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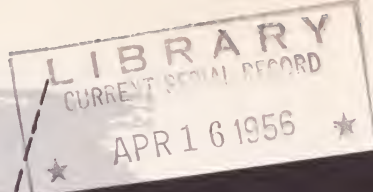
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# **MERCHANDISING of Selected FOOD ITEMS in Grocery Stores**

**Canned RED  
SOUR CHERRIES**

**CARROTS**

**BANANAS**

**MARKETING RESEARCH REPORT NO. 111**  
**Agricultural Marketing Service**  
With the cooperation of  
**PENNSYLVANIA STATE AGRICULTURAL  
EXPERIMENT STATION**

**UNITED STATES DEPARTMENT OF AGRICULTURE**

February 1956

Washington, D. C.

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## ACKNOWLEDGMENTS

The cooperation of the Kroger Company in making available its retail stores as a laboratory in Pittsburgh, Pa., made this merchandising research possible. Special appreciation is due R. D. Hardesty and Harvey Seaman of the Kroger Company Research Department, Cincinnati, Ohio; Robert Tinsley, produce merchandising manager of the Pittsburgh Branch of the Kroger Company.

Appreciation is expressed to A. J. Rogers of the National Red Cherry Institute, and other representatives of that organization, for their part in the development of the experiment on canned red sour cherries.

The Amalgamated Food Employees Union, Local No. 590, Pittsburgh, Pa., cooperated in this research by waiving union membership requirements for the enumerators who collected the retail store data and maintained displays in the experimental stores.

The study on which this report is based was conducted under the authority of the Agricultural Marketing Act of 1946 by the U. S. Dept. of Agriculture with the cooperation of the Pennsylvania State Agricultural Experiment Station in the initial planning and in the employment and training of field personnel.

Related reports issued by the Department:

AMS-18. Merchandising Studies in Supermarkets--Apples, Lettuce, and Tomatoes (A Preliminary Report), by Hugh M. Smith. March 1955. 9 pp.

MRR-102. Merchandising Winter Pears in Retail Food Stores, by Hugh M. Smith, Wendell E. Clement, and William S. Hoofnagle. September 1955. 17 pp.

# MERCHANDISING OF SELECTED FOOD ITEMS

## IN GROCERY STORES

### Canned Red Sour Cherries, Carrots, and Bananas

By Hugh M. Smith and Wendell E. Clement, marketing specialists,  
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#### SUMMARY AND HIGHLIGHTS

Experiments were conducted in Pittsburgh, Pa., in the winter and spring of 1954-55 on merchandising of canned red sour cherries, carrots, and bananas in retail stores.

#### Cherries

An evaluation was made in a 12-week experiment of consumer preference in terms of sales of canned red sour cherries (water-pack, pitted) when offered in 2 can sizes side by side. The two different can sizes were similarly labeled, and the cherries retailed at approximately the same price per ounce regardless of size of can. In pounds, sales of the 19-ounce No. 2 can were 39 percent greater than sales of the 17-ounce No. 303 can. Consumers in the Pittsburgh market, when confronted with an unbiased choice, purchased 5 of the larger cans to each 4 of the smaller ones.

#### Carrots

In 4 weeks of experimentation to evaluate consumer response, carrots were displayed in 4 ways: (1) In 1-pound bunches, (2) in 1-pound polyethylene bags, (3) in 1- and 2-pound polyethylene bags, and (4) in 1-pound bags and 1-pound bunches.

The method by which the most carrots were sold was the combination display of 1- and 2-pound polyethylene bags. This method produced 37 percent more sales than the display in 1-pound bunches alone--the least successful method. The second best method was the combination display of 1-pound bags and 1-pound bunches. Sales by this method were 30 percent greater than those by 1-pound bunches alone, and 9 percent greater than sales from display of 1-pound bags alone.

Although the combination types of display resulted in more sales of product, they required approximately 20 percent more display area.



## Bananas

Bananas in units of various sizes were banded with paper tape on which was marked the weight and price, in a 4-week experiment. The price of the units ranged from 10 to 49 and from 10 to 99 cents. The bananas were displayed on racks and flat tables. Of the 4 merchandising methods tested, none was significantly different from the others in terms of quantity sold.

