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THE EFFECT OF POINT-OF-PURCHASE DISPLAY
MATERIAL ON SALES OF FRESH TEXAS GRAPEFRUIT.

A Report To The
Texas Valley Citrus Committee
November, 1969

From The
TEXAS AGRICULTURAL MARKET RESEARCH AND DEVELOPMENT CENTER
Department of Agricultural Economics and Sociology
Texas A&M University

THE TEXAS AGRICULTURAL MARKET RESEARCH AND DEVELOPMENT CENTER

The purpose of the Center is to be of service to agricultural producers, groups and organizations, as well as processing and marketing firms in the solution of present and emerging marketing problems. Emphasis is given to research and educational activities designed to improve and expand the markets for Texas food and fiber products.

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Market Research and Development Center

STAFF

Robert E. Branson, Ph.D
Coordinator
William E. Black, Ph.D
Associate Coordinator
Chan C. Connolly, Ph.D
John P. Nichols, Ph.D
Thomas L. Sporleder, Ph.D
Randall Stelly, Ph.D
H. R. Roberts
Research Associate

ASSOCIATE STAFF

Edward Uvacek, Ph.D
Livestock
John Seibert
Grains
Johnny Feagan
Organization
Charles Baker
Cotton and Foreign Trade

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THE EFFECT OF POINT-OF-PURCHASE DISPLAY
MATERIAL ON SALES OF FRESH TEXAS GRAPEFRUIT.

Thomas L. Sporleder*

I. INTRODUCTION

Background

For several marketing seasons the Texas Valley Citrus Committee has utilized in-store point-of-purchase display material as one aspect of their promotion and merchandising program for Texas citrus marketed in fresh form. Historically, over 75 percent of Texas citrus has been marketed in the fresh form.¹ Thus, the promotion and merchandising program for fresh Texas citrus is an important part of the marketing effort.

In the past, kits containing the point-of-purchase display material have been distributed to the retail outlets in the various markets where Texas citrus was sold. The recent general market area for Texas citrus is indicated in Table 1. Utilization of the point-of-purchase display material was at the discretion of the retail outlet receiving the material.

Early in the 1968-69 season the Texas Valley Citrus Committee requested the Texas Agricultural Market Research and Development Center of Texas A&M University to measure the effectiveness of the point of-

* Assistant Professor, Department of Agricultural Economics and Sociology, Texas A&M University.

¹ During the 1964-65 to 1968-69 period, a mean average of 76.2 percent of Texas grapefruit production was marketed in the fresh form.

Source: United States Department of Agriculture, Citrus Fruits, By States, Crop Reporting Board, Statistical Reporting Service, Washington, D. C., 1909-1969.

TABLE 1.
 PERCENT OF TEXAS GRAPEFRUIT SHIPMENTS TO
 INDICATED GEOGRAPHIC AREAS, 1966-67 TO 1968-69.

Geographic Area	Season		
	1966-67	1967-68	1968-69
	---percent---		
1. Texas	28	55	27
2. Oklahoma:			
Oklahoma City & Western Oklahoma	3	3	3
Tulsa & Eastern Oklahoma	2	2	2
3. Kansas	4	5	4
4. Nebraska:			
Omaha & Eastern Nebraska	2	2	2
Western Nebraska	0	0	0
5. Colorado	4	4	4
6. Arkansas	2	4	3
7. Louisiana	2	2	1
8. Missouri:			
Kansas City & Northwestern Missouri	4	2	3
Cumulative Percent	51	79	49
Other Areas	49	21	51

Source: Texas Sweet Citrus Segments Texas Valley Citrus Committee, Pharr, Texas, July 1968 and 1969.

purchase display material in increasing the sales of fresh Texas grapefruit. This study is the result of that request.

Objectives

The primary objective of this study was to measure the effect of in-store point-of-purchase display material on the sales of fresh Texas grapefruit under typical marketing conditions. This last qualification was considered an important element of the objective. That is, typical marketing conditions meant that sales effectiveness of the display material was to be measured without a display contest or other special incentive for increased merchandising activity beyond what the display material itself would impart. Thus, the objective was to measure the effectiveness of the in-store point-of-purchase display material in the absence of potentially confounding effects attributable to other merchandising incentives which could be regarded as complimentary to the display material.

A secondary objective of the study was to derive a cost-benefit ratio for the in-store point-of-purchase display material derived from the results obtained from completing the primary objective.

