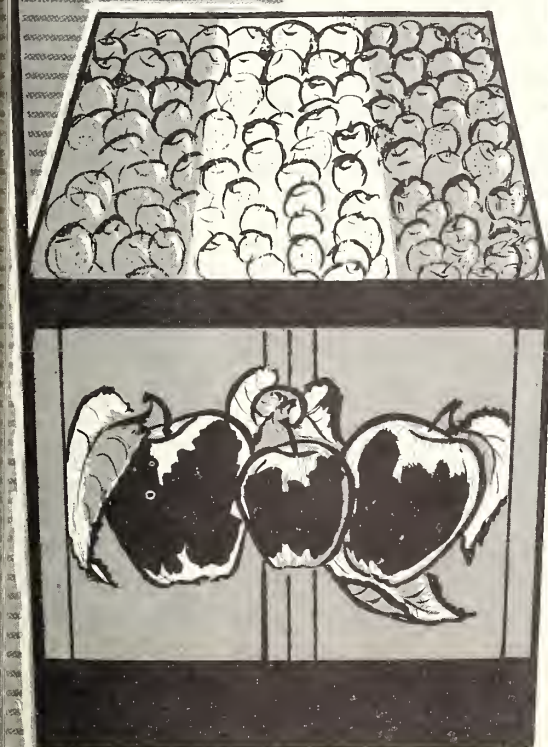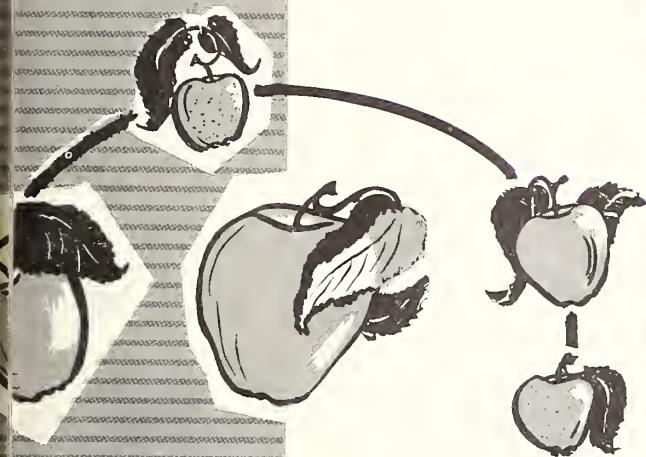# SPECIAL
PROMOTIONAL
PROGRAMS
FOR
APPLES

Their Effects on Sales
of Apples and Other Fruit

MARKETING RESEARCH REPORT NO. 446

PREFACE

This study is part of a program of marketing research designed to provide information which will help organizations of producers of farm products to evaluate their present promotional programs and aid them in planning future promotion work aimed at market expansion.

The study reports the total impact of well-coordinated apple advertising and merchandising activities on sales of apples and other selected fruits, and the relative effectiveness of two promotional themes for apples. It employs a research method for studying advertising not previously reported. Also covered are findings pertaining to the individual sales contribution of specific merchandising practices (such as prices, amount of display area, and newspaper advertising) used in conjunction with the special promotional program.

The study was carried out in cooperation with the Washington State Apple Commission which scheduled media advertising and furnished merchandising materials to cooperating retail stores for each promotional theme. It was conducted under the general direction of George H. Goldsborough. Michael G. Van Dress aided in coordinating and supervising the field activities.

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January 1961

SPECIAL PROMOTIONAL PROGRAMS FOR APPLES

Their Effects on Sales of Apples and Other Fruits

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SUMMARY

Controlled experiments in 72 food supermarkets in 6 midwestern cities indicated that advertising and promotion sponsored by the Washington State Apple Commission, using two specific themes, were associated with substantial increases in sales of all apples handled by the stores, as well as of Washington apples.

Compared with periods of no promotion, sales of Washington-grown apples per store in a 4-week period were 32 percent higher for the "apple use" promotional theme (emphasizing use of the fruit in salads, pies, and other dishes), and 21 percent greater for the "health" promotional theme.

Sales of all apples (from Washington and other areas) were 20 percent greater when the apple-use theme was used than when there was no promotion, and 9 percent greater for the health theme.

Advertising based on either theme for a 4-week test period did not affect sales of apples in the succeeding 4-week period.

There appeared to be a slight increase in sales of oranges when either theme was employed for apples. Sales of grapefruit remained relatively stable when the "use" theme was featured for apples, but showed a large increase when apple promotion stressed the health theme. Use of the health theme for apples seemed to add emphasis to the "Fresh for Health" promotional materials furnished by another organization and featuring grapefruit. Banana sales were slightly lower for both the apple-use and health themes.

Changes in sales of apples, oranges, grapefruit, and bananas were significantly related to changes in some but not all of the practices employed by stores in merchandising and promoting these fruits, such as amount of display area, newspaper advertising, and prices.

Sales of apples from Washington State and from other areas were significantly affected by changes in the respective price of each; however, prices of apples from one area did not affect sales of those from other areas. Changes in amount of display space for either Washington apples or apples from other areas affected the sales of both. Varying the display space for grapefruit was the only in-store merchandising practice used with other fruits which significantly influenced sales of apples.

Practices directly employed by the stores in merchandising apples did not have a measurable effect, adverse or beneficial, on sales of bananas, grapefruit, and oranges. The amount of display space devoted to grapefruit was directly or positively related to grapefruit sales and in addition inversely related to sales of apples and oranges. Similarly, the display space devoted to bananas was directly related to banana sales and inversely related to orange sales. These findings indicate that grapefruit competes with apples, oranges, and bananas, and bananas compete with oranges for display space and sales.

OBJECTIVES

In recent years, agricultural producer organizations in the most important commercial apple producing areas have provided increasing support to various State, regional, and national promotional programs for fresh apples. Similar activities are being carried on by producers of other fruits and other farm products. In 1958, promotional expenditures for such activities totaled about $67 million with about $20 million spent on fruit and fruit products (2). 1/

The purpose of these programs is to move a greater volume of products at the existing market price, or move a given volume at a higher market price. To be sure of achieving this purpose, there is a need to appraise the effectiveness of present programs and evaluate alternative promotional techniques as an aid in planning future programs.

