

PREPACKAGING OF OHIO APPLES ON THE FARM AND THE EFFECT OF VARIOUS
BAG SIZES ON THEIR ACCEPTANCE BY CONSUMERS

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PART I

Prepackaging of Apples by 21 Ohio Producers

Methods of prepackaging^{1/} apples at the farm changed very little in 1951 from the previous year. Each grower has his own improvised method and in all cases it was a hand operation. Since this report represents 21 producers while the last report represented only 12, differences between the data for the two years do not necessarily indicate change from the previous year. Special emphasis will be given to the aspects of the study where evidence indicates changes from the previous year.

More growers were using polyethylene^{2/} bags than in the previous year. It accounted for more volume than any other type of container. The use of the five pound package gained in popularity over the four pound size from 1950 to 1951. While no records were obtained of quantity packed in each size, it was evident that the five pound size accounted for considerably more volume than the four pound size.

Several growers were using more than one type or size of container which accounts for the number using different containers totaling more than the number of producers who furnished data for the study. Table 1 includes a complete listing of type, size and cost of containers used by the 21 producers.

The average loss of packages from breakage during the prepackaging operation continued at less than one percent. In many cases the supplier replaced the broken or torn packages.

Cardboard boxes continued to be the most popular master container for delivering the packages. A variety of improvised master containers were employed, such as used melon crates and field crates. Used cardboard or wooden cartons or boxes of various kinds were also employed. The cost of the master containers

^{1/} Prepackaging at the farm merely means that the producer puts the apples in consumer units before delivering to the buyer.

^{2/} Polyethylene is a slightly cloudy plastic material.

varied from zero to \$1.00 each. The average cost per bushel of apples was 7.5 cents for the master container. This was 1.2 cents lower than for the 12 growers furnishing figures for the previous year. In part the saving was a result of experience.

Table 1. Type, Size and Cost of Packages Used by Twenty-One Ohio Apple Growers for the Crop Year of 1951.

Type of Package	Number Using	Average Price Per Thousand	Price Range Per Thousand
Polyethylene			
Five pound	7	\$29.86	\$27.30 to 33.50
Four pound	6	28.04	22.70 to 32.00
Three pound	2	26.00	26.00
Pliofilm			
Five pound	2	34.75	33.50 to 36.00
Four pound	4	28.00	25.50 to 31.50
Three pound	2	28.50	27.00 to 30.00
Baskets			
Four quart	3	58.90	48.50 to 73.20
Mesh bag			
Five pound	1	42.50	42.50
Cartons			
Window carton	1	50.00	50.00

Fifteen of the 21 producers had their master containers returned from the warehouse or store. Some of these 15 paid a slight fee for the return, varying from four to ten cents per container but in most cases the return was at no charge. The number of trips per container varied from two to 40.

Thirteen of the producers were delivering the prepackaged apples direct to the retail store while nine were delivering to the warehouse. One of these producers delivered to both places.

Several growers guaranteed the condition of the packaged apples by replacing any damaged or decayed apples. Usually the package containing such apples was replaced by another package.

Of the eleven varieties prepackaged by the 21 growers the five leading varieties were Delicious, Rome Beauty, Stayman, MacIntosh and Jonathan. An indication of one of the advantages of prepackaging was in the number of producers packaging two and one-fourth inch apples. These apples are usually moved at sacrifice prices in bulk containers but in the packages they were well accepted at little or no discount in price. Observation in the stores was that when the two and one-fourth inch apples were offered at the same price as larger apples of the same variety the small apples were often taken in preference to the larger ones which indicated that some consumers preferred the smaller size. It might be well at some future date to study this relationship to determine its possibilities in moving the small apples. The popularity of prepackaging as a means of moving the two and one-fourth inch apple can be seen in Table 2 which lists sizes prepackaged. Only three of the 21 producers were not packing two and one-fourth inch apples.

As stated in a previous publication^{1/} the advantages to be gained from mechanization of the prepackaging operation would be limited due to the comparatively small volume per producer and the comparatively low labor cost per bag. The smaller producers were able to keep their packaging costs at about the same figure as the larger producers.

