

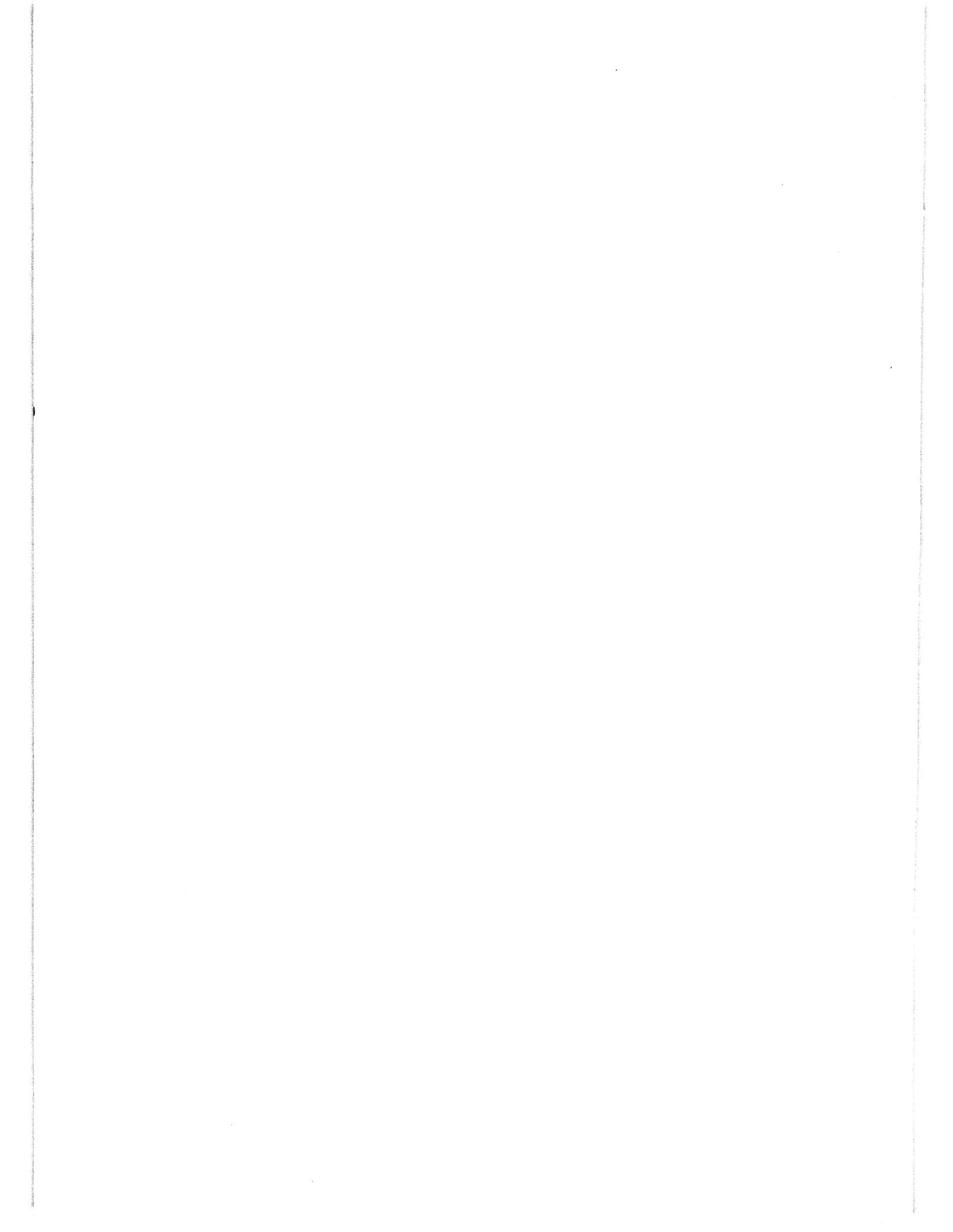
COMPARATIVE EFFICIENCY OF RETAILING PRODUCE BY DIFFERENT PACKAGING PROCEDURES

D. I. GOODING AND R. W. SHERMAN

Department of Agricultural Economics and Rural Sociology

OHIO AGRICULTURAL EXPERIMENT STATION

Wooster, Ohio



COMPARATIVE EFFICIENCY OF RETAILING PRODUCE BY DIFFERENT PACKAGING PROCEDURES

D. I. GOODING AND R. W. SHERMAN

INTRODUCTION

In 1960, the average per capita food consumption in the United States was 1,469 pounds¹. Over one third of this total was composed of fruits and vegetables, including potatoes. Excluding bananas, over 60 percent of all forms of fruit and vegetable consumption was purchased in the fresh form². Probably no area in a supermarket has received more attention and study than the fresh produce area. Most supermarket management people feel that for successful store operation they must please their customers by an attractive display of fresh produce. Along with the attractiveness must go efficiency of merchandising, and, as a result, continuous study has been given to this. Self-service merchandising is a means of holding cost at a low level, and one of the requisites of self-service is to make it easy for the customers to select their purchases without help from a clerk.

Prepackaging³ or unitizing helps to make such merchandising possible. However, much difference in opinion has existed concerning the degree of prepackaging desirable and necessary for efficient merchandising. Starting in 1958, some stores in Columbus, Ohio were merchandising all fresh fruits and vegetables in prepackaging form, while some were marketing nearly 80 percent in bulk form. Other retail stores were offering various percentages between these extremes in prepackaged form. Clearly, at the management level there has not yet been agreement concerning how far to go in prepackaging. Thus, the importance of determining effect of prepackaging on store efficiency seems evident.

In order for a retailer to determine the profitability of prepackaging of fruits and vegetables and whether or not it is most efficient to do it in the store, a number of factors must be considered as follows:

¹Agricultural Statistics, United States Department of Agriculture, Washington, D.C., page 573.

²Fruit Situation, August 1961, page 29 and Vegetable Situation, October 1961, pages 20-26, Economics Research Service, United States Department of Agriculture, Washington, D.C.

³"Prepackaged form" is defined for purposes of this study to include methods of unitizing produce such as banding, bagging, overwrap and traying. Price marking on the merchandise which is also a method of unitizing is not considered as prepackaging. No attempt was made in this study to analyze the effects of different forms of prepackaging (i.e., banding vs. overwrap vs. bagging).