Purchases in each of the 4 methods tested were made most often at a price from 30 to 39 cents. Over a third of the total sales were within this price range. Ninety-four percent of all purchases during the experiment were within the price range of from 10 to 59 cents. These findings raise some question as to the feasibility of banding bananas in units that retail at a price greater than 59 cents at the current price levels.

Of the total quantity of bananas handled during the experiment, 8.8 percent were sold at reduced prices because of deterioration. Spoilage accounted for 6 percent of the total quantity of bananas. No definite relationship could be established between the merchandising method and markdown sales and spoilage.

## BACKGROUND AND PURPOSE OF STUDY

Within recent years there have been important changes in merchandising practices in retail grocery stores. In many stores today the consumer has the opportunity to select the type or quantity of products desired without being influenced by a clerk. Thus, the consumer's decision is more directly affected by the display, type and size of package, price in relation to competing products, labeling, advertising, and many other retailing factors than formerly. Increased production of agricultural products through technical advances also has brought pressure upon the marketing system to move larger quantities into the hands of consumers. Therefore, it is important that the merchandising program, an important facet of the marketing system, function at a high level of effectiveness.

Experimental research was carried out in a selected group of retail food stores in Pittsburgh, Pa., during the spring and winter of 1954-55, directed toward determining which of several methods of merchandising would be most successful in moving larger quantities of each of three products into consumption. In view of a trend toward a smaller can for many vegetables and some fruits, canned red sour cherries in 2 can sizes were displayed side by side to determine which was the better seller. Four methods of merchandising carrots and bananas were evaluated by total sales resulting from each method tested. Results of these experiments should provide definite information as to the merits of each of the merchandising methods tested.

## CANNED RED SOUR CHERRIES

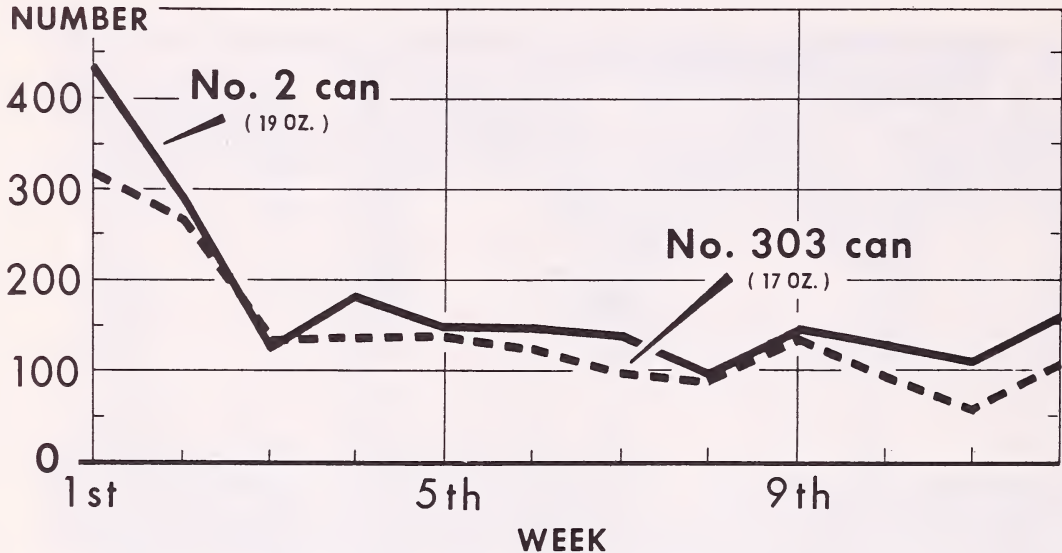
Producers and processors of canned red sour cherries (primarily for piemaking) have been concerned that the long-run demand for their product may be adversely affected if the trend to pack cherries in the small can continues. This trend is indicated as follows: In 1952, over 2 million cases of No. 2 cans (19 ounces) were packed; and 375,000 cases



Figure 1.--Merchandising display of canned red sour cherries in can sizes No. 2 (right) and No. 303.

# SALES OF RED SOUR CHERRIES BY WEEKS

In 12 Stores, Pittsburgh, Pa., Feb. 21 - May 14, 1955



APPROXIMATELY SAME PRICE PER OUNCE FOR BOTH CANS

U. S. DEPARTMENT OF AGRICULTURE

NEG. 1776-55 (8)

AGRICULTURAL MARKETING SERVICE

Figure 2, A

of No. 303 cans (17 ounces) were packed. In contrast, in 1954 the pack consisted of about 850,000 cases of the larger size and over 1.1 million cases of the smaller size. Between 1952 and 1954 an almost complete reversal occurred in the packing of red sour cherries in the 2 sizes. Comparative consumer preference for the 2 can sizes was unknown.