Due to differences in skill and duties performed, the number of packages packed per worker varied from 22 to 90 per hour. The average was 57. On an average, one helper was employed for each three packers. The duty of the helper was to keep each packer constantly supplied with apples and to take the filled master containers away. In a few cases, the helpers placed the bagged apples in the master container but usually this was the duty of the packer. The average hourly rate paid helpers was 79 cents and the average rate paid packers was 75.6 cents per hour.

^{1/} See footnote ^{1/} on page one.

Four growers paid their packers by the bag. The price paid per bag varied from one and one-fourth to two cents. No detailed analysis was made of this incentive type of payment versus straight time payment.

Much of the labor was family and neighbor help. In large part they were women who desired part time temporary work.

Return from Prepackaged Apples

Among the advantages attributed by apple producers to prepackaging were, (1) increasing gross income, (2) stabilizing price, (3) moving more apples in the same or shorter time, (4) raising the price received for two and one-fourth inch apples, and (5) increasing the net income.

One grower received almost two and one-half times as much for the prepackaged apples as for the same apples in bulk containers. Another grower received only 3.4 percent more than for the same apples in bushel containers. The latter was prepackaging large apples which were selling for \$3.25 per bushel basket.

No comparisons could be made on seven growers because three of them prepackaged all apples and the other four didn't sell the same apples in bulk as they sold in the package.

The average increase in returns for the prepackaged apples over those in bulk containers was 81 cents per bushel or 44.6 percent. This was less than reported by the 12 producers for the previous crop year.

Cost of Prepackaging

The average cost^{1/} of packaging a bushel of apples was 60.7 cents for the 21 producers. These expenses including labor, package and master container

^{1/} The costs considered herein are direct, out of pocket cost. No attempt has been made to include different overhead and administrative cost such as social security, increased space requirements, etc.

costs varied from a high of 84.3 cents to a low of 40 cents. Wide variation existed in the costs of packages, master container and labor.

Of the average cost of 60.7 cents for packaging a bushel of apples, 34.2 cents was for individual packages, 19.0 cents for labor and 7.5 cents for the master container. The 60.7 cents is slightly higher than the previous year's average cost of 59.1 cents reported by 12 producers. Master container costs were less while labor and package expenses were slightly higher.

Table 2. Size of Apples Prepackaged by 19 Producers and Reported Gross Cash Increase Per Bushel From Selling Apples Prepackaged Over Similar Apples Sold in Bulk by Fourteen Producers, Crop Year of 1951-52.

Increase Per Bushel	Percent Increase	Number of Growers	Size of Apples (Inch)
\$.11	3.4	1	2 3/4 and 3
.15	5.0	1	2 1/4, 2 1/2 and up
.20	5.3	1	2 1/4, 2 2/2 and 3
.44	17.0	1	2 1/4, 2 1/2 and 2 3/4
.48	21.3	1	2 1/4, 2 1/2 and up
.65	27.4	1	2 1/2, 2 3/4 and up
.81	43.6	1	2 1/4
.86	34.4	1	2 1/2
.95	45.0	1	2 1/4, 2 1/2 and 2 3/4
1.02	54.1	1	2 1/4, 2 1/2, 2 3/4 and up
1.245	65.8	1	2 1/4
1.44	144.0	1	2 1/4 and 2 1/2
1.49	79.2	2	2 1/4
(1)	(1)	2	2 1/4, 2 1/2, 2 3/4 and up
(1)	(1)	1	2 1/4, 2 1/2 and 2 3/4
(1)	(1)	1	2 1/4, and 2 1/2
(1)	(1)	1	2 1/4, 2 1/2 and 2 3/4
.81	44.6	Average	

(1) Comparative prices not reported.

If the producers who packaged their apples had marketed them in bulk, they would have had container cost and labor expense for bulk packing. To arrive at the net difference in the two methods, these costs would have to be subtracted from the total cost of prepackaging. While exact cost of bulk packing was not determined, the estimate of several producers indicates that prepackaging costs are approximately 30 cents more per bushel than bulk packing.

PART II

Size of Package

1951 Crop Year

The most usual size of prepackaged units of apples offered to the consumer in Ohio prior to the study had been the four and five pound bag. To our knowledge there had been very few, if any, cases in which two or more sizes of units were offered at the same time.