II. METHODOLOGY

Experimental Design

In order to achieve the objective of measuring the effect on sales of the point-of-purchase (POP) display material, the sales of fresh Texas grapefruit were monitored in each of 12 stores in 2 cities for a period of 10 weeks during February, March, and April, 1969. Thus, actual store sales by weeks were recorded in 24 stores over a 10 week period for a total of 240 sales observations.

The markets chosen for the test were Tulsa, Oklahoma, and Omaha, Nebraska. Many factors influence the final choice for a market in which to conduct such a test. Some of these are population and average income of families in the cities, the sales of Texas vs. Florida citrus in the market, availability of historic sales records, and the characteristics of retail supermarkets willing to cooperate in such a test. After considering each of these factors, 12 stores of a chain in Tulsa and 12 stores of a chain in Omaha were selected. The stores in each city were subsequently classified into 4 groups of 3 on the basis of the income of the neighborhood where the store was located and on the basis of past store sales. Therefore, each of the 4 groups of stores in a city was composed of a high income store, a medium income store, and a low income store.

Each week during the test a particular situation existed with respect to utilization of POP display material and retail price for fresh Texas grapefruit. A particular situation or combination of price and existence of POP display material for fresh Texas grapefruit is called

a treatment. There were four possible treatments during the test: 1) regular price and no POP material 2) special price and no POP material 3) regular price with POP material and 4) special price with POP material. The treatments were rotated among the 4 groups of stores in each city during the 10 week test period. Thus, each store had each treatment at some time during the test period.

Store Audits

Each store was audited twice each week during the test period. An audit of sales was completed on Tuesday of each week and an audit of prices and display space was completed on Friday of each week.

Controlled and Uncontrolled Variables

Part of any research problem is for the researcher to identify the significant factors which may vary over time that could influence the results of the research. Some factors, such as city size, income, and geographics are controlled and have been previously discussed. The purpose of this section is to provide a detailed list of other factors which are significant and classify them as to the amount of control imposed upon them during the test.

Remember that the basic objective of the study was to measure the effectiveness of in-store point-of-purchase display material on the sales of fresh Texas grapefruit under typical marketing conditions. This objective implies that the less control exerted over various factors during the test, the more typical the conditions under which the results are obtained. The following variables or factors were not controlled

during the test:

1. The sales of any product in any store.
2. The number of customers visiting any store.
3. The amount of display space allocated to any product.
4. The absolute level of price for fresh Texas grapefruit in either bulk or bag.
5. Advertising in mass media or special promotions (such as couponing or stamp specials) for any product.
6. The price for any competing product.
7. Amount or use of in-store point-of-sale display material for any competing product.

The following variables or factors were controlled during the test:

1. Duration of the test period (10 weeks).
2. Each week a particular set of 6 stores were required to have a minimum amount of in-store point-of-purchase display material for fresh Texas grapefruit by their display of either bulk or bag. The remaining 6 stores in each city each week were required to have no point-of-purchase display material by their display of either bulk or bag Texas grapefruit.
3. Price variability of Texas grapefruit through time was assured by requiring stores in each city to have a special price for some weeks and a regular price other weeks.
4. Price level for either bulk or bag Texas grapefruit among a particular set of stores was controlled each week during the test period.

Statistical Procedures

A statistical procedure known as Analysis of Covariance (ANOCOV) was utilized for analysis of the data generated from the experiment. The ANOCOV procedure allows for both qualitative and quantitative data to be utilized in the analysis. Thus, this procedure is particularly amendable to the analysis of data generated from an experiment where control is kept at a minimum.

The technical methodology of the ANOCOV procedure will not be discussed in this report but is readily available to those interested from several sources.²

² For example, see George W. Snedecor and William G. Cochran . . . Statistical Methods (Ames, Iowa: The Iowa State University Press, 1967), Chapter 14; or N. R. Draper and H. Smith, Applied Regression Analysis (New York: John Wiley and Sons, Inc., 1968), Chapters 5 and 9.

III. EMPIRICAL RESULTS AND EVALUATION

This section presents the final specification of the ANOCOV model and the associated parameter estimates. The technical details of the analysis will be minimized in this report, however, they cannot be entirely avoided.

