to a lack of suitable cultivars (5). Most red bunch grapes (*Euvitis* hybrids) and muscadine grapes (*Vitis rotundifolia*) in Florida have relatively poor color and color stability (3, 5), and as a consequence, cultivars with improved color are needed. In addition, white bunch grape cultivars that produce unique and commercially acceptable wines are also needed to compliment the current white bunch grapes. A very active breeding program at the University of Florida has released several new grape cultivars over the years (6, 8), and many of these are for, or could be for, wine production.

A wine evaluation process is necessary because it is usually very difficult or impossible to predict the wine quality of a cultivar without actually producing wine, storing it and evaluating it (3). The soluble solids, pH, acidity and flavor of the grapes are usually only rough indices of the potential wine quality. One of the functions of the grape processing and enology program at the University of Florida is the evaluation of cultivars and breeding lines for wine production in Florida. This report will summarize the results of this cultivar evaluation in 1986.

Materials and Methods

All grapes were obtained from the University of Florida's Central Florida Research and Education Center at Leesburg and usually crushed the same day of harvest. The breeding lines and cultivars evaluated are shown in Table 1. Wines were produced using standardized wine making procedures described below.

White wines. White bunch and muscadine grapes were crushed, treated with 50 ppm sulfite and pressed in a basket press. The resulting juice was analyzed for soluble solids (using a refractometer), pH and acidity (titration) and allowed to settle overnight at 2°C. The juice was then adjusted to 21% soluble solids using sucrose to provide sufficient ethanol in the wine. The juice was then innoculated with Pasteur Champagne yeast and allowed to ferment to dryness (less than 0.5% reducing sugar) at 13°C in glass carboys. The wine was racked several times, cold stabilized by placing at 2°C for 7-10 days and then filtered through

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