Stores in which the experiment was conducted first received cherries packed in No. 303 cans in July 1954. This was 7 months prior to beginning of the test.

## Method

In the matched-lot nonrotational type experiment with canned red sour cherries (water pack, pitted), No. 2 and No. 303 cans were displayed side by side in 12 stores (fig. 1). The experiment was conducted over a 12-week period, February 21 through May 14, 1955. Consumers were offered the same brand and quality of cherries in the 2 can sizes. The cherries retailed at approximately the same price per ounce regardless of can size. Prices remained the same throughout the experiment, with the No. 2 can



## SALES OF RED SOUR CHERRIES BY STORES

12 weeks, Pittsburgh, Pa., Feb. 21 - May 14, 1955

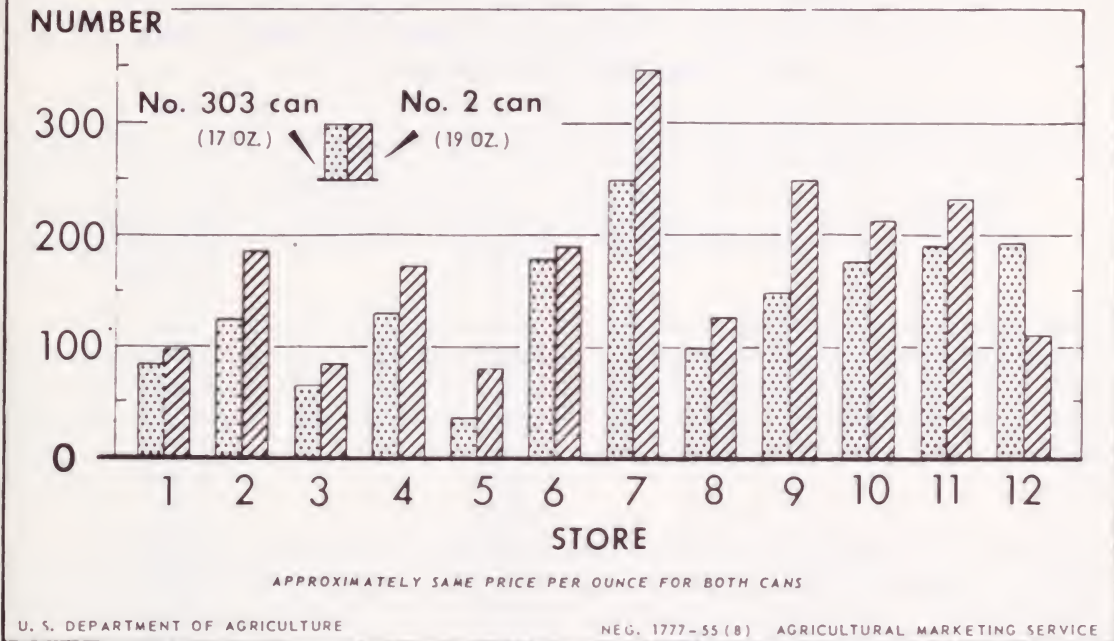


Figure 2, B

containing 19 ounces of cherries priced at 2 for 55 cents and the No. 303 can containing 17 ounces priced at 2 for 49 cents. Advertising and promotion were applied equally to both can sizes. An equal number of rows of cans of the two sizes were displayed on the shelf, and also in island displays initially for a short time.

Offering red sour cherries in two can sizes side by side provided customers an opportunity to compare them before making their purchase. Consumer response to each can size is automatically measured by the comparative volume of sales of each when offered side by side with all other variables held constant.



### Findings

In 11 weeks out of the 12-week period, and in 11 of the 12 stores in the experiment, the larger can outsold the smaller by a substantial number (fig. 2, A and B). Moreover, based on the total quantity of cherries sold, sales in the larger cans exceeded sales in the smaller by an even larger margin in all 12 weeks of the experiment. (Table 1.)