Specification of the General ANOCOV Model

A general linear model to explain total sales of fresh Texas grapefruit was ultimately specified which contained the following variables:

Dependent variable:

TSC = total sales of both bulk and bag Texas grapefruit per customer per week.

Independent or Explanatory Variables:

AVCS = total weekly metropolitan newspaper advertising for fresh grapefruit in competing chain stores (measured in agate lines).

COUP = a 0, 1 variable for presence or absence on a weekly basis of a newspaper coupon for an 8 pound bag of Texas grapefruit redeemable for cookware in the cooperating chain in Omaha, Nebraska.

CIT = a 0, 1 variable utilized to measure differences in TSC attributable to city differences.

PTS = weekly weighted average price for fresh Texas grapefruit (measured in cents per pound).

DATX = total display space allocated to both bulk and bag Texas grapefruit each week (measured in square feet).

DAF = total display space allocated to both bulk and bag

Florida grapefruit each week (measured in square feet).

SAPC = total sales of all apples (measured in pounds of sales per customer per week).

I_1 = a variable utilized to measure the presence of differences in weighted average price for Texas grapefruit between cities (technically known as an interaction term, this variable is equal to CIT times PTS).

I_2 = a variable utilized to measure the presence of differences in the total amount of in-store display space allocated to Texas grapefruit between cities (this variable is equal to CIT times DATX).

PAF = weekly weighted average price for fresh Florida grapefruit (measured in cents per pound).

POP = a 0, 1 variable utilized to measure differences in TSC attributable to the presence of in-store point-of-purchase display material for fresh Texas grapefruit (either bulk or bag).

I_3 = a variable utilized to measure the presence of interaction or dependency between the in-store point-of-sale material for fresh Texas grapefruit and the total amount of display space allocated to fresh Texas grapefruit (this variable is equal to POP times DATX).

Parameter Estimates

The parameter estimates for this model appear in Table 2. The coefficient of correlation (R^2) for the model is .48. This indicates that the model "explained" approximately 48% of the variation in the total sales of fresh Texas grapefruit per customer per week.

TABLE 2.
ESTIMATED COEFFICIENTS AND STANDARD
ERRORS FOR THE ANOCOV MODEL

Variable or Factor	Mean Average of the Variable	Estimated Coefficient of the Variable	Standard Error of the Coefficient
Total Sales - Texas Grapefruit (TSC)	0.08445	N.A. ^a	N.A.
Newspaper Advertising - Competing Stores (AVCS)	11.55500	0.00101**	0.00034
Omaha Newspaper Coupon (COUP)	N.A.	-0.04030**	N.A.
City Differences (CIT)	N.A.	-0.08587	N.A.
Price - Texas Grapefruit (PTS)	10.38789	-0.00837**	0.00263
Display Space - Texas Grapefruit (DATX)	18.99873	0.00164**	0.00053
Display Space - Florida Grapefruit (DAF)	9.19708	-0.00090*	0.00052
Sales of Apples (SAPC)	0.12395	0.17989**	0.06521
Interaction (I ₁)	5.58849	0.00929**	0.00380
Interaction (I ₂)	7.15208	-0.00068	0.00063
Price - Florida Grapefruit (PAF)	13.99000	0.00140	0.00123
Point-of-Purchase for Texas (POP)	N.A.	-0.00763	N.A.
Interaction (I ₃)	10.30667	-0.00002	0.00053

^a N.A. = not applicable because of the special nature of these variables.

* This coefficient (or variable) is significant at the 90% probability level.

** This coefficient (or variable) is significant at the 95% probability level.

Source: Computed.

Interpretation

Table 2 is really quite simple to interpret. The column showing the mean average of the variables is simplest of all. This column is utilized to determine what the average of each of the variables was during the test period. For example, the average price of Texas grapefruit during the test period (PTS) was 10.4 cents per pound while the average price for Florida grapefruit (PAF) was 13.99 cents per pound. A similar interpretation can be given for each of the other variables listed.³

The next column, showing the estimated coefficients of each variable may be interpreted as the direction and magnitude (or amount) of change in sales of Texas grapefruit per customer per week (TSC) for each one unit change in an independent variable. For example, the estimated coefficient for the price of Texas grapefruit (PTS) is -0.00837 . This means that for a one unit increase in the average price of fresh Texas grapefruit (one cent per pound), average sales of Texas grapefruit decreased by $.00837$ pounds per customer per week. Similarly, for a one unit (or one square foot) increase in display space for Texas grapefruit (DATX), the sales of Texas grapefruit increased by $.00164$ pounds per customer per week.