The purpose of this part of the study was to see if consumers had a preference for other than the one usual size of bag and if more than one size offered at the same time might be desirable. It was decided to try three, five and ten pound bags in three offerings - (1) five pound bags alone, (2) five and ten pound bags at the same time, and (3) three, five and ten pound bags as the third offering. Note that the fairly well standardized five pound bags were never dropped from any of the combinations.

The study was conducted over a period of nine successive weeks starting in the second week of November. The same display space was used for the entire period in each store. Records were kept for only the last three days of each week to facilitate changes in offerings. The apples were placed in two stores and the offerings matched in such a way that all combinations in each store were matched against all possible combinations in the other store. One producer furnished all the apples and delivered them direct to the two stores where the apples were offered. With the exception of the first two weeks practically no bulk apples were sold in these two stores until western apples came on the market.

The pricing of the apples was based on the price of the standard five pound package as determined by the cooperating stores. The three and ten pound bags were priced so as to approximate the difference in cost of packing and handling. The retail price increased as the season progressed but by a comparatively small amount. A total of 33,916 pounds of apples were sold through the test displays.

Since western apples will no doubt always furnish strong competition with Ohio apples, the sale of prepackaged apples was studied with no change in the offerings of western apples.

Table 3 shows by weeks the combination of packaged offerings and the relation of the sale of western to Ohio prepackaged apples. This comparison is included to point out the important competition of western apples.

Table 3. Western Apples as Percentage of Prepackaged Apples, by Week

Week	Bag Sizes of Ohio Prepackaged		Western apples as percent of Ohio Prepackaged	
	Store	Store	Store	Store
	No. 1	No. 2	No. 1	No. 2
1	5 lb.	5 lb.	1/	1/
2	3-5-10	3-5-10	1/	1/
3	5-10	5-10	1/	16.3
4	3-5-10	5	9.1	11.8
5	5-10	3-5-10	8.3	33.0
6	5	5-10	30.0	36.5
7	5-10	5	66.6	68.9
8	5	3-5-10	35.7	66.4
9	3-5-10	5-10	19.9	13.8
Weighted average ^{2/} -		-	26.5	32.7

^{1/} No western apples offered

^{2/} Of those weeks where both prepacks and western apples were offered.

There was little evidence of any difference in the effect of various bag sizes for apples on western apple sales. The seventh and eighth weeks showed almost two-thirds as many western apples sold as Ohio prepackaged. These were Christmas holiday weeks. The percentage of sales represented by western apples fell sharply in the week following the holidays.

The relationship of sales of apples in different size prepackaged units for the nine week period is shown in Table 4.

The five pound package outsold both the three and ten pound sizes in both stores except during the second week when it was outsold by three pound bags in both stores. In turn the three pound bags always outsold the ten pound size by a margin of from 15 to about 185 percent. Only once (the last week of the experiment) when all three sizes were offered did any one size unit account for half or more of the apples and indicates clearly the demand of consumer for several unit sizes.

Table 4. Percent of Prepackaged Apples Sold in Each Size of Bag.

Week	Store No. 1		Store No. 2	
	Bag Sizes Offered (Pounds)	Percent of Sales	Bag Sizes Offered (Pounds)	Percent of Sales
1	5	100	5	100
2	3	40	3	40
	5	34	5	37
	10	26	10	23
3	5	90	5	74
	10	10	10	26
4	3	36	5	100
	5	45		
	10	19		
5	5	78	3	29
	10	22	5	49
			10	22
6	5	100	5	75
			10	25
7	5	74	5	100
	10	26		
8	5	100	3	31
			5	42
			10	27
9	3	34	5	77
	5	54	10	23
	10	12		

Since each bag size combination was offered three times in each store it might be well to mention the total pounds of apples sold with each offering. In total, the five pound unit when offered alone in the two stores accounted for 10,085 pounds of sales. The combination of five and ten pound bags accounted for 12,670 pounds or 25.6 percent more than the five pound bags alone. The 3,5, and 10 pound combination sold 11,161 pounds or 10.7 percent more than the fives alone.