1. The difference in acquisition costs in the prepackaged and in the bulk forms, and whether or not this varies from one season to another throughout the year.

2. The differences in costs of handling in the store with various methods used.

3. The differences in store volume of sales with various methods of handling in the store and the influence of this on total store profits.

These factors need to be considered separately for each commodity and possibly for each grade of the commodity.

The second factor listed above is probably the least known and may be most difficult to obtain. This study was concerned with these costs of handling in the store.

The three main retailer costs, referred to as "store run" costs, are:

1. Cost of labor
2. Cost of packaging materials
3. Cost of losses

From the total of these store costs, the acquisition cost of the items, and adjustments for differences in volume of sales, one can get a good indication of the most efficient and profitable packaging procedures to follow by the retail store for different fruits and vegetables handled.

METHODOLOGY

This research project was conducted during 1960 and 1961. Eight stores representing three supermarket chains in Columbus, Ohio were selected for the study. A series of thirty-one intensive, two-week periods of observations for each selected store were obtained during the two-year period.

Stores having weekly gross sales of \$25,000 to \$50,000 were chosen. These stores were located in areas having residents of similar economic status. This was done in order to minimize differences that might exist due to size of produce department, work methods, and demand for different types of produce.

The project was designed to measure and compare the efficiency of the retailer in merchandising produce by the different packaging procedures encountered in the study. Both the short-run and long-run effects, viewed from the perspective of the

retailer and society, were analyzed. This was accomplished by determining the costs of labor, packaging, the product loss and acquisition costs of the produce for the three procedures of packaging encountered. It should be noted that only the costs as affected by packaging procedures at the retail level are reported in this publication.

It was recognized that considerations other than that of the least cost method of merchandising exist. However, for purposes of this study, the following assumptions were made:

1. That the retail price for any particular item would be equal for the same quality of produce irrespective of the method of merchandising. This was based on the concept that in the long run the consumer will not pay more for produce merchandised by one method if the same quality can be obtained in another packaging procedure.