This study was conducted to compare the effects of two promotional themes for Washington apples with the effects of no promotion on the sales of apples and other selected fruits. A secondary objective was to develop improved research techniques for evaluating the effectiveness of promotional programs.

PROCEDURE

Six midwestern cities in which the Washington State Apple Commission and similar organizations had not previously conducted extensive promotional programs for apples were selected for the test. The cities were selected in pairs on the basis of comparability of such factors as sources of supply for apples and competing fruits, size of city, location of city, major economic characteristics, and limited overlapping of local newspaper and television advertising facilities between cities. The cities were Cedar Rapids and Davenport, Iowa; Joplin and Springfield, Mo.; Lincoln, Neb.; and Topeka, Kan.

In each city a panel of 12 representative self-service food stores was selected for testing the effectiveness of the promotional themes. The panel stores in each city represented different retail organizations (chains, voluntary chains, and nonaffiliated independents), different geographical areas of the city, and different sizes. Trade sources estimated that the panel stores in each city accounted for approximately 50 to 80 percent of retail food sales.

1/ Underscored numbers in parentheses refer to items in the Literature Cited, page 10 .

The test treatments included (1) an apple-use advertising and promotional theme which emphasized various uses of fresh apples (such as fruit salads and pies); (2) a health advertising and promotional theme which emphasized the healthful qualities of apples (build strong bodies and teeth); and (3) a control treatment of no advertising or other promotion, to serve as a basis of comparison. Promotion for the two test themes was as nearly equal as possible. It included scheduled television programs Wednesday and Friday of each week sponsored by the Washington State Apple Commission, the use of point-of-sale material related to the advertising themes, and special displays in the panel stores. In addition, cooperating retailers supported this promotion by featuring apples as part of their regular advertisements in local newspapers serving their usual market area.

In this study, an experimental design was used in assigning treatments to the cities and time periods. This method of assigning treatments eliminated or equalized the influences of city and seasonal differences, thus increasing the accuracy of the experimental findings. 2/ The design used also permitted measurements of both direct and carryover sales effects of each test theme or treatment (1, 3) (table 1).

To further insure reliable measurement of treatments under normal operating conditions, sample stores cooperated by (1) maintaining comparable apple displays for both test promotional themes; (2) maintaining approximately equal store-sponsored promotional effort (special displays and newspaper ads) for each test theme; (3) maintaining comparable competition (such as price, display, and feature advertising) from selected fruits for each theme; and (4) maintaining normal merchandising practices for all fruits during periods of no promotion.

Data were collected from cooperating stores each week on the volume (pounds) of apples, oranges, grapefruit, and bananas sold. 3/ Supplementary data were obtained twice a week (Monday and Friday) on merchandising practices employed by panel stores which were thought to affect the sales of apples and selected fruits. These data included origin, variety, grade, size, and price of fruit; type, size, and location of display; type of package materials for apples and other fruits; and the type, amount, size, and location of point-of-sale material. Particular attention was given to maintaining records on pricing practices for the fruits studied so that proper adjustments could be made if major changes occurred among the treatments; however, such changes did not occur. The pricing practices used for apples were units of 1 or 2 pounds for premium quality and size fruit displayed in bulk and units of 4 and 5 pounds for economy grade and size fruit displayed in packages. Oranges were generally displayed in bulk and priced in units of one dozen. Grapefruit was displayed in bulk and priced in units of 3 or 6. Bananas were displayed in random size tape wrapped hands and the pricing units on the display were one pound. The

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2/ Methodology and analytical tables 5 to 21 are given in the appendix.
3/ Data were collected by standard audit method: (beginning inventory + weekly receipts) - (ending inventory + transfers + withdrawals + spoilage) = sales.

weighted average price for each fruit did not vary significantly between periods of the no-advertising treatment and the treatments using either of the promotional themes. In addition, data were obtained weekly for total store sales, sales of produce, number of customers, and square inches of space in newspaper advertisements devoted to all apples, Washington State apples, and other selected fruits.

Analyses of variance and covariance were used in conjunction with appropriate statistical tests to determine the overall effects of the treatments and nonquantitative factors (time, city, and stores) on sales of apples (Washington and other), bananas, grapefruit, and oranges. Multiple regression analyses were used to measure the sales effects of certain merchandising practices. A detailed discussion of these analytical procedures is given in the appendix.

Table 1.--Double change-over experimental design used in apple advertising study, 72 supermarkets in 6 midwestern cities, January 19 to May 9, 1959

Four-week periods	Joplin, Mo.	Topeka, Kans.	Cedar Rapids, Iowa	Springfield, Mo.	Lincoln, Nebr.	Davenport, Iowa
Jan. 19-Feb. 14	1/A	B	C	A	B	C
Feb. 16-Mar. 14	B	C	A	C	A	B
Mar. 16-Apr. 11	C	A	B	B	C	A
Apr. 13-May 9	C	A	B	B	C	A

1/ Letters designate advertising and promotional themes used in study: A, health; B, apple-use; C, no advertising and promotion (control).

FINDINGS

Effects of Specific Apple Advertising Themes on Apple Sales 4/

Washington State apples.--Sales of Washington State apples during 4-week periods of advertising using the apple-use theme averaged almost 32 percent higher per store than sales during comparable periods of no advertising (table 2). For the health theme, average sales per store per 4-week period were 21 percent greater than in periods of no advertising.

4/ In comparing sales differences between treatments (promotional themes and no promotion) for the fruits studied, it was assumed that differences in prices and merchandising practices employed by the stores for each treatment were associated with the presence or absence of advertising for apples and were part of the treatment. However, differences in price and other merchandising practices between treatments were not significant (see appendix). A separate analysis of the effect of these factors is given in the following section of this report.

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Statistical tests indicated the increased sales for the use theme were significant at the 0.05 probability level while the gain in sales for the health theme was significant at the 0.10 probability level (table 2). In other words, the odds are only 5 and 10 in 100 that increases of such magnitude could be due to sampling errors or chance variations. Since the odds are so low, it is concluded that the increases were due to the influence of the advertising and promotion using the two themes.