There are two coefficients that need special interpretation. These are COUP and CIT. The estimated coefficient for COUP means that when the newspaper coupon appeared in the newspaper in Omaha, total sales were $.0403$ pounds per customer higher for that week than for a week when there was no coupon. The estimated coefficient for CIT means that the average

³ The exception to this is for the variables COUP, CIT, and POP. The average of these variables is non-existent since they simply represent presence or absence of a qualitative factor.

sales of Texas grapefruit in Omaha were .08587 pounds per customer per week less than the average sales of Texas grapefruit in Tulsa.

The last column of Table 2 shows the error associated with the coefficient listed in the previous column. Thus, the last two columns may be directly compared to obtain a measurement on how significant an influence any particular variable had on sales of Texas grapefruit per customer per week. A general rule is that if the figure in the last column is as large or larger than the coefficient in the middle column then the variable associated with that coefficient is not an important or significant factor effecting sales of Texas grapefruit (TSC).

Here again, because of the nature of the variables, COUP, CIT, and POP must be given special statistical treatment in order to determine their significance in explaining TSC. The appropriate statistic for determining the significance of these variables is called an F ratio. The computed F ratio for each of these variables is:

<u>Variable</u>	<u>F Ratio</u>
COUP	28.48839
CIT	1.28454
POP	2.51149

If the F ratio listed above for a variable is greater than 3.84 then that variable has a significant or important influence on total sales of Texas grapefruit.⁴ The comparison between the F.ratio and 3.84 shows that COUP

⁴ "Significant" at the 95% level of probability. That is, 95% of the time the conclusion we draw based on this criterion would be correct (in the long run). The number 3.84 is determined from a table of percentage points of the F-Distribution. See, for example, Norman L. Johnson and Fred C. Leone, Statistics and Experimental Design (New York: John Wiley & Sons, Inc., 1964), Table G, page 467.

has a significant influence on total sales of fresh Texas grapefruit but CIT and POP do not. This means that the presence of the in-store point-of-purchase display material for Texas grapefruit had no measurable influence on the sales per customer per week of Texas grapefruit.

Also, note from Table 2 that variable I_3 was not significant in the analysis. This variable was formulated and included in the ANOCOV model for the specific purpose of measuring whatever effect the use of POP display material had on the display space allocated to fresh Texas grapefruit. Obviously, if the use of POP display material induced the retail outlets to provide a larger sales space for Texas grapefruit, then increased sales would result. The effect could be indirectly attributable to the POP display material. However, since variable I_3 is not significant in the analysis, this means that the use of POP display material had no measurable influence on increasing display space allocated to fresh Texas grapefruit during this test. In other words, the use of POP display material did not induce the retail outlets, on the average, to increase the size of the display for fresh Texas grapefruit.

Respecification

Many variables were included in the initial analyses before a determination was made concerning those which significantly influenced sales of Texas grapefruit.⁵ Traditional statistical procedures dictate that non-significant variables should be excluded from consideration before the coefficients of the variables in the final model are estimated. This

⁵ A total of 55 variables were analyzed in various models before the final model reported in Table 3 was determined.

is so because the value of the coefficients for each variable will change somewhat each time another variable is excluded from the model. Table 3 shows the estimated coefficients of the final model after the non-significant variables POP and I_3 are excluded from the model. The coefficient of correlation (R^2) for the final model is .475.

Price Elasticity

The ANOCOV model is appropriate for estimating price elasticity for Texas grapefruit. The estimated coefficient of price elasticity for Texas grapefruit based on the final model (Table 3) is -1.02. This coefficient means that for each one percent increase in the retail price of Texas grapefruit, the quantity of Texas grapefruit sold decreased by 1.02 percent.

Cross Price Elasticity

The estimated model (Table 3) can also be used to estimate a coefficient of cross price elasticity. The estimated coefficient of cross price elasticity between the price of Florida grapefruit and sales of Texas grapefruit is 0.23. This coefficient means that for each one percent increase in the price of Florida grapefruit the sales of Texas grapefruit increased .23 percent. This estimated coefficient indicates, as expected, that Florida and Texas grapefruit are somewhat substitutable from the consumer's point of view.