2. In the long run,⁴ competitive conditions would prevail among retailers.

Three packaging procedures for produce were encountered:

1. **Prepackage-prepackage sale (P-P).** This constitutes the delivery of produce to the retail store and sale to the consumer in previously packaged consumer size units, requiring only the application of a price mark at the retail store.

2. **Bulk-prepackage sale (B-P).** This is the sale of produce which the retail store buys in such a form that some processing, other than pricing, is required at the store level to put the merchandise in prepackaged form.

3. **Bulk-bulk sale (B-B).** Bulk form varies considerably with different produce items. In some cases, each customer purchase may need to be weighed and price marked. Sometimes the price is previously marked on each unit of the merchandise. Occasionally, a customer just selects the item and it is priced at the checkout. The amount of labor used varies considerably with the procedure followed.

Forms of prepackaging encountered in this study were as follows: for apples, mostly bagged but a few tray overwraps; for cabbage, bag; for cauliflower, bag; for celery, sleeve or band; for sweet corn, mostly tray overwrap; bananas, band; grapes, tray overwrap; lemons, mostly bag; lettuce, bag; carrots, bag; grapefruit, bag; dry onions, bag; oranges, mostly bag; peaches, tray overwrap and four-pound baskets; pears, tray overwrap; potatoes, bag; tomatoes, mostly tray overwrap; strawberries, considered in bulk although in containers as received.

⁴"Long Run" as used here means the amount of time necessary for all stores to become aware of costs involved in procedures under study.

A test run was conducted during February and March, 1960. Complete cost data for each produce item were obtained during these two months. These costs included depreciation of equipment, lighting, rent for selling space and laundry, as well as the "principal" costs of labor, packaging material, loss and cost of the delivered produce. However, it soon became apparent that such a detailed study would be prohibitively expensive in terms of the benefits which such data would provide. Since the indirect costs would be similar for any produce item, regardless of the method of handling, only the direct costs of labor, packaging materials and losses were considered in this study which ran throughout 1960 and 1961.

Data for this study were collected by a two-man team of researchers, who were present at the retail store daily for a period of six to eight hours during the hours of operation. Measurements of cost of labor, packaging materials and loss were determined as follows:

1. **Labor time factor**—This statistic measured the quality of labor (in minutes per pound) required to merchandise a pound of produce. This labor time included all the activities associated with handling produce, from receiving at the store until it was placed in the consumer's grocery cart. These activities are:

- a. backroom servicing—truck unloading and storage operations
- b. trimming
- c. weighing
- d. pricing
- e. packaging
- f. displaying
- g. selling

The time involved in performing each activity pertaining to each method of handling a specific produce item as well as the weight of volume handled was recorded. During the two-week period each activity was examined carefully enough times to establish accurate costs. Then, a labor time (in minutes per pound) was calculated for each activity. Summing the times for each activity associated with a particular method of merchandising resulted in the total labor required to merchandise a pound of a specific commodity by a particular method. Given the average wage rate, the labor cost of merchandising was computed.

2. **Packaging materials**—These costs were computed for the (B-B) and (B-P) methods of marketing. A form was devised to record the number of polyethylene bags, films, labels or tape used in packaging for the (B-P) method. The average weight per

package was also determined. Given the cost of the packaging materials, the packaging cost per pound was computed. In the (B-B) method, the total weight of the item sold during the period was noted. The average weight of the produce per sale was also obtained. Then, the number of sales was computed. Finally, the number of kraft bags or other packaging materials used was calculated, and the cost figured on a per pound basis.

3. Losses—The value of losses was based on the delivered price of the produce. This value was obtained for each of the methods of handling a produce item. When produce became unsalable, the weight and value were recorded. Also, the weight and value of produce salable only at reduced prices were noted. The cost of losses per pound of total sales was then computed.

RESULTS AND CONCLUSIONS

Labor accounts for over 50 percent of retailing costs. Both the use of labor and the total "store run" cost of retailing were analyzed. The findings for the different methods of packaging are presented in Tables 1 and 2. Variance analysis was used to determine whether the differences among the amounts of labor and the "store run" costs were significant. In general, the data are reliable enough to be a guide for management. Most of the data met a 95 percent level of confidence, which means that one risks being wrong once in 20 because of random variation in the data.