Table 1.--Sales of red sour cherries by weeks and size of can in 12 experimental stores

Weeks	Sales	
	No. 2	No. 303
	<u>Ounces</u>	<u>Ounces</u>
Feb. 21-26.....	8,265	5,355
Feb. 28-Mar. 5.....	5,510	4,505
Mar. 7-12.....	2,337	2,244
Mar. 14-19.....	3,439	2,312
Mar. 21-26.....	2,793	2,329
Mar. 28-Apr. 2.....	2,793	2,108
Apr. 4-9.....	2,622	1,683
Apr. 11-16.....	1,605	1,479
Apr. 18-23.....	2,717	2,227
Apr. 25-30.....	2,394	1,581
May 2-7.....	2,052	986
May 9-14.....	3,002	1,785
Total	39,729	28,594

Sales of both can sizes reached a seasonal peak during the first week of the experiment because of the promotional program associated with Washington's birthday. Sales of cherries during the following 11 weeks remained relatively stable.

Generally, larger stores sold more cherries than smaller stores. However, consumer preference for the larger can size was consistent regardless of size of store or its location in the city.

Measured in pounds, 39 percent more cherries were sold in the larger than in the smaller can during the experiment (table 1). The difference in terms of volume was statistically significant at the 1-percent probability level (appendix, table 9). Although less than half of the total red sour cherry pack in 1954 was in No. 2 cans, consumers in the Pittsburgh market, when confronted with an unbiased choice, purchased 5 cans of No. 2 to each 4 cans of No. 303.

## CARROTS

Carrots constitute one of the major vegetable crops produced commercially in the United States. The value of carrots produced for commercial outlets in 1954 was estimated to be in excess of 49 million dollars.<sup>1/</sup> The principal producing areas are California, Arizona, and Texas. Carrots are usually marketed during all seasons of the year with market peaks in early fall and winter.

The production of carrots has remained at a relatively high level since 1950, with the annual production for the fresh market fluctuating around 800,000 tons.<sup>2/</sup> On the other hand, the per capita consumption of carrots has steadily declined. The per capita consumption of carrots for fresh use in 1951 was 8.4 pounds as compared with 7.6 pounds in 1954.<sup>3/</sup>

The marketing of carrots has undergone a substantial change recently. The trend has been to market increased proportions in topped form; that is, carrots with the inedible tops removed. A large part of the topped carrots are being packaged in polyethylene bags. Currently about 80 per cent of fresh carrots sold in the United States are marketed in prepackaged form.<sup>4/</sup>

Marketing carrots in prepackaged form has advantages for both producer and distributor. Transportation and handling costs are substantially reduced when the inedible portion is removed. Packaged carrots are a much cleaner product to handle and display and have a longer shelf life, thereby reducing spoilage. Few losses are incurred as a result of

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<sup>1/</sup> 1954 Annual Summary, Commercial Vegetables for Fresh Market. Agr. Market. Serv., U. S. Dept. Agr., Wash., D. C., Dec. 1954.

<sup>2/</sup> Commercial Vegetables: Production of All Commercial Vegetables for Fresh Market and Processing, 1935-54. TC-54:1249, Agr. Market. Serv., U. S. Dept. Agr., Wash., D. C., Dec. 20, 1954, 6 pp.

<sup>3/</sup> Per capita consumption data for carrots were calculated in the Statistical and Historical Research Branch of the Agricultural Economics Division, AMS.

<sup>4/</sup> Stokes, Donald R., Produce Packaging Potential. Talk delivered at the American Management Association Packaging Conference, Chicago, Ill., April 19, 1955.

breakage by customer handling. Setting up and maintaining displays of packaged carrots in the store do not require so much time and attention. Consumers find packaged carrots less bulky, more convenient to handle and store.

The cited advantages partly account for the current widespread adoption of packaged carrots among industry groups. However, because of steadily declining per capita consumption, producers and distributors have raised the question as to whether the shift has adversely affected sales. Some groups maintain that more of the product can be sold when displayed in bunch form with tops on. Other groups hold that such a display is a step backward.

### Method

To obtain additional information on the factors affecting the sales of and consumer demand for carrots, four merchandising methods were tested: (1) carrots displayed in 1-pound bunches, (2) carrots displayed in 1-pound polyethylene bags, (3) a combination display of carrots in 1- and 2-pound polyethylene bags, and (4) a combination display of carrots in 1-pound polyethylene bags and 1-pound bunches. In all instances bunched carrots were displayed with tops on.