Display Space Elasticity

An interesting statistic that can be computed from the model (Table 3) is the amount of change in sales of Texas grapefruit when the amount

TABLE 3.
ESTIMATED COEFFICIENTS AND STANDARD
ERRORS FOR THE RESPECIFIED ANOCOV MODEL

Variable or Factor	Mean Average of the Variable	Estimated Coefficient of the Variable	Standard Error of the Coefficient
Total Sales - Texas Grapefruit (TSC)	0.08445	N.A. ^a	N.A.
Newspaper Advertising - Competing Stores (AVCS)	11.55500	0.00099**	0.00034
Omaha Newspaper Coupon (COUP)	N.A.	-0.04071**	N.A.
City Differences (CIT)	N.A.	-0.08355	N.A.
Price - Texas Grapefruit (PTS)	10.38789	-0.00825**	0.00264
Display Space - Texas Grapefruit (DATX)	18.99873	0.00163**	0.00046
Display Space - Florida Grapefruit (DAF)	9.19708	-0.00088*	0.00052
Sales of Apples (SAPC)	0.12395	0.17423**	0.06505
Interaction (I ₁)	5.58849	0.00903**	0.00380
Interaction (I ₂)	7.15208	-0.00071	0.00063
Price - Florida Grapefruit (PAF)	13.99000	0.00139	0.00124

^a N.A. = not applicable because of the special nature of these variables.

* This coefficient (or variable) is significant at the 90% probability level.

**This coefficient (or variable) is significant at the 95% probability level.

Source: Computed

of display space allocated to it changes. The estimated coefficient of elasticity between display space and sales for Texas grapefruit is 0.37. This coefficient means that when the amount of display space allocated to Texas grapefruit in the store increased by one percent, the sales of Texas grapefruit increased by .37 percent. This shows that the amount of display space in the store has an effect on sales. However, the effect of display space on sales is not as great as the effect of price (.37 percent compared with 1.02 percent).

City Differences

There were, of course, differences in the absolute levels of the variables included in the analysis between cities. Even though these differences were not statistically significant in the aggregate analysis, the differences in some factors are presented in Table 4 as a matter of interest.⁶

Note from Table 4 that the total sales per customer per week of all grapefruit (both Florida and Texas) were similar in the two markets; that is, .130 pounds per customer per week in Omaha and .112 pounds per customer per week in Tulsa. However, the sales of Texas vs. Florida were markedly different in the two markets. The sales of Texas grapefruit were nearly equal to the sales of Florida grapefruit in Omaha. In Tulsa, however, the sales of Texas grapefruit was the major portion of the sales of all grapefruit.

⁶ City differences not being statistically significant refers to the fact that the variable CIT was not significant in explaining total Texas grapefruit sales.

TABLE 4.
 MEAN VALUE OF SELECTED FACTORS IN
 OMAHA, NEBRASKA AND TULSA, OKLAHOMA

Variable or Factor	Mean Value in Omaha, Nebraska	Mean Value in Tulsa, Oklahoma
Average Price of Bulk Texas Grapefruit	4.6 cents per pound	9.9 cents per pound
Average Price of Bag Texas Grapefruit	11.4 cents per pound	10.3 cents per pound
Total Texas Grapefruit Sales	.066 pounds per customer	.103 pounds per customer
Total Florida Grapefruit Sales	.064 pounds per customer	.009 pounds per customer
Bulk Texas Grapefruit Sales	.005 pounds per customer	.058 pounds per customer
Bag Texas Grapefruit Sales	.061 pounds per customer	.045 pounds per customer

Source: Computed.

Effect of POP on Texas Sales Relative to Florida Sales

Another potential effect that the use of POP display material for Texas grapefruit may have is to shift sales of Florida grapefruit to Texas grapefruit. That is, the POP material could increase the sales of Texas grapefruit relative to Florida grapefruit without actually increasing the total number of pounds of all grapefruit sold.

When both Texas and Florida grapefruit are important factors in the market, then POP may effect the ratio of Texas sales and Florida sales. In Omaha both Texas and Florida are important in the market but not in Tulsa (Table 4). Consequently, a different ANOCOV model was specified for Omaha alone. Although the details of this analysis will not be presented here, the conclusion from that model is that the use of POP display material for Texas grapefruit had no measurable influence on increasing sales of fresh Texas grapefruit relative to fresh Florida grapefruit during the test.