These increases indicate a significant effect from offering the extra bag sizes along with the fives. However, this analysis fails to eliminate one important variable - that of difference in store traffic or produce volume by weeks. This may be responsible for a part of the difference in sales as shown by the figures in the previous paragraph. The analysis under Table 7 (appearing later with discussion) has this variable eliminated by putting apple sales in terms of percent of produce sales.

Table 5 shows the percent of apples sold in each size bag throughout the nine week study period when offered in different combinations.

Table 5 Percent of Prepackaged Apple Sales Represented by Different Size Units, by Combination of Bag Sizes Offered During the Nine Week Experimental Period.

Bag Size	Store and Bag Size Combination					
	Store No. 1		Store No. 2		Total	
	5-10 Pounds	3,5,10 Pounds	5-10 Pounds	3,5,10 Pounds	5-10 Pounds	3,5,10 Pounds
3	--	36.7	--	33.6	--	35.5
5	80.9	44.2	75.3	42.7	78.5	43.6
10	19.1	19.1	24.7	23.7	21.5	20.9

When only five pound packages were offered, they accounted for the total sales and therefore there was no need to include these facts in Table 5. The last two columns are the important statistics to note here. These indicate that the ten pound bags will sell slightly more than 20 percent of the apples whether in combination with five pounds only or with both three and five pound units. These two columns make it apparent that the competition is almost solely between three and five pound bags as far as Ohio apples are concerned. If it were possible to

eliminate the effect of both time and place at the same time in such an experiment we could determine whether the addition of the three pound unit to the 5-10 pound combination would sell more apples. Since this is not possible some other method of determining the contribution of the three pound unit would be necessary. Some conclusions may be drawn by first setting up norms for 3-5-10, and 5-10 pound combinations and comparing what happened when matched in different ways at different times in the test. Such conclusions cannot be entirely conclusive because of the impossibility of eliminating influence of time. These comparisons are shown in Table 6.

Table 6. Percent of Prepackaged Apple Sales of Two Stores in Different Size of Bag by Different Combinations.

Week	Bag Sizes (lbs.)		Percent of Total	
	Store No. 1	Store No. 2	Store No. 1	Store No. 2
Control Period				
1	5	5	55.4	44.6
2	3-5-10	3-5-10	57.4	42.6
3	5-10	5-10	51.3	48.7
Experimental Period				
4	3-5-10	5	56.4	43.6
5	5-10	3-5-10	62.9	37.1
6	5	5-10	51.7	48.3
7	5-10	5	53.2	46.8
8	5	3-5-10	56.3	43.7
9	3-5-10	5-10	55.6	44.4
All offerings		All offerings	55.6	44.4

During the first three weeks the same combinations of units were offered in both stores and the percentages of total sales by each store recorded. These percentages can then be matched against the percentages for later weeks when different matchings were made.

When five pound bags only were in both stores, 55.4 percent of the prepackaged apples of both stores were sold by Store No. 1. Later when Store No. 1 offered five pound bags only against 5-10 and 3-5-10 pound combinations in Store No. 2,

the respective percentages of the total were 51.7 and 56.3. This shows no conclusive evidence that adding other size units to the offerings of store No. 2 changes the relationship materially. This was likewise true when the store No. 1 had 3-5-10 pound units with varying combination in store No. 2. With 5-10 pound units in store No. 1, the percentage went up materially when the other store offered 3-5-10's at the same time. As a summary, it can be said that the evidence of any great effect of adding 3 and 10 pound bags to the 5's on total sales is not too apparent in this kind of analysis where effect of total produce sales on apple sales has not been taken into account. The next paragraph takes into account this variable and sheds new light on volume of sales attained when more than one size of package was offered.

Probably the best method of measuring the effect on sales of adding the three and ten pound units to the five pound unit is by comparison of the percentage of produce sales represented by apples when the various combinations of bag sizes were offered at different times. This measure shows a distinct increase in the proportion represented by apples when both the 10's separately and the three and ten's together were added to the five's. When the five pound bag was offered alone, apples sales made up 4.30% of the total produce sales. When the ten's alone and the three and ten's were added to the five pound offering apple sales represented 4.92 percent of produce sales in both cases. When considering the difference between these percentages, one must consider that the produce sales of these stores amounted to thousands of dollars each week. Thus a small increase in percent of produce sales represented by apples means a large increase in dollars worth of apple sales. When stated in terms of increase in apple sales the addition of the ten's, and three's and ten's to the five's amounted to 14.4 percent in both cases. This increase amounted to a total of 2800 pounds of apples in both stores for the nine week period when either combination was added to the five pound bag. By adding either combination of the ten's alone or the three's and ten's together with the five's the increase amounted to slightly over 300 pounds of apples per week in the two stores.