In Table 1, it may be noted that for those items involving more than one procedure, the use of labor for 12 of the 14 commodities displays significant differences among the methods used to merchandise the item. Four of the commodities (cabbage, carrots, lettuce and strawberries) were marketed by only one method. Thus, bananas and pears were the only items studied that did not reveal significant differences between or among different packaging procedures.

In general, as we might expect, more labor is used for the bulk prepackage because the packaging is done in the store.

The following items revealed significantly less labor for the (P-P) packaging procedure: apples, cauliflower, onions, potatoes and tomatoes. The (B-B) method of marketing exhibited significantly less labor for sweet corn, grapes, lemons and peaches. The amounts of labor for oranges and grapefruit were significantly less for both the (B-B) and (P-P) procedures than for (B-P) (no significant difference existed between the (B-B) and (P-P) methods). The

labor used for celery was significantly less for the banded celery than for the overwrap celery, both (B-P).

TABLE 1.—Labor Used for Merchandising Selected Fruits and Vegetables.

Commodity	B-B	B-P	P-P	Level of ¹
				Confidence
				Percent
				Minutes Per Pound
Apples	.2446	.2749	.0739	99.5
Bananas	.2715	.2405	—	N.S.*
Cabbage	—	.2273	—	—
Carrots	—	—	.0903	—
Cauliflower	—	.2489	.0876	99.5
Celery	—	.2219 banded .2811 overwrap	—	75.0**
Corn, Sweet	.1281	.4602	—	99.5
Grapefruit	.0660	.1555	.0538	99.5
Grapes	.4455	.5708	—	95.0
Lemons	.0952	.2198	—	99.5
Lettuce	—	.2722	—	—
Onions, Dry	.4074	.2820	.0656	99.5
Oranges	.0504	.2001	.0431	99.5
Peaches	.1811	.2929	—	90.0
Pears	.3986	.4416	—	N.S.*
Potatoes	.1231	.1507	.0301	99.5
Tomatoes	.4725	.6571	.1529	99.5
Strawberries	.4818	—	—	—

¹A confidence level of 99.0% means that there is only one chance in 100 that the difference between or among costs may be due to chance.

*Not Significant

**In this case, the significant difference is between two methods of B-P.

The principal costs of merchandising produce are shown in Table 2. The total cost column shows the cost to the retailer of merchandising a given commodity. These total cost figures can be combined with acquisition cost to get an indication of what would be the most profitable procedure to follow by a retailer. The "store run" costs are a measure of the costs of packaging in the given procedures. The least cost method of marketing a specific commodity would be desirable in the long run, from the viewpoint of both society and the retailer, if the acquisition costs and other factors are the same.

Significant differences (at the 75 percent confidence level) among packaging procedures were noted in the "store run" costs of 10 produce items. The analysis of apples, grapefruit, onions, oranges, potatoes and tomatoes revealed that the "store run" costs were significantly lower for the (P-P) packaging procedure. "Store run" costs were significantly lower for the lemons and sweet corn when marketed by the (B-B) method. The banded celery (B-P) exhibited significantly lower "store run" costs than the over-

**TABLE 2.—Principal Costs of Merchandising One Hundred Pounds,
Retail Weight, of Selected Produce Commodities. (dollars)**