Carrots in 1-pound bags and 1-pound bunches were sold at a 2-unit price; for example, 2 for 25 cents (bags) or 2 for 29 cents (bunches). Two bunches of carrots sold for a 4-cent premium over two 1-pound bags. Two-pound bags of carrots were sold at 1-unit price; for example, 23 cents each. One 2-pound bag of carrots sold at a discount of 2 cents under two 1-pound bags.

The latin square design of controlled experimentation was used to test four methods of merchandising carrots. The effectiveness of each of the four merchandising methods tested was evaluated on the basis of the total quantity of carrots sold by each method during the 4-week retail store experiment.

Before any merchandising method was considered superior to the others, it was necessary that the difference in quantity of sales between given methods be of such magnitude and consistency as reasonable to insure that other similar experiments would reflect similar differences in sales. Of course, consumer response to different methods of displaying carrots in Pittsburgh might not be exactly the same as the response in other areas. However, the findings should be indicative of what might be expected from a general merchandising program for carrots.



Findings

Volume of Sales

The findings indicated that more carrots were sold when made available to consumers in a combination display of 1- and 2-pound bags (table 2).

Table 2.--Quantity of carrots sold by specified methods in 12 food chain stores, Pittsburgh, Pa. 1/

Merchandising method	Sales	
	Total	Per 100 customers
	Pounds	Pounds
A. Carrots displayed in 1-pound bunches ...	3,896	5.6
B. Carrots displayed in 1-pound polyethylene bags .....	4,647	6.6
C. A combination display of carrots in 1- and 2-pound polyethylene bags .....	5,320	7.3
D. A combination display of carrots in 1-pound polyethylene bags and bunches.	5,063	6.9

1/ The experiment covered 4 weeks: April 4-9, April 18-23, April 25-30, and May 2-7, 1955.

Sales by this method were 37 percent greater than sales from displays of 1-pound bunches, the least successful method (fig. 3). The difference in the total quantity of sales between these two methods was statistically significant at the 1-percent probability level. 5/ Sales from the combination display of 1- and 2-pound bags were 5 percent greater than sales from the next best method--a combination display of carrots in 1-pound bags and 1-pound bunches (fig. 4). Displays of bunch carrots required slightly more display area than packaged carrots because of the tops.

5/ A Duncan test was performed to establish the significance of individual comparisons between merchandising methods. When a significant difference between merchandising methods exists, the variation in the quantity of sales may be attributed to the merchandising method and not to chance variation.





Figure 3.--A combination display of carrots in 1- and 2-pound polyethylene bags.

The findings from this research appear to indicate that the shift from bunch to bag carrots has not adversely affected sales at the retail level in the Pittsburgh market.

#### Combination Vs. Single Type Displays

In merchandising research the question is often raised as to whether a combination or a single type display is best in maximizing sales. The combination versus single type display of carrots was tested. There were 2 combination and 2 single type displays throughout the experiment. The combination displays required approximately 20 percent more space than comparable single ones. Sales of carrots from the 2 combination displays exceeded sales from the 2 single type displays. Of the total quantity of carrots sold during the experiment, 55 percent moved to consumers from combination type displays as compared with 45 percent from single type displays (table 3). The difference in the quantities sold by the combination versus single type display was statistically significant at the 1-percent probability level.

#### Dollar Value of Sales

Another means of analyzing the effectiveness of the merchandising methods was to measure the dollar value of sales. Since there was some difference in the price of carrots by merchandising methods tested, a



Figure 4.--A combination display of carrots in 1-pound polyethylene bags and 1-pound bunches.

Table 3.--Carrot sales from single versus combination display, 12 food chain stores, Pittsburgh, Pa. 1/

Type of display	Sales	
	Pounds	Percent
Single type display:		
In 1-pound bunches .....	3,896	21
In 1-pound polyethylene bags .....	4,647	24
Total .....	8,543	45
Combination type display:		
In 1- and 2-pound polyethylene bags .....	5,320	28
In 1-pound polyethylene bags and 1-pound bunches .....	5,063	27
Total .....	10,383	55
Grand total	18,926	100

1/ The experiment covered 4 weeks: April 4-9, April 18-23, April 25-30, and May 2-7, 1955.



direct association would not necessarily be expected to prevail between the quantities sold and the resulting dollar value by each method. The highest dollar value of sales occurred from the combination display of 1-pound bags and 1-pound bunches (table 4). Under the single type displays a slightly higher dollar value was returned from the display of 1-pound bags as compared with the display of 1-pound bunches. In both combination type displays the dollar value of sales was higher than in the single type displays. This analysis, however, does not attempt to evaluate the net return at any level in the marketing channel from the types of displays used in the experiment.