Table 7. Percent of Produce Sales Represented by Ohio Packaged Apples with Different Combinations of Bag Sizes.

Bag Size Combination (lbs)	Store No. 1	Store No. 2	Both Stores	Index of Apple Sales Volume (5#alone = 100%)
5 only	3.63	5.11	4.30	100.0
5 and 10	4.57	5.51	4.92	114.4
3, 5, and 10	5.17	4.56	4.92	114.4

Since the increase was identical for both the addition of the ten pound bag alone and the three and ten pound bag at the same time the conclusion could be made that the addition of the ten pound bag to the five pound will accomplish the result of increasing sales. Addition of the three pound bags has little effect on sales of ten pound units or on total sales. However, the offering of three pound units probably should be made since the consumers demonstrated that they want it.

The three pound bag was priced with enough premium to pay its extra cost per pound and the packer and trade should therefore not be prejudiced against it on the basis of cost.

Since it is apparent that the ten pound bag increased sales no more evidence is necessary to establish its value. But apparently the value of the use of three pound bags would rest largely on the fact that since the customers have shown their desire for it that good merchandising and the retailer's desire to get away from bulk would probably dictate its use. Further possibilities in the value of the three pound bag to Ohio producers would be in its effect on competition of western apples or in its use to sell small apples. Such effect would have to be tested further than this year's study allowed to reach any definite conclusion.

1952 Crop Year

In order to test the validity of the first year's results under different price levels it was decided to continue the test of the effect of various sizes of bags on volume for a second year. The national apple crop was smaller in 1952 than in 1951 and prices of local prepackaged apples were approximately two cents higher per pound at the retail level. Western apple prices also were higher. It was thought best as a result of the higher level of apple prices to offer three, four, and eight pound units instead of three, five, and ten which were offered the first year.

The study sample was enlarged to include seven experimental stores and five control stores. The control technique was modified to eliminate carry-over effects of different offerings.

Over 200,000 pounds of apples were sold through the 12 experimental stores during the test period in this second year's study. During these experimental weeks over 500,000 customers passed through the stores and it is felt that this volume of apples and number of customers was large enough to permit valid conclusions to be made of the results.

The twelve stores were located in greater Columbus, Fairborn, Knollwood, Washington Court House and Urbana. Various sizes of self-service stores were selected and the stores were located so as to represent various consumer income areas. Except to keep the display at the same location and of the same size throughout the ten week period no other special treatment was given the experimental apples by any of the twelve produce departments. All apples in the experiment went through regular marketing channels to get to the stores.

Records were kept for each offering of apples sold during the ten week study period during October, November, and December. These records covered all six market days of each week. All stores handled the four pound prepackaged apples during the first two week control period which was used as a base. After the two

week control period, three stores added eight pound prepacks to the standard four pound while four stores added both three and eight pound packaged to the regular four pound offering. The other five stores were used as control stores and continued to handle apples as during the two week base period. All stores continued to sell bulk western and eastern apples in addition to the Ohio pre-packaged apples.

The first thing to be checked was the sale of western bulk apples. Sale of these apples normally increases from the start of their season to the Christmas holidays. Thus, a check was made of what happened to their sale during the experimental weeks compared to the control weeks with different offerings of Ohio prepackaged apples.

These percentage increases are shown in Table 8. It can be seen that the increase was in direct inverse relation to the number of bag sizes of local apples offered. This is shown in both actual percentage increases in volume compared to base period and in increases in the western apples as a percentage of produce sales.

Table 8. Changes in Sales of Western Apples During Experimental Period as Percentage of Base Period in Twelve Ohio Stores, 1952.