IV. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The objective of this study was to measure the effect of in-store point-of-purchase display material on the sales of fresh Texas grapefruit under normal or typical marketing conditions. Based upon the results of the statistical analysis contained herein, the primary conclusions of this study are:

1. The presence of the in-store point-of-purchase display material for Texas grapefruit by itself had no measurable influence on the sales per customer per week of fresh Texas grapefruit. This means that, on the average, sales of Texas grapefruit were the same in the presence or absence of the display material as it was normally used in the stores.
2. The use of in-store point-of-purchase display material for Texas grapefruit by itself had no measurable influence on the in-store display space allocated to fresh Texas grapefruit. This means that, on the average, the display space that was allocated to Texas grapefruit was the same regardless of the store's use of the display material.
3. The use of in-store point-of-purchase display material for Texas grapefruit by itself had no measurable influence on the sales per customer per week of fresh Texas grapefruit relative to the sales per customer per week of fresh Florida grapefruit. This means that, on the average, sales of Texas grapefruit relative to Florida were the same in the absence or presence of the display material for Texas grapefruit.

4. As expected, price and display space have a significant influence on sales. With a 1 percent increase in fresh Texas grapefruit price, the quantity sold decreased by about 1 percent. With an increase in display space allocated to fresh Texas grapefruit of 1 percent, sales increased by about .37 percent. Therefore, if in-store point-of-purchase material is to be effective in increasing sales it must increase the amount of display space allocated to the grapefruit or induce the retail outlet to reduce price.

Results of this study must be interpreted with a degree of caution. It is valid to conclude that in-store point-of-purchase display material, as characteristically distributed by the Texas Valley Citrus Committee, is not profitable. However, this study was not designed to measure the effectiveness of a total merchandising program of which point-of-purchase display material is a part. Therefore, it is not valid to conclude that in-store point-of-purchase display material is not useful in the context of a total merchandising program, or that the use of such material should necessarily be totally discontinued.

The above conclusions are directly related to the primary objective of this study. However, the analysis suggests another interesting conclusion that may be helpful in developing a total merchandising program for Texas citrus.

A coupon redeemable for cookware with the purchase of an 8 pound bag of Texas grapefruit was placed in the Omaha newspaper by the chain cooperating in the test 3 weeks during the 10 week test period. Although

this activity was not a part of the basic experimental design, the effect on sales of the coupon could be measured by appropriate statistical procedures. The increase in sales of fresh Texas grapefruit attributable to the coupon was 48.2 percent. This means that sales of Texas grapefruit per customer per week were, on the average, 48.2 percent higher for the weeks when the coupon appeared in the newspaper compared to the weeks when it did not.

Recommendations

Based upon the conclusions of this study, several recommendations may be made. First, it is apparent that retail price and the amount of in-store display space have a significant influence on sales, but use of in-store point-of-purchase display material by itself does not. This means that a total merchandising program for Texas grapefruit should center around two key variables: price and display space. Any incentive that can be offered to the retail store or to the retail store produce manager to enlarge the amount of display space allocated to Texas grapefruit or to directly or indirectly reduce the price of Texas grapefruit would benefit sales. There are several possible means of directing a merchandising program toward this end. Some of these include:⁷

1. Sponsorship of a display contest. This has obvious benefit in increasing the display space allocated to the product.
2. Offer incentives to the retail chain stores to run price, coupon,

⁷ This is not intended as an exhaustive list of alternatives but merely as several examples of possible alternatives.

or stamp specials on Texas grapefruit,⁸ The results of the Omaha newspaper coupon for grapefruit verify the effectiveness of this type technique.

3. Increase total display space allocated to fresh Texas grapefruit by introducing new package sizes into the market. For example, a 5 or 8 pound bag could be prepackaged and shipped into a market. A retailer may be offering only bulk Texas grapefruit or only bulk and 20 pound sacks. If he also offered a 5 or 8 pound bag, total display space would increase.

The primary recommendation however, is that the use of in-store point-of-purchase material cannot and should not be considered as the merchandising program for Texas grapefruit. The point-of-sale material can rightfully be a part of a total merchandising program which reinforces other promotional techniques of the type mentioned.

Which alternative or combination of alternatives, if any is implemented is a policy decision to be made by industry leaders and therefore outside the scope of this report.

⁸ Of course, there are legal aspects of these kinds of incentives that would have to be examined before such a policy could be implemented.