Commodity	Store Run			Total
	Labor	Packaging	Loss	
Apples				
B-B	.78	.16	.47	1.41
B-P	.91	.47	.24	1.62
P-P	.22	.00	.15	.37**
Bananas				
B-B	.90	.03	.50	1.43
B-P	.78	.07	.33	1.18**
Cabbage				
B-P	.78	.00	.76	1.54
Carrots				
P-P	.30	.00	.04	.34
Cauliflower				
B-P	.87	.00	.67	1.54**
P-P	.32	.00	2.40	2.72
Celery				
B-P Banded	.73	.00	.08	.81**
B-P Overwrap	1.01	.44	.02	1.47
Com, Sweet				
B-B	.52	.04	.12	.68**
B-P	1.65	.37	.80	2.82
Grapefruit				
B-B	.23	.00	.79	1.00
B-P	.55	.26	.11	.92
P-P	.21	.00	.11	.34**
Grapes				
B-B	1.40	.23	1.72	3.35
B-P	2.11	1.04	.86	4.01
Lemons				
B-B	.41	.11	.52	1.04*
B-P	.83	.53	.06	1.42
Lettuce				
B-P	.93	.37	.19	1.49
Onions, Dry				
B-B	1.23	.21	.49	1.93
B-P	.98	.37	.07	1.42*
P-P	.25	.00	.06	.31**
Oranges				
B-B	.29	.14	.57	1.00
B-P	.65	.23	.22	1.10
P-P	.18	.00	.13	.31**
Peaches				
B-B	.58	.10	.69	1.37
B-P	1.04	.64	.36	2.04
Pears				
B-B	1.43	.24	1.22	2.89
B-P	1.65	.66	.07	2.38
Potatoes				
B-B	.35	.08	.14	.57*
B-P	.57	.18	.04	.79
P-P	.09	.00	.02	.11**
Tomatoes				
B-B	1.56	.26	1.18	3.00*
B-P	2.39	1.09	.95	4.43
P-P	.52	.00	1.26	1.78**
Strawberries				
B-B	1.61	.00	2.53	4.14

**Significantly lower than other procedure or procedures at 75% confidence level.

*Significantly lower than one procedure but significantly higher than other at 75% confidence level.

wrap celery. No significant differences in "store run" costs existed for pears, grapes and peaches. Four items; cabbage, carrots, lettuce and strawberries, were merchandised only by one method.

An additional interpretation of the analysis of oranges, grapefruit, onions, tomatoes, potatoes and cauliflower is offered. There was no significant differences in the use of labor between the (B-B) and (P-P) methods of packaging oranges and grapefruit. However, when the "store run" costs of merchandising were considered, the (P-P) method of marketing oranges and grapefruit was clearly the lowest cost. This may be explained by the higher losses for the (B-B) procedure of merchandising these two commodities. Although the lowest cost procedure of marketing onions was the (P-P) method, the (B-P) procedure exhibited significantly lower "store run" costs than the (B-B) onions. For tomatoes, the (B-B) procedure was significantly lower in "store run" costs than the (B-P) method. However, the (P-P) procedure was the lowest cost method of retailing tomatoes.

The analysis for potatoes showed that the (P-P) method of retailing was clearly the lowest cost, when "store run" costs were considered. Also, the "store run" costs for (B-B) potatoes were significantly lower than those for the (B-P) potatoes. Although "store run" cost of cauliflower was higher, for the (P-P) method of merchandising, the losses for the (P-P) method were responsible for most of this cost.

Because of variations in seasonal supplies, quality, effect on sales and other factors, it might be most profitable for a retailer to use one method for one grade of a commodity at one time and a different method at another time. For these reasons it is difficult to forecast definitely what should be used for each commodity in the future.

The reader should remember that the results here obtained are based on data from stores in Columbus, Ohio during 1960 and 1961, having gross weekly store sales of \$25,000 to \$50,000. Thus, the results found in the study should not be applied to vastly different situations.

The author's best predictions of packing procedures for some commodities which likely will prevail generally in the long run, based on this study, are shown in Table 3.

TABLE 3.—Predictions of Methods of Merchandising Generally Likely to Prevail in the Long Run.

Commodity	Method
Apples	P-P
Celery	B-P
Corn	B-B
Grapefruit	P-P
Lemons	B-B
Onions	P-P
Oranges	P-P
Potatoes	P-P
Tomatoes	P-P and B-B

As merchandising of fruits and vegetables is improved, the following results may be expected:

1. In the short run the retailer will increase profits by adopting the least cost method (including acquisition cost and other factors) of merchandising produce. However, as this knowledge is disseminated among retailers, the increased profits will be competed away to the consumer in the form of lower prices.

2. In the long run and under competitive conditions, consumers will receive the benefits of the adoption of the least cost method of retailing in the form of lower prices or preferred services. These competitive conditions assume competition among supplier as well as at retail levels.