Bag Sizes Offered (lbs)	Increase	
	In volume as percent of base period.	In volume as percent of produce compared to base period
3, 4, and 8	42.69	13.8
4 and 8	68.60	45.1
4 only	132.12	77.2

This constitutes good evidence that offering two or more bag sizes of Ohio apples gives increased competitive advantage to the local prepackaged apples over western apples. Statistically it means that the offering of three bag sizes of Ohio apples replaced 191 pounds of western apples per week per store which would have been sold if only one size unit of Ohio apples had been offered. This amounts to an important addition to demand for Ohio apples. While the combination

of three, four and eight pound bags was most effective in competing with western apples the four and eight pound combination was also effective but not to the same degree. It is evident that the more varied the offering of Ohio apples, at least up to three bag offerings, the stronger is the competition which it affords with western apples.

Evidence is presented in Table 10 that the competition of prepackaged apples with apples other than western was also very effective but that this competition was about as effective regardless of number of bag sizes offered. In all three offerings the sale of apples other than western and prepackaged apples dropped by at least 49 percent during the experimental period.

In Table 9 is shown the relative sales of apples by bag size during the test period with the only variable as the number of bag sizes offered. Bulk apple sales are not summarized in this table. The most important thing brought out in this table is the comparative importance of each bag size in the different combination of offerings regardless of what happened to bulk or total apple sales.

Table 9. Percent of Prepackaged Apples Sold in Each Size of Bag, by Store Groups Having Various Types of Bag Offerings.

Store Group #1 (4 stores)		Store Group #2 (3 stores)		Store Group #3 (5 st.)	
Bag Size (pounds)	Percent of Sales	Bag Size (pounds)	Percent of Sales	Bag Size (pounds)	Percent of Sales
3#	33.5	4#	63.5	4#	100
4#	41.7	8#	36.5		
8#	24.8				

It is evident that there was an important demand by consumers for all three sizes of bags offered. In the stores presenting three bag sizes the three pound bag accounted for one-third of the sales. Where the three pound bag was omitted the sales in eight pound bags made up a much higher percent of the total.

To aid in analyzing more accurately the effect of various combinations of bags, the effects of differences in volume of produce sales in different weeks were eliminated by expressing sales of apples as a percent of total produce sales. (Although these percentages represented by apples may seem small, it must be remembered that these produce departments sold well over a quarter of a million dollars worth of produce in this ten week period.) From these percentages then can be calculated the change in apple sales associated with the various treatments. These are shown as percentage changes in the last column on Table 10.

Table 10. Apple Sales as a Percent of Produce Sales

Offerings	Control Period	Experimental Period	Experimental Period as a Percent of Control
Stores offering three bag sizes			
Prepackaged apples	1.39	4.81	+ 246.0
Western apples	1.59	1.81	+ 13.8
Other	4.14	2.11	- 49.0
Total	7.12	8.73	+ 22.6
Stores offering two bag sizes			
Prepackaged apples	2.19	3.75	+ 71.2
Western apples	2.15	3.12	+ 45.1
Other	3.29	.95	- 71.1
Total	7.63	7.82	+ 2.5
Stores offering one bag size			
Prepackaged apples	2.04	3.78	+ 85.3
Western apples	1.36	2.41	+ 77.2
Other	5.76	2.11	- 63.4
Total	9.16	8.30	- 9.4

The first two columns under each combination of bag sizes shown in Table 10 are percentages of total produce represented by sales of different offerings of apples for both the control and experimental periods. Total sales of apples expressed in percentage of produce were affected differently by the three different offerings of prepackaged apples. Three bag sizes resulted in 22.6

percent increase in total apple sales (as percent of produce) for the experimental period and in 246.0 percent increase in prepackaged apples.

Where only two sizes were offered total sales went up only 2.5 percent with the experimental prepacks increasing 71.2 percent. In control stores with only the one size of bag offered total apple sales dropped 9.4 percent but sales of experimental prepackaged apples increased 85.3 percent based on produce sales. However, in these control stores bulk western apples had a much greater increase than in stores with two and three bag sizes.