Table 4.--Dollar sales of carrots by specified methods in 12 food chain stores, Pittsburgh, Pa. 1/

Merchandising method	Sales	
	Total	Per 100 customers
	Dollars	Dollars
A. Display in 1-pound bunches .....	564.95	0.81
B. Display in 1-pound polyethylene bags ....	580.90	.82
C. Combination display in 1- and 2-pound polyethylene bags .....	636.81	.88
D. Combination display in 1-pound polyethylene bags and 1-pound bunches .....	668.60	.91

1/ The experiment covered 4 weeks: April 4-9, April 18-23, April 25-30, and May 2-7, 1955.

#### Price Reduction and Spoilage

Almost no carrots were discarded as spoilage during this experiment. In some instances, however, the tops were removed from bunch carrots and the edible portion was placed in polyethylene bags. Dehydration appeared to be the primary cause of the small amount of loss that occurred.

#### BANANAS

##### Method

Various combinations of pricing and displaying bananas were considered as factors which directly affect the consumer's choice of whether to purchase the product and in what quantity. For instance, can a consumer better appraise bananas when they are sold in hands on a rack or on a flat table display (figs. 5 and 6)? Furthermore, what is the most desirable unit size or sizes in which to offer the product? To assist in answering these

questions the following variables were chosen to be tested: (A) flat table display with units priced up to 99 cents, (B) flat table display with units priced up to 49 cents, (C) rack display with units priced up to 49 cents, and (D) rack display with units priced up to 99 cents.



Figure 5.--Merchandising display of bananas on a rack with units priced up through 49 cents.





Figure 6.--Merchandising display of bananas on a flat table with units priced up through 99 cents.

An additional important factor in merchandising bananas is the amount of spoilage. Therefore, the quantity of bananas spoiled in the 4 methods was determined. The volume of markdown sales of bananas by the different methods was also appraised by relating the total quantity sold.

## Findings

### Volume of Sales

Of the 4 merchandising methods tested, none were significantly different from the others in terms of quantity sold (table 5). The small differences between methods were no larger than might be expected from chance variation.

Table 5.--Quantity of bananas sold per 100 customers, by specified methods, in 12 food chain stores, Pittsburgh, Pa. 1/

Merchandising methods	Sales <u>2/</u>	
	Total	Per 100 customers
	<u>Pounds</u>	<u>Pounds</u>
A. Flat table display with units priced up through \$0.99 .....	11,691	16.0
B. Flat table display with units priced up through \$0.49 .....	11,347	15.9
C. Rack display with units priced up through \$0.49 .....	11,887	16.1
D. Rack display with units priced up through \$0.99 .....	11,998	17.0

1/ Includes 4 test weeks, November 8-December 4, 1954.

2/ The difference between averages is not statistically significant at the 5-percent level.

### Pricing Units

To ascertain consumer response to various-sized banded hands (bunches), bananas in the experiment were banded with paper tape containing the weight and price. The prices were set at 10-cent intervals and records were taken as to the number of purchases made from each price interval. In each of the 4 methods tested, most frequent purchases were made in the price intervals of 30 to 39 cents. Ninety-four percent of all purchases of bananas were made within the price range of from 10 to 59 cents. The results raise some question as to the feasibility of banding bananas in units that retail at a price greater than 59 cents at current price levels (table 6). Bananas retailed at 19 cents per pound during this study.

Table 6.--Relative frequency distribution of the number of purchases of bananas by price ranges and methods in 12 retail food stores, Pittsburgh, Pa. 1/

Price intervals	Merchandising methods <u>2/</u>			
	A	B	C	D
Cents	Percent	Percent	Percent	Percent
10-19	6.1	7.3	6.5	5.5
20-29	22.2	31.4	30.9	23.4
30-39	34.4	40.9	41.8	33.9
40-49	22.2	20.4	20.8	21.4
50-59	8.7			9.4
60-69	2.9			3.0
70-79	1.5			1.3
80-89	1.0			1.2
90-99	1.0			.9
Total	100.00	100.0	100.0	100.0

1/ Includes 4 test weeks, November 8-December 4, 1954.