Sales of Washington State apples per store per 4-week period were almost 9 percent greater for the apple-use theme than for the health theme (table 2). However, this difference was not large enough to be statistically significant at an acceptable probability level. On the basis of the results under analysis, we cannot conclude that the apple-use theme was any more effective in increasing sales of Washington State apples than the health theme.

Table 2.--Sales of apples from Washington State and other areas, without promotion and with promotion based on 2 themes, 72 supermarkets in 6 midwestern cities, 4-week periods from January 19 to May 9, 1959 1/

Source of apples	Average sales per store per 4-week period			Difference in sales between--					
	With no promotion	With apple-use theme	With health theme	No promotion and--				Apple-use theme and health theme	
				Apple-use theme		Health theme			
	Lb.	Lb.	Lb.	Lb.	Pct.	Lb.	Pct.	Lb.	Pct.
Washington State....	3,124	4,117	3,784	993	31.8	660	21.2	333	8.8
Other areas (Midwestern and Eastern States and Canada)............	2,227	2,322	2,026	95	4.3	-201	-9.1	295	14.6
Total or average....	5,351	6,439	5,810	1,088	20.1	459	8.6	629	10.8

1/ All sales data are adjusted for variations among treatments (no promotion, apple-use theme, and health theme) which might be attributed to differences in number of customers and purchasing power per customer.

Sales of Washington apples in any period were not significantly affected by the presence or absence of advertising in the preceding 4-week period.

All apples.--When sales of apples from Washington State and from other areas (Midwestern and Eastern States, and Canada) were combined, sales per store per 4-week period were 20 percent higher for the use theme than for periods of no advertising. The increase was statistically significant at the 0.01 probability level. Sales for the health theme were about 9 percent greater, and significant at the 0.10 level (table 2).

A comparison of the effects of the two promotional themes showed almost 11 percent greater sales for the apple-use theme; this sales difference was statistically significant at the 0.05 probability level. Although the two themes had about the same effect on sales of Washington apples, the use theme was more effective than the health theme in promoting sales of apples in general.

Test results of carryover effects of treatments for total apple sales were similar to the findings for Washington State apples. That is, sales of all apples during any 4-week period were not appreciably affected by the presence or absence of promotion in the preceding 4-week period.

Effects of Apple Advertising Themes on Sales of Other Fruits

Advertising Washington State apples appeared to exert only a minor influence, if any, on the sales of oranges, grapefruit, and bananas individually and in total. The effect of the advertising seemed to vary among the fruits to a limited extent, depending on the theme employed (table 3). The sales differences between treatments were not of sufficient magnitude to determine whether the promotional themes for apples significantly raised or lowered the sales of these fruits. However, the differences that were found corresponded to findings of previous research studies. Thus, some logical inferences can be drawn concerning the influence of the promotional themes for apples on the sales of these fruits.

Oranges.--Orange sales followed the same trend as apple sales when apples were advertised, showing sales increases of about 3 percent for the apple-use theme and 5 percent for the health theme (table 3). These findings correspond to results found in previous research which indicated that merchandising practices which increase sales of apples also benefit sales of oranges (4, 5, 6).

Grapefruit.--Sales of grapefruit were slightly lower during periods of advertising using the apple-use theme than in periods of no promotion (table 3). However, grapefruit sales during periods of advertising employing the health theme were about 14 percent higher than sales during periods of no advertising. During the study it was observed that grapefruit was emphasized in large pictorial point-of-sale material furnished cooperating stores by the United Fresh Fruit and Vegetable Association which was conducting institutional promotion around the general theme of "Fresh for Health." Evidence that consumers associate health factors with grapefruit was found in a recent study in which 65 percent of a nationwide sample of housewives said they used grapefruit because of its healthful qualities (7).

Bananas.--Banana sales were lower when either the apple-use or health theme was advertised than during periods of no promotion (table 3). These sales results, while not statistically significant, are similar to the findings of previous studies which have indicated that apples and bananas are competitive products (4, 5, 6).

Table 3.--Sales of oranges, grapefruit and bananas without apple promotion and with apple promotion based on 2 themes, 72 supermarkets in 6 midwestern cities, 4-week periods from January 19 to May 9, 1959 1/

Fruit	Average sales per store per 4-week period			Difference in sales between no promotion and--	
	With no promotion	With apple-use theme	With health theme	Apple-use theme	Health theme
	Pounds	Pounds	Pounds	Percent	Percent
Oranges.......:	5,516	5,680	5,784	3.0	4.9
Grapefruit....:	5,272	5,156	5,996	-2.2	13.7
Bananas.......:	5,944	5,836	5,752	-1.8	-3.2
Total.......:	16,732	16,672	17,408	- .4	4.0

1/ All sales data were adjusted for variations among treatments (no promotion, apple-use theme, and health theme) which might be attributed to differences in number of customers and purchasing power per customer. Sales data were further adjusted for the effects of prices, display space, and other significant merchandising and promotional practices employed by stores (see tables 4 through 9).

Effects of Selected Merchandising and Promotional Practices Employed by Stores

Analysis of the supplemental data on merchandising and promotional practices employed by stores in selling apples, bananas, grapefruit, and oranges revealed that changes in some but not all practices were related to changes in sales of these fruits. The practices significantly related to sales of each fruit studied were established (table 4) and the weekly store average and range of variation for each practice were ascertained (tables 5 and 6).

Sales of each fruit were primarily affected by the merchandising and promotional practices used directly with it, such as price, special displays, amount of display space, and newspaper advertising (table 4). The major exception to this generalization was the amount of display space devoted to each fruit, which affected the fruit displayed and also had varying influences on other fruits (table 4). Variation in the amount of display space used for grapefruit affected all fruit except bananas. Grapefruit sales varied directly with the amount of space in grapefruit displays, while sales of apples and oranges varied inversely with the amount of space contained in grapefruit displays (tables 7, 8, 10, and 11). The amount of space in banana displays affected the sales of bananas and oranges. Banana sales increased and orange sales decreased when the size of banana displays were increased. Similarly, a decrease in banana sales and an increase in orange sales were associated with a decrease in the amount of space used for banana displays (tables 9 and 11). In a like manner, the sales of apples from a specific area varied directly with an

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increase or decrease in the amount of display space devoted to them and varied inversely with an increase or decrease in the amount of display space used for apples from other areas (tables 7 and 8).