Comparing the effectiveness of various bag size offerings as was done for the 1951 study shows the same outcome for 1952 but to different degrees. Using the one bag size as base it was found that the two bag size offering increased sales by 13.1 percent and the three bag size offering increased the sales by 35.3 percent.*

It is evident that the display of three sizes is more effective in increasing total apple sales and in selling prepackaged apples. The big increase in sale of prepackaged apples where three sizes were offered was partly in the sale of more apples in total and partly in displacement of western apples which would have increased by about 77 percent (as shown by control stores) with only one bag size competition. Bulk other than western apples showed about the same pattern of decrease from the control period to the experimental period regardless of offerings of prepackaged apples. This is rather conclusive evidence that any displacement coming from more than one bag size offering was almost entirely if the displacement of western apples.

Sales of various offerings of apples as well as of produce were computed as a percent of control period and are shown in Table 11. This table differs from Table 10 in that apple sales have not been corrected by produce volume as was done in Table 10. The main use of this table is to show actual figures and changes. The relative changes shown in Table 10 are more accurate measures of effect of various offerings.

* These percentages were obtained by dividing (100% + 2.5%) by (100% - 9.4%) and (100% + 22.6%) by (100% - 9.4%)

Table 11. Average Weekly Sales of Apples and of Total Produce During Control and Experimental Periods by Twelve Retail Stores in Ohio.

Offerings	Control Period	Experimental Period	Percent Change from Control to Experimental Period
Stores offering three bag sizes (3#, 4#, 8#)			
Prepackaged apples (lbs)	309	1149	+ 271.5
Western apples (lbs)	214	305	+ 42.7
Other (lbs)	940	466	- 50.4
Total apples (lbs)	1463	1961	+ 34.1
Total produce (dollars)	2874.54	3259.56	+ 13.4
Stores offering two bag sizes (4#, 8#)			
Prepackaged apples (lbs)	401	786	+ 95.9
Western apples (lbs)	274	461	+ 68.2
Other (lbs)	752	202	- 73.1
Total apples (lbs)	1427	1449	+ 1.5
Total produce (dollars)	2419.30	2770.86	+ 14.5
Stores offering one bag size (4#)			
Prepackaged apples (lbs)	265	545	+ 105.6
Western apples (lbs)	105	244	+ 132.4
Other (lbs)	799	321	- 59.8
Total apples (lbs)	1169	1110	- 5.1
Total produce (dollars)	1658.24	1955.62	+ 17.9

All groups of experimental stores had an increase in total produce sales per week in the experimental period compared to the control weeks. For apples alone the increase was 34 percent for those stores with three bag sizes and 1.5 percent for those with two bag sizes. The control stores with only the one bag size actually had a drop of five percent in apple sales. This change represented all apples with the only variable in handling apples being in the number of sizes of bag offerings. The differences in the changes between the groups were almost entirely associated with this one variable since all other variables had been eliminated by the use of controls with the exception that produce managers were asked to handle western apples just as they were accustomed to,

Analysis of volume of sales of experimental apples shows that stores with three sizes of bags increased sales by 271 percent over the control period. Stores with two bag sizes increased 96 percent and the control stores increased sales 106 percent indicating that three sizes of bags was much more effective than two sizes in increasing apple sales volume.

SUMMARY AND CONCLUSIONS

Prepackaging at the Farm for Two Crop Years, 1951 and 1952

Farm prepackaging of apples was mainly a hand operation with considerable variation in detail between growers. There were wide ranges in labor cost per bag and in master container costs. The average cost of packaging a bushel of apples in consumer packages was 60.7 cents for the 21 producers or about 30 cents higher than packaging in bulk as estimated by the growers. These growers reported an increase in returns of 81 cents per bushel for prepackaged apples over the same apples in bulk.

Although many types of materials were used, polyethylene seemed to be most satisfactory. Appearance of the fruit in this bag was excellent and the material withstood handling with a minimum of breakage.

Eleven varieties and all sizes of apples were prepackaged. The 2 $\frac{1}{4}$ inch apple was packaged by more growers than any other size. Advantages attributed by growers to prepackaging are: (1) increasing gross income, (2) stabilizing price, (3) moving more apples in the same or shorter time, (4) raising the price received for two and one-fourth inch apples, and (5) increasing net income.