2/ Code letters refer to merchandising methods for bananas as follows:

- A. Flat table display with units priced up through \$0.99
- B. Flat table display with units priced up through \$0.49
- C. Rack display with units priced up through \$0.49
- D. Rack display with units priced up through \$0.99

#### Markdown Sales

Because of their highly perishable nature, markdown of bananas is often a necessity, especially on weekends. Rather than take a full loss on over-ripened bananas, store managers prefer to reduce the price and thus decrease their monetary losses. Of the total quantity of bananas handled during the experiment, 8.8 percent were sold at reduced prices because of some deterioration (table 7). A larger proportion of markdown sales occurred in the 2 methods where banded hands were priced up to \$0.99. Bruising and interior deterioration may have been more prevalent in the larger hands because their rate of turnover was slower.



Table 7.--Markdown sales of bananas by merchandising methods tested, Pittsburgh, Pa. 1/

Merchandising method	Markdown sales	
	Quantity:	Percent of total
	: quantity handled	
	<u>Pounds</u>	<u>Percent</u>
A. Flat table display with units priced up through \$0.99 .....	1,244	8.9
B. Flat table display with units priced up through \$0.49 .....	1,091	7.1
C. Rack display with units priced up through \$0.49 .....	1,148	8.1
D. Rack display with units priced up through \$0.99 .....	1,388	11.0
Average	1,216	8.8

1/ Includes 4 test weeks, November 8-December 4, 1954.

### Spoilage

An attempt was made to ascertain whether there were any significant differences between merchandising methods relative to their effect upon banana waste and spoilage (table 8). Findings from the analysis of variance test indicate there was no significant difference at the 5-percent

Table 8.—Percentage relationship between quantity of bananas handled and that lost through spoilage, both on and off display, by merchandising methods tested, Pittsburgh, Pa. 1/

Merchandising method	Spoilage as a		Spoilage	
	percentage of			
	quantity	handled	On display	Off display
	<u>Percent</u>		<u>Percent</u>	<u>Percent</u>
A. Flat table display with units priced up through \$0.99 ...	5.8		62.4	37.6
B. Flat table display with units priced up through \$0.49 ...	5.8		61.6	38.4
C. Rack display with units priced up through \$0.49 .....	5.5		65.8	34.2
D. Rack display with units priced up through \$0.99 .....	6.7		61.9	38.1
Average	5.9		62.8	37.2

1/ Includes 4 test weeks, November 8-December 4, 1954.



probability level in the quantity of banana spoilage between the different methods tested. Spoilage accounted for 6 percent of the total quantity of bananas handled in the retail stores. The major proportion of the spoilage occurred while bananas were on display. A further examination was made between the total quantity of bananas received by a particular store and the resultant amount of spoilage. From a linear correlation analysis of these two series of data, no reasonable degree of association could be established between the quantity handled and the quantity spoiled.

Based on findings, it appears that the spoilage of bananas is not a direct result of the merchandising method employed or the total quantity of the product handled. The problem of spoilage of bananas seemed to be largely dependent upon the quality of the product when received at the retail level.

## APPENDIX

### Cherries

Table 9.--Analysis of variance table for determining significance of effects of stores, time periods, and treatments on the quantity of cherries sold in 12 retail food chain stores, Pittsburgh, Pa.

Source of variation	:	Degrees of freedom	:	Mean square
Weeks	:	11	:	389,479
Treatments	:	1	:	<u>1</u> /430,514
Stores	:	11	:	244,108
Treatments x weeks	:	11	:	21,271
Treatments x stores	:	11	:	32,703
Stores x weeks	:	121	:	55,993
Stores x treatments x weeks	:	121	:	19,890

1/ This mean square with 1 degree of freedom tested against the interaction mean square (stores x weeks) with 121 degrees of freedom is significant at the 1-percent probability level.

### Carrots and Bananas

The official test on both carrots and bananas covered a 4-week period. The experiments were conducted in 12 self-service retail food stores of a national chain. The fact that all stores were under the same management made possible the coordination of retailing practices applying to both experimental and nonexperimental commodities. Data were gathered from these stores under normal operating conditions so as not to create an artificial atmosphere in the market place.