These analyses showed that price and amount of display space devoted to each fruit exerted the most influence on sales. The relationship to sales for each fruit was direct for the amount of display space and inverse for price (tables 7, 8, 9, 10, and 11). The variation in sales of each fruit from week to week was also generally related directly to the week-to-week variation in amount of newspaper advertising space devoted to each fruit by retailers: however, the variation in the amount of newspaper advertisement space for eastern and midwestern apples and grapefruit was not sufficient to detect statistically significant relationships.

Sales of each fruit studied were significantly related to the volume of produce sales and the relationships were direct (tables 7, 8, 9, 10, and 11). Produce sales reflect the combined effects of promotional and merchandising practices employed by stores on the sales of individual products and the influence of such practices in drawing additional customers into the stores. Thus, findings pertaining to practices affecting sales of the fruits studied become more significant in view of their relation to sales of all produce.

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APPENDIX

Methodology

Variance and covariance analyses.--Analyses of variance and covariance of
the sales data were made to determine the effect of the two apple promotional
themes (apple-use and health), as compared to no promotion and to each other,
on sales of apples (Washington State apples and all apples), oranges, grape-
fruit, and bananas. Variance analysis was used to segregate the variations in
the sales data associated with the factors stratified in the experimental de-
sign and with experimental error (9). These factors included time periods,
cities, and treatment effects. The experimental error includes variation asso-
ciated with noncontrollable factors and sampling error or chance variation. 5/

Data on sales of Washington apples and other apples for each treatment
were adjusted by covariance analysis for the differences among treatments (no
promotion, apple-use theme, and health theme) which could be associated with
differences in produce sales among treatments (10, pp. 394-412). Produce sales
were used as an index to reflect changes in the number of customers patronizing
the stores and changes in the relative purchasing power of customers. The re-
gression of produce sales on sales of Washington State apples and all apples
increased the precision of the findings of these data.

Sales of oranges, grapefruit, and bananas were similarly adjusted for the
effects of differences in customer traffic and purchasing power, and also for
the merchandising and promotional practices employed by stores which signifi-
cantly affected sales and varied among the treatments. The partial regression
coefficients obtained in the multiple regression analysis (discussed in the
section immediately following) were used in making these adjustments.

The "F" test was used to determine if the variations in sales among the
three treatment means were statistically significant; and the "least signifi-
cant difference" test was employed to determine if differences between any two
treatment means were statistically significant (8; 10, pp. 244-250). These
statistical tests indicate the probability (odds) of finding sales differences

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5/ If sales data for apples and other fruits had been gathered from all
food supermarkets in all cities throughout the United States, there would be no
sampling error. However, sales data obtained from a sample of stores will vary
between samples. Sampling error or chance variation refers to the estimate of
such variation between samples of stores plus the nonconstant errors made in
collecting and recording the data.

(increases or decreases) such as those obtained between treatments as a result
of experimental errors, if in fact the true differences between treatments had
been zero. A difference in sales between two treatments is considered to be
statistically significant with a high degree of confidence if the probability
is 0.10 or less (0.05, 0.01, 0.005) that the difference is due to sampling
error or chance variation. That is, if the odds that the sales differences
were due to chance are low, (10 in 100, 5 in 100), it is concluded that the
differences are due to the influence of the treatments. The researcher may use
a probability level of a greater magnitude (for example 0.20) in testing differ-
ences between treatments; however, less confidence is placed in the inferences
or conclusions drawn from such a test. For example, if the difference in sales
between two treatments is found to be significant at the 0.01 probability level,
the odds are 99 to 1 that the difference in sales is due to the difference in
the effects of the treatment; but if the difference in sales is significant at
the 0.10 probability level, the odds are 9 to 1 (90 to 10) that the difference
is due to the treatment effects, and at the 0.20 probability level, the odds
are only 4 to 1 (80 to 20). Thus, the findings of significance at the 0.10,
0.20, and higher probability levels should be used with greater reservation
than when the 0.01 or 0.05 level is attained.

Multiple regression analysis.--Multiple regression analyses were made of
supplementary data (prices, display space, newspaper advertisement space, and
produce sales) to determine the influence of specific factors on sales of
Washington State apples, apples from other areas, oranges, grapefruit, and ba-
nanas, and to adjust the sales data if necessary. The supplementary data used
are hereafter referred to as quantitative factors.

Data for these quantitative factors were tabulated for each city by weeks
and plotted on scatter diagrams against sales of each fruit. Thus, a general
indication was obtained of the factors related to volume of sales of each fruit.
Factors which had no apparent relation to sales were eliminated. A multiple
covariance technique was used to adjust the sales variations for each fruit and
the selected quantitative factors for the effects of differences in cities and
time periods. Corrections were made by this technique only for the nonquanti-
tative factors of cities and time periods which were fixed or balanced by the
design of the experiment. It was not possible to measure the direct effects on
sales of such nonquantitative factors as variety, size, and quality of fruits,
size of pricing unit, type of display (prepackaged, bulk, or combination), and
packaging material. It is necessary to use other research techniques such as
controlled experiments to evaluate the sales effectiveness of such factors. A
multiple regression analysis was made of the adjusted data to identify and quan-
tify the net effects of the factors significantly affecting sales of Washington
apples and selected other fruits. The multiple regression analysis was repeated
until only those factors affecting sales remained which were statistically sig-
nificant at the 0.05 probability level. The practical significance of a factor
was also a criterion for retaining it in repeated analysis; that is, the magni-
tude of a change in sales associated with a unit change in the factor. 6/

6/ The model for the complete analysis was programed on the IBM 650 elec-
tronic data-processing computer. Details of this program are outlined in
No. 06.2002.8, parts 1, 4, 6, and 8 of the library series of programs at the
Institute of Statistics, University of North Carolina, Raleigh, N. C.