Sale of Prepackaged Apples Through Retail Stores

1951 crop year

Addition of three and ten pound bags to the ~~regular~~ offering of five pound polyethylene bags of apples in two stores in Columbus, Ohio in 1951 increased apple sales 14.4 percent.

When all three sizes of bags were offered at the same time in 1951, 35.5 percent of the total sales were in three pound units, 43.6 percent in the five pound units and 20.9 percent in the ten pound bag. When five and ten pound units were offered at the same time without the three pound units, 78.5 percent of the sales were in five pound and 21.5 percent in the ten pound units.

1952 crop year

In 1952 the addition of eight pound units to the four pound units increased both total and prepackaged apple sales both in amount and as a percent of produce sales. The addition of the three pound unit further increased total apple sales and prepackaged apple sales.

Stores having three bag size offerings increased total apple sales as a percent of produce sales over the base period by 22.69 percent, the stores with two bag sizes had a 2.53 percent increase while the stores having only one bag size had a decline of 9.34 percent in total apple sales as a percent of produce from the base period.

When all three (3, 4, and 8 pound) units were offered at the same time 33.5 percent of the volume of sales were in three pound units, 41.7 percent in four pound units and 24.8 percent in eight pound units. With the offering of two (4 and 8 pound) units at the same time 63.5 percent of the volume sold was in four pound and 36.5 in eight pound units. It will be noted that in both cases the eight pound unit sold a larger percent of the total than did the ten pound unit in the previous year.

Effective competition with the western apple seems to depend on number of bag sizes offered since each addition of an extra bag size of the prepackaged apples decreased the sale of western apples.

The sale of prepackaged apples varied less from week to week throughout the season than did bulk eastern and western apple sales.

Combined Conclusions

Increasing the number of bag sizes offered increased prepackaged and total apple sales both in volume and as a percent of produce sales.

Demand for different size sales units was clearly demonstrated by the acceptance of each size offered. Particular attention should be paid to acceptance of both eight and ten pound units. The study lends doubt to the wisdom of offering

only one size unit if total sales and competition with other apples are important.

The value of the addition of a three pound sales unit was demonstrated.

OBSERVATIONS

The following statements are observations made during this study. They are not based on research findings but were the observation of the entire research staff on this project. These observations should be treated as such and not as statistically proven facts. Most of these observations would be worthy of empirical study.

1. When closely graded and carefully sized two and one-quarter inch apples were packaged in polyethylene bags, consumers bought them at the same price and often in preference to larger apples. By questioning, it was found that these purchasers usually had small children in their families. Just as in the larger sizes the coloring of the small apple is important to the consumer acceptance.

This movement of two and one-quarter inch prepackaged apples is in contrast to slow movement of the same apple in bulk at discounted prices.

2. Improvements could be made in the proper spacing of air holes in the films to avoid "fogging" and collection of moisture on the film. The less clouded bags moved before the clouded ones. Consumers seemed suspicious of clouded bags.

3. Spoilage losses were extremely low in packaged apples. A higher rate of spoilage was noticed in unpackaged midwestern apples and especially in western bulk apples. This was probably caused by damage in transit and by customer handling until the less desirable apples had to be thrown out.

4. In some stores where large ($3\frac{1}{4}$ inch and over) well colored Ohio Red Delicious apples were offered in the same manner as western apples, people readily bought the Ohio apples at the same price they were paying for Washington Delicious apples.

5. Uniform sized apples appear better in the polyethylene bag and moved much better than mixed sizes. Color and quality should be uniform. It was noticed that one poor apple in the bag often caused that bag to be laid aside by the customer.

6. Practically all produce managers commented that they like a small size of bag added to the larger sizes so they would not have to handle any bulk apples.

7. There was no evidence that unconventional prices such as 31¢, 32¢, 41¢, 42¢, 53¢, 54¢, 61¢, 91¢, 93¢, 94¢, \$1.01, \$1.09, \$1.12 had any detrimental effect on unit sales. Likewise, there is no definite price limit or range as far as the research showed.

8. Breakage of bags is not a problem. Eight and ten pound bags of .0015 polyethylene film were sufficiently strong to stand customer handling. Customers did not seem to be afraid of breaking the large bag.

9. The spoilage loss of apples handled in prepackaged units was much lower than in bulk.