The experimental design used for these studies was a basic 4 x 4 rotational latin square. The design was replicated three times through additional stores and once through time. Four basic merchandising methods for each of the commodities were rotated among the experimental stores so that every method was tested the same number of times during each time period and once in each store during the course of the experiment (table 10). At the conclusion of the experiment, each method had been tested three times each week and in all of the experimental stores. This procedure was used in an effort to equalize the effect of nontest variables--size and type of stores, seasonality in demand, competition from other products, and differences in preference of customers among stores--on the quantity of sales resulting from each merchandising method. The effect of certain other variables on the volume of sales was equalized by holding them constant throughout the experiment.

In order to train enumerators in the way in which the experiments were to be conducted and to insure that store personnel were familiar with the operation of the test, a pretest period of 1 week was used. Usually, one enumerator was assigned to each store, to maintain the displays in the prescribed manner and according to the rotational schedule. In addition, he collected data on sales and obtained cash register counts of those customers potentially exposed to the merchandising method being tested. He did not interfere with the consumer's selection of a product in any manner.

The analysis of variance technique was used in analyzing data to obtain and assign the existing variation to specific components. In these experiments the components were stores, time periods, merchandising methods, and experimental error. The significance or nonsignificance of each component on the data was ascertained by determining the ratio of the mean square of each component to the appropriate error term. Variation attributable to each of these components is indicated in tables 11 and 12. When the analysis of variance indicated that the effects on sales by the different merchandising methods were not identical, a Duncan test was performed to establish the significance of individual comparisons between methods.

Table 10.--Experimental design for carrots and bananas, Pittsburgh, Pa., merchandising experiments

Time period <u>2/</u>	Merchandising method <u>1/</u> tested in store number--			
	1	2	3	4
1st	B	A	D	C
2nd	C	D	A	B
3rd	D	C	B	A
4th	A	B	C	D
	5	6	7	8
1st	D	C	B	A
2nd	B	A	D	C
3rd	C	D	A	B
4th	A	B	C	D
	9	10	11	12
1st	C	D	A	B
2nd	D	C	B	A
3rd	B	A	D	C
4th	A	B	C	D

1/ Code letters refer to merchandising methods for bananas as follows:

- A. Flat table display with units priced up through \$0.99
- B. Flat table display with units priced up through \$0.49
- C. Rack display with units priced up through \$0.49
- D. Rack display with units priced up through \$0.99

Code letters refer to merchandising methods for carrots as follows:

- A. Carrots displayed in 1-pound bunches
- B. Carrots displayed in 1-pound polyethylene bags
- C. A combination display of carrots in 1- and 2-pound polyethylene bags
- D. A combination display of carrots in 1-pound polyethylene bags and 1-pound bunches

2/ Each time period consisted of 1 week for both the banana and carrot experiments. The banana experiment was conducted from November 8-December 5, 1954, and the carrot experiment was carried out during the following weeks: April 4-9, April 18-23, April 25-30, and May 2-7, 1955.



Table 11.--Analysis of variance table for determining significance of effects of stores, time periods, and treatments on the quantity of carrots sold in 12 retail food chain stores, Pittsburgh, Pa.

Source of variation	:	Degrees of freedom	:	Mean square
Weeks	:	3	:	9,043.96
Store	:	11	:	96,116.14
Between groups	:	2	:	35,805.06
Within groups	:	9	:	109,518.60
Treatments	:	3	:	<u>1/</u> 32,332.02
Weeks x groups	:	6	:	2,625.42
Treatments x groups	:	6	:	3,130.90
Error	:	18	:	4,851.83

1/ This mean square with 3 degrees of freedom tested against the error mean square with 18 degrees of freedom is significant at the 1-percent probability level.

Table 12.--Analysis of variance table for determining significance of effects of stores, time periods, and treatments on the quantity of bananas sold in 12 retail food chain stores, Pittsburgh, Pa.

Source of variation	:	Degrees of freedom	:	Mean square
Weeks	:	3	:	13,470.61
Stores	:	11	:	458,766.27
Between groups	:	2	:	170,189.31
Within groups	:	9	:	522,894.49
Treatments	:	3	:	6,800.72
Weeks x groups	:	6	:	2,831.09
Treatments x groups	:	6	:	<u>1/</u> 9,450.87
Error	:	18	:	3,505.85

1/ The treatments x groups mean square tested against the error mean square is significant. This indicates that the relative superiority of the various methods changed from group to group; therefore, the merchandising methods cannot be said to differ significantly.