Method of weighting prices.--The prices observed during the first and last part of each week for each variety and size of apples and other selected fruits were weighted in relation to the estimated volume of sales made during each part of the week. Weighting factors of 0.2 were applied to the prices observed during the first part of each week and 0.8 for prices observed during the last part of each week for each variety and size of fruit observed and displayed separately in the stores. 7/ The weighted price obtained for each variety and size in this manner was then applied to the total pounds of the variety or size of fruits sold for the week. The total values obtained for apples from speci-fied areas and other fruits were then divided by the total pounds sold during the week to arrive at an average weekly price for each fruit. The following example illustrates the computation of the average weighted weekly price of Washington State apples for a store with two displays of apples from this area. The price of apples from other areas and the price of other fruits were weighted in a similar manner.

Price-weighting formula	Cents per pound
Step I--time of week:	
Price per pound of Winesap apples, Tuesday, 18¢ times 0.2..	03.60
Price per pound of Winesap apples, Friday, 15¢ times 0.8...	12.00
Total, rounded..	15.6
Price of Red Delicious apples, Tuesday, 21¢ times 0.2......	04.20
Price of Red Delicious apples, Friday, 19¢ times 0.8.......	15.20
Total, rounded..	19.4
Step II--pounds of Washington apples sold:	
Step I, $.156 times weekly sales of Winesap apples,	
2,200 pounds equals $343.20	
Weighted price for Red Delicious apples obtained in	
Step I, $.194 times weekly sales of Red Delicious	
apples, 1,000 pounds equals $194.00	
Final weighted price equals total weekly value of	
Washington State apple sales, $537.20, divided by	
total weekly sales in pounds, 3,200.....................	16.8

7/ The weighting factors of 0.2 for the first 3 days of the week and 0.8 for the last 3 days of the week were based upon findings of previous research and estimates of leaders in the trade.

Table 4.--Merchandising and promotional practices employed by stores which significantly affected sales of Washington State apples, other apples, and other selected fruits, 72 food supermarkets in 6 midwestern cities, January 19 to May 9, 1959 1/

Factors	Factors significantly affecting sales of--				
	Washington State apples	Other apples	Oranges	Grapefruit	Bananas
Price:					
Washington State apples...........	x	--	--	--	--
Other apples......................	--	x	--	--	--
Oranges...........................	--	--	x	--	--
Bananas...........................	--	--	--	--	x
Grapefruit........................	--	--	--	x	--
Display space:					
Washington State apples...........	x	x	--	--	--
Other apples......................	x	x	--	--	--
Oranges...........................	--	--	x	--	--
Grapefruit........................	x	x	x	x	--
Bananas...........................	--	--	x	--	x
Newspaper advertisement space:					
Washington State apples...........	x	--	--	--	--
Oranges...........................	--	--	x	x	--
Bananas...........................	--	--	--	--	x
Grapefruit........................	--	--	--	--	--

1/ Factors statistically significant at 5 percent probability level.

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Table 5.--Prices, display space, and newspaper advertisement space for fruit, and sales of all produce, 72 supermarkets in 6 midwestern cities, January 19 to May 9, 1959

Factor	Weekly average per store	95-percent range of variations 1/
	Ct./lb.	Ct./lb.
Price:		
Washington State apples..:	16.6	11.2 - 22.0
Other apples.............:	13.2	4.4 - 22.0
Oranges..................:	13.2	10.0 - 16.2
Grapefruit...............:	9.0	5.6 - 12.4
Bananas..................:	16.8	11.7 - 21.9
	Sq. ft.	Sq. ft.
Display space:		
Washington State apples..:	24.0	0 - 52.0
Other apples.............:	15.7	0 - 39.9
Oranges..................:	14.3	0 - 57.1
Grapefruit...............:	26.7	0 - 57.0
Bananas..................:	15.7	1.2 - 30.2
	Sq. in.	Sq. in.
Newspaper advertisement space:		
Washington State apples..:	3.7	0 - 24.5
Oranges..................:	5.0	0 - 35.3
Grapefruit...............:	6.5	-- --
Bananas..................:	4.1	0 - 27.5
	Dol.	Dol.
Produce sales............:	1,566	50 - 3,082

1/ Approximately 95 percent of the observations fall within specified limits of range. A lower limit of zero means that the factor was not observed to be present for a particular store during a particular week.

Table 6.--Prices, display space, and newspaper advertisement space for fruit, and sales of all produce, without apple promotion and with promotion based on 2 themes, 72 supermarkets in 6 midwestern cities, January 19 to May 9, 1959

Quantitative factor	Weekly average per store during--		
	No promotion	Apple-use theme	Health theme
	Ct./lb.	Ct./lb.	Ct./lb.
Price:			
Washington State apples......:	16.6	16.5	16.8
Other apples 1/...........:	13.9	13.5	12.1
Oranges...............:	13.1	13.2	13.2
Grapefruit............:	9.0	8.9	9.0
Bananas...............:	17.0	16.5	16.8
	Sq. ft.	Sq. ft.	Sq. ft.
Display space:			
Washington State apples......:	22.4	24.0	25.7
Other apples..........:	16.6	15.5	15.0
Oranges...............:	27.7	28.6	29.1
Grapefruit............:	27.1	26.1	27.0
Bananas...............:	16.2	15.6	15.2
	Sq. in.	Sq. in.	Sq. in.
Newspaper advertisement space::			
Washington State apples......:	4.3	4.2	2.5
Oranges...............:	5.7	4.4	4.8
Grapefruit............:	7.1	4.8	7.4
Bananas...............:	4.5	5.7	2.0
	Dol.	Dol.	Dol.
Produce sales............:	1,572	1,594	1,534

1/ From Midwestern and Eastern States, and Canada.

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Table 7.--Changes in sales of Washington State apples associated with changes in significant merchandising and promotional factors during test of 2 apple advertising themes, 72 supermarkets in 6 midwestern cities, January 19 to May 9, 1959

Factor	Units of measure	Weekly averages: per store	Change in Washington State apple sales associated with a unit change in each factor (b value) [1]		Percentage of total variation in sales associated with observed variations in each factor ($R_1{}^2$)
			Pounds		Percent
Display space for Washington State apples..	Sq. ft.	24.0	+21.8		17.2
Produce sales............................	Dol.	1,566.0	+ .3		14.7
Display space for other apples [2]........	Sq. ft.	15.7	-6.8		1.7
Price of Washington State apples..........	Ct./lb.	16.6	-25.9		1.3
Display space for grapefruit..............	Sq. ft.	26.7	-4.8		.9
Newspaper advertisement space for Washington State apples.................	Sq. in.	3.7	+5.0		.8
Joint effects of above factors...........	---	---	---		13.0
Total....................................	---	---	---		49.6
Other factors and experimental error [3]	---	---	---		50.4
Total....................................	---	---	---		100.0

[1] A plus sign indicates that a positive change (increase) in the value of a factor is accompanied by an increase in apple sales, and a negative change by a decrease in apple sales. For example, on the average an increase of 1 square foot in the display space for Washington State apples was accompanied by an increase of 21.8 pounds in Washington apple sales. A negative sign signifies that a positive change in the factor results in decreases in Washington apple sales and a negative change (decrease) in the factor results in an increase in Washington apple sales. Thus, on the average, an increase of 1 cent a pound in the price of Washington apples resulted in a decrease of 25.9 pounds in sales of Washington apples.

[2] From Midwestern and Eastern States, and Canada.

[3] Other factors include nonquantitative factors such as quality, variety, and size of apples.

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Table 8.--Apples from areas other than Washington State: Changes in sales associated with changes in significant merchandising and promotional factors during test of 2 apple advertising themes, 72 supermarkets in 6 midwestern cities, January 19 to May 9, 1959 1/

Factor	Units of measure	Weekly averages per store	Changes in apple sales associated with a unit change of each factor (b value) 2/ Pounds	Percentage of total variations in sales associated with observed variations in each factor (R_i^2) Percent
Display space for apples (other than Washington apples)..........	Sq. ft.	15.7	+25.8	19.4
Produce sales...................	Dol.	1,566.0	+ .3	6.8
Display space for Washington State apples..................	Sq. ft.	24.0	-8.4	2.0
Display space for grapefruit........	Sq. ft.	26.7	-6.4	1.3
Price of other apples.............	Ct./lb.	13.2	-8.8	0.3
Joint effects of above factors......	---	---	---	7.7
Total........................	---	---	---	37.5
Other factors and experimental errors 2/..................	---	---	---	62.5
Total........................	---	---	---	100.0

1/ Apples from Midwestern and Eastern States, and Canada.
2/ A plus sign indicates that a change in apple sales is in same direction as the change in the value of factor; an increase in value of factor is accompanied by an increase in apple sales. A negative sign indicates that changes are in opposite direction.
3/ Other factors include nonquantitative factors such as variety, quality, and size of apple.

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Table 9.--Changes in sales of bananas associated with changes in significant merchandising and promotional factors during test of 2 apple advertising themes, 72 food supermarkets in 6 midwestern cities, January 19 to May 9, 1959

Factors affecting sales of bananas	Units of measure	Weekly averages per store	Changes in sales associated with a unit change of each factor (b value) [1]	Percentage of total variation in sales associated with observed variations in each factor (R_i^2)
			Pounds	Percent
Produce sales....................	Dol.	1,566.0	+0.7	25.6
Newspaper advertisement space for bananas.......................	Sq. in.	4.1	+19.6	4.8
Price of bananas.................	Ct./lb.	16.8	-86.8	4.5
Display space for bananas........	Sq. ft.	15.7	+15.6	1.1
Joint effects of above factors...	---	---	---	14.7
Total............................	---	---	---	50.7
Other factors and experimental errors [2]/......................	---	---	---	49.3
Total............................	---	---	---	100.0

[1]/ A plus sign indicates change in banana sales is in same direction as change in value of factor; that is, an increase in value of factor is accompanied by an increase in banana sales. A negative sign indicates changes are in opposite direction.
[2]/ Other factors include such nonquantitative factors as quality, size of pricing unit, and type of display.

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Table 10.--Changes in sales of grapefruit associated with changes in significant merchandising and promotional factors during test of 2 apple advertising themes, 72 food supermarkets in 6 midwestern cities, January 19 to May 9, 1959

Factors affecting sales of grapefruit	Units of measure	Weekly averages per store	Changes in grapefruit sales associated with a unit change of each factor (b value) [1]		Percentage of total variation in sales associated with observed variations in each factor (R_i^2)
			Pounds		Percent
Produce sales..............	Dol.	1,566.0	+0.8		25.1
Price of grapefruit........	Ct./lb.	9.0	-122.1		3.6
Display space for grapefruit.	Sq. ft.	26.7	+10.7		1.9
Newspaper ad space for oranges..................	Sq. in.	5.0	+8.5		1.4
Joint effects of above factors.................	---	---	---		17.4
Total.................	---	---	---		49.4
Other factors and experimental errors [2]/...	---	---	---		50.6
Total.................	---	---	---		100.0

1/ A plus sign indicates change in grapefruit sales is in same direction as change in value of factor, i.e., an increase in value of factor is accompanied by an increase in grapefruit sales. A negative sign indicates changes are in opposite direction.
2/ Other factors include such nonquantitative factors as quality and variety of grapefruit, and type of display.

Table 11.--Changes in sales of oranges associated with changes in significant merchandising and promotional factors during test of 2 apple advertising themes, 72 food supermarkets in 6 midwestern cities, January 19 to May 9, 1959

Factors affecting sales of oranges	Units of measure	Weekly averages per store	Changes in orange sales associated with a unit change of each factor (b value) [1]	Percentage of total variation in sales associated with observed variations in each factor (R_i^2)
			Pounds	Percent
Produce sales [2]................	Dol.	1,566.0	+0.7	30.4
Display space for oranges....	Sq. ft.	28.5	+16.2	3.2
Price of oranges............	Ct./lb.	13.2	-93.9	2.6
Newspaper advertisement space for oranges............	Sq. in.	5.0	+6.5	1.1
Display space for bananas....	Sq. ft.	15.7	-14.9	1.0
Display space for grapefruit.	Sq. ft.	26.7	-7.3	.8
Joint effects of above factors.................	---	---	---	13.6
Total.................	---	---	---	52.7
Other factors and experimental errors [2]..............	---	---	---	47.3
Total.................	---	---	---	100.0

[1] A plus sign indicates change in orange sales is in same direction as change in value of factor, i.e., an increase in value of factor is accompanied by an increase in orange sales. A negative sign indicates changes are in opposite direction.
[2] Other factors include such nonquantitative factors as quality and size of orange.

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Table 12.--Analysis of covariance, Washington State apple sales in pounds (Y$_2$), produce sales in dollars (X$_1$), 72 food supermarkets in 6 midwestern cities, January 19 to May 9, 1959

Source of variation	Degrees of freedom	Sum of squares and products			Error of estimate		
		SX$_1^2$	SX$_1$Y$_2$	SY$_2^2$	SS	Degrees of freedom	Mean square
Variance between squares	1	1,069,495,206	1,347,843,530	1,698,635,178	---	---	---
Periods within squares	6	989,824,182	460,118,871	456,393,772	---	---	---
Between periods	3	964,234,684	386,067,879	239,007,656	---	---	---
Periods x squares	3	25,589,498	74,050,992	217,386,116	---	---	---
Cities within squares	4	6,160,749,391	3,913,851,525	4,500,496,182	---	---	---
Between cities	2	3,519,317,855	2,783,553,058	3,150,764,502	---	---	---
Cities x squares	2	2,641,431,536	1,130,298,467	1,349,731,680	---	---	---
Direct effect of treatments	2	36,021,777	2,604,759	496,806,198	---	---	---
Error 1/	10	69,926,512	-78,414,629	600,608,902	512,675,815	9	56,963,979
Direct effect of treatment plus error	12	105,948,289	-75,809,870	1,097,415,100	1,043,170,369	11	---
Adjusted for produce sales	---	---	---	---	530,494,554	2	2/265,247,277

1/ Carryover effects are insignificant and are pooled in error terms.
2/ This mean square with 2 degrees of freedom tested against error mean square with 9 degrees of freedom is significant at the .005 percent probability level.

Table 13.--Analysis of covariance, total apple sales in pounds (Y_1), produce sales in dollars (X_1), 72 food supermarkets in 6 midwestern cities, January 19 to May 9, 1959

Source of variation	Degrees of freedom	Sum of squares and products			Error of estimate		
		SX_1^2	SX_1Y_1	SY_1^2	SS	Degrees of freedom	Mean square
Variance between squares	1	1,069,495,206	1,607,807,526	2,417,070,246	---	---	---
Periods within squares	6	989,824,182	-1,448,912,250	2,437,012,149	---	---	---
Between periods	3	964,234,684	-1,450,684,268	2,422,596,446	---	---	---
Periods x squares	3	25,589,498	1,772,018	14,415,703	---	---	---
Cities within squares	4	6,160,749,391	2,791,089,570	1,613,017,480	---	---	---
Between cities	2	3,519,317,855	1,636,124,065	825,223,082	---	---	---
Cities x squares	2	2,641,431,536	1,154,965,504	787,794,398	---	---	---
Direct effects of treatments	2	36,021,777	42,438,284	492,948,044	---	---	---
Error 1/	10	69,926,512	-82,535,043	353,388,409	255,971,376	9	28,441,264
Treatments + error	12	105,948,289	-40,096,759	846,336,453	831,161,596	11	---
Adjusted for produce sales	---	---	---	---	575,190,220	2	2/287,595,110

1/ Carryover effects are insignificant and are pooled in error terms.
2/ This mean square with 2 degrees of freedom tested against error mean square with 9 degrees of freedom is significant at the .005 percent probability level.

Table 14.--Analysis of variance, orange sales in pounds, 72 supermarkets in 6 midwestern cities, January 19 to May 9, 1959

Source of variation	Degrees of freedom	Sums of squares	Mean square
Variance between squares....:	1	252,954,295	252,954,295
Periods within squares.....:	6	681,904,557	113,650,760
Between periods..........:	3	660,715,087	220,238,696
Periods x squares.........:	3	21,189,470	7,063,157
Cities within squares......:	4	2,367,207,269	591,801,817
Between cities...........:	2	574,046,399	287,023,200
Cities x squares..........:	2	1,793,160,870	896,580,435
Direct effect of treatments.............:	2	72,454,980	1/36,227,490
Error 2/................:	10	372,991,297	37,299,130

1/ This mean square with 2 degrees of freedom tested against error mean square with 10 degrees of freedom is not significant at an acceptable probability level.
2/ Carryover effects are insignificant and are pooled in error term.

Table 15.--Analysis of variance, grapefruit sales in pounds, 72 supermarkets in 6 midwestern cities, January 19 to May 9, 1959

Source of variation	Degrees of freedom	Sums of squares	Mean square
Variance between squares...	1	1,169,746,288	1,169,764,288
Periods within squares......	6	3,336,197,094	556,032,849
Between periods.............	3	3,164,246,918	1,054,782,306
Periods x squares...........	3	171,950,176	57,316,725
Cities within squares.......	4	3,673,858,464	918,464,616
Between cities..............	2	542,214,184	271,107,092
Cities x squares............	2	3,131,644,280	1,565,822,140
Direct effect of treatments...........	2	271,702,691	1/135,851,346
Error 2/....................	10	903,048,905	90,304,891

1/ This mean square with 2 degrees of freedom tested against error mean square with 10 degrees of freedom is not significant at an acceptable probability level.
2/ Carryover effects are insignificant and are pooled in error term.

Table 16.--Analysis of variance, banana sales in pounds, 72 supermarkets in 6 midwestern cities, January 19 to May 9, 1959

Source of variation	Degrees of freedom	Sums of squares	Mean square
Variance between squares:	1	989,373,368	989,373,368
Periods within squares...:	6	623,826,252	103,971,042
Between periods.........:	3	587,507,391	195,835,797
Periods x squares.......:	3	36,318,861	12,106,287
Cities within squares...:	4	4,616,655,173	1,154,163,793
Between cities.........:	2	3,954,688,850	1,977,344,425
Cities x squares........:	2	661,966,323	330,983,162
Direct effect of treat- ments.................:	2	258,721,440	1/129,360,720
Error 2/.............:	10	369,054,042	36,905,404

1/ This mean square with 2 degrees of freedom tested against error mean square with 10 degrees of freedom is not significant at an acceptable probability level.
2/ Carryover effects are insignificant and are pooled in error term.

Table 17.--Analysis of variance of Washington State apple sales associated with quantitative factors adjusted for nonquantitative factors, 72 supermarkets in 6 midwestern cities, January 19 to May 9, 1959

Source of variation	Degrees of freedom	Sums of squares	Mean square	F ratio [1]
Total........................	863	412,284,650	---	---
Nonquantitative factors:				
Cities and time periods......	17	129,383,870	7,610,816	22.76
Error[1]......................	846	282,900,780	334,398	---
Quantitative factors: [2]				
Display space for Washington State apples.................	1	48,705,457	48,705,457	286.56
Produce sales................	1	41,561,786	41,561,786	244.53
Display space for other apples......	1	4,861,877	4,861,877	28.61
Price of Washington State apples......	1	3,630,474	3,630,474	21.36
Display space for grapefruit.........	1	2,558,838	2,558,838	15.06
Newspaper advertisement space for Washington State apples..........	1	2,113,867	2,113,867	12.44
Joint effects of above factors (interactions)............	---	36,697,381	---	---
Error[2]......................	840	142,771,100	169,966	---

[1] All factors significant at the .05 percent probability level.
[2] Quantitative factors are adjusted for each other and for nonquantitative factors of cities and time periods.

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Table 18.--Apples from areas other than Washington State: Analysis of variance of sales associated with quantitative factors adjusted for nonquantitative factors, 72 supermarkets in 6 midwestern cities, January 19 to May 9, 1959

Source of variation	Degrees of freedom	Sums of squares	Mean square	F ratio [1]
Total.............................	863	445,816,140	---	---
Nonquantitative factors:				
Cities and time periods.........	17	77,262,200	4,544,835	10.43
Error$_1$.........................	846	368,553,940	435,643	---
Quantitative factors: [2]				
Display space for apples other than Washington apples................	1	71,576,782	71,576,782	261.44
Produce sales...................	1	25,209,570	25,209,570	92.08
Display space for Washington State apples.........................	1	7,216,814	7,216,814	26.36
Display space for grapefruit....	1	4,654,243	4,654,243	17.00
Price of other apples...........	1	1,193,676	1,193,676	4.36
Joint effects of above factors (interactions)................	---	28,454,575	---	---
Error$_2$.........................	841	230,248,280	273,779	---

1/ All factors significant at the .05 percent probability level.
2/ Quantitative factors are adjusted for each other and for nonquantitative factors of cities and time periods.

Table 19.--Analysis of variance of orange sales associated with quantitative factors, adjusted for nonquantitative factors, 72 supermarkets in 6 midwestern cities, January 19 to May 9, 1959

Source of variation	Degrees of freedom	Sums of squares	Mean square	F ratio [1]
Total........................	863	712,705,990	825,847	---
Nonquantitative factors:				
Cities and time periods......	17	56,499,250	3,323,485	4.28
Error$_1$...................	846	656,206,740	775,658	---
Quantitative factors: [2]				
Produce sales.	1	199,162,746	199,162,746	549.11
Display space for oranges....	1	21,145,468	21,145,468	58.30
Price of oranges.............	1	16,832,953	16,832,953	46.41
Newspaper advertisement space for oranges.............	1	7,438,998	7,438,998	20.51
Display space for bananas....	1	6,677,325	6,677,325	18.41
Price of bananas.............	1	6,198,560	6,198,560	17.09
Display space for grapefruit.	1	5,357,094	5,357,094	14.77
Joint effects of above factors (interactions).......	---	89,087,286	---	---
Error$_2$...................	839	304,306,310	362,701	---

[1] All factors significant at the .05 percent probability level.
[2] Quantitative factors are adjusted for each other and for nonquantitative factors of cities and time periods.

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Table 20.--Analysis of variance of grapefruit sales associated with quantitative factors, adjusted for nonquantitative factors, 72 supermarkets in 6 midwestern cities, January 19 to May 9, 1959

Source of variation	Degrees of freedom	Sums of squares	Mean square	F ratio [1]
Total.........................	863	1,084,170,600	---	---
Nonquantitative factors:				
Cities and time periods.........	17	128,940,110	7,584,712	6.17
Error$_1$......................	846	955,230,490	1,129,114	---
Quantitative factors: [2]				
Produce sales..................	1	240,119,065	240,119,065	418.69
Price of grapefruit............	1	34,779,755	34,779,755	60.64
Display space for grapefruit...	1	18,094,949	18,094,949	31.55
Newspaper advertisement space for oranges...........	1	12,950,749	12,950,749	22.58
Joint effects of above factors (interactions)...........	---	166,397,121	---	---
Error$_2$......................	842	482,888,851	573,502	---

[1] All factors significant at the .05 percent probability level.
[2] Quantitative factors are adjusted for each other and for nonquantitative factors of cities and time periods.

Table 21.--Analysis of variance of banana sales associated with quantitative factors, adjusted for nonquantitative factors, 72 supermarkets in 6 midwestern cities, January 19 to May 9, 1959

Source of variation	Degrees of freedom	Sums of squares	Mean square	F ratio [1]
Total.............................	863	1,010,829,500	---	---
Nonquantitative factors:				
Cities and time periods.............	17	125,152,520	7,361,913	7.03
Error₁.............................	846	885,676,980	1,046,900	---
Quantitative factors: [2]				
Produce sales......................	1	226,376,295	226,376,295	435.70
Newspaper advertisement space for bananas...............	1	42,358,811	42,358,811	81.53
Price of bananas...................	1	39,691,608	39,691,608	76.39
Display space for bananas..........	1	9,441,017	9,441,017	18.17
Joint effects of above factors (interactions).................	---	130,336,619	---	---
Error₂.............................	842	437,472,630	519,564	---

[1]/ All factors significant at the .05 probability level.
[2]/ Quantitative factors are adjusted for each other and for nonquantitative factors of cities and time periods.

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