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Costs and Use of Labor In Harvesting Apples for Fresh Market

Hudson Valley, New York, 1959 and 1960

by

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INTRODUCTION

Efficiencies in operating fruit farms have increased greatly in recent years. Most of the gains have occurred in the growing, storing and selling operations. As a result harvesting costs make up an increasingly larger share of the total cost of producing apples. This is of particular significance to the fruit grower who sells on the fresh market. Such innovations as the bulk box and the fork lift have not been easily adapted to fresh market conditions.

TABLE 1. COSTS IN HARVESTING AND HANDLING APPLES ON NEW YORK COST ACCOUNT FARMS (1937-1958)

Period	Average cost per bushel to: Harvest	Average cost per bushel to: Grow, harvest, store and sell	Harvesting cost as per cent of total cost
			per cent
1937-40	$.14	$ .81	17
1941-45	.26	1.71	15
1946-50	.31	1.31	24
1951-55	.34	1.46	23
1956-58	.40	1.46	27

Source: New York State Cost Account Records, Cornell University, Ithaca, New York.

An indication of the increasing importance of harvesting costs is suggested by New York Cost Account Records. While these farms represent only a small proportion of fruit farms in the state, their experience over a twenty year period has meaning for the fruit industry generally. Despite reductions in the cost of producing a bushel of apples since 1945, harvest costs have continued to rise.

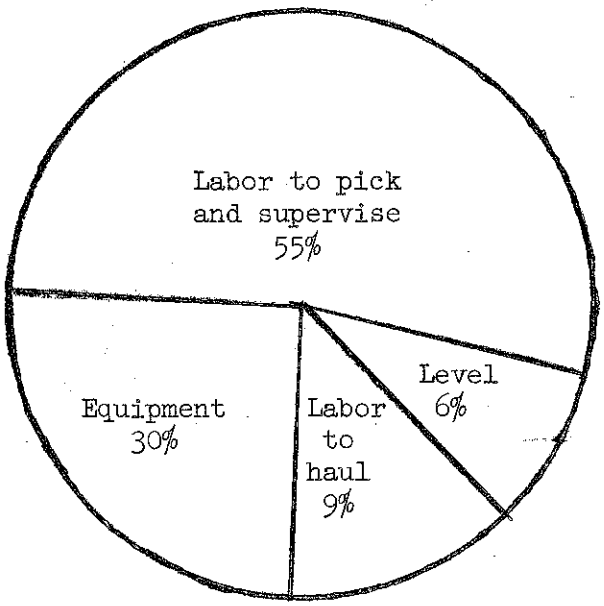

FIGURE 1. DISTRIBUTION OF COSTS IN HARVESTING ONE BUSHEL OF APPLES FOR FRESH MARKET New York, 1958-59

Harvesting a bushel of apples for fresh market costs between 35 and 40 cents per bushel under average conditions. About half of this cost is for picking labor. Other labor for leveling, hauling and supervision, plus the cost of field containers, picking equipment, and tractors, trucks, and trailers used in hauling make up the other half of harvest costs. Increasing efficiency in the harvest operation is not easy. Pickers are paid on a piece-rate basis. Mechanical methods cannot be employed here. At least nothing has been suggested as yet for fresh fruit which looks feasible. As a result major gains in efficiency must come in the other harvest operations.

Objectives

Because technological change in harvesting apples for fresh market has moved slowly, a study of the harvest operation on a group of farms in the Hudson Valley was made in 1959 and 1960. This study involved two major parts:

(1) An investigation of the use of labor during harvest and costs associated with each of the major jobs performed.

(2) A study of physical damage and bruising associated with different methods used in harvesting fresh market apples.

The results of the first part of this study concerning the use of labor during harvest are presented in this report 1/. A breakdown of jobs during the harvest season and costs associated with each are discussed. Variation from farm to farm is identified. A comparison of costs in 1960 is made with those found in 1959 in the Hudson Valley and in 1956 and 1957 in Western New York. A brief discussion of problems and possible solutions to the organization of labor during harvest conclude the report.

In 1960, 49 fruit farms in Ulster, Orange, Dutchess and Columbia Counties were visited. The number of farms chosen from each county was in proportion to the volume of fruit produced in that county.

1/ A preliminary report describing costs of labor in harvesting apples in the Hudson Valley during 1959 is presented in A. E. Res. 50, "Costs and Physical Damage in Harvesting Apples for Fresh Market" by T. I. Mullen, November 1960.

An emunerator visited each grower and obtained data concerning farm organization, tree numbers, bushels of apples harvested, method of harvest, use of labor, rates of pay and opinions of the grower on various aspects of the use of labor during the harvest operation.

Harvest costs per acre increase as yields increase. For this reason all costs were computed on a per bushel basis. In this manner direct comparisons of labor use and efficiency could be made from farm to farm.

Methods of Harvesting Apples

Nearly all of the apples for fresh market in the Hudson Valley are picked by hand into drop-bottom, picking bags and emptied into wooden field containers of some type. A few growers empty picking containers into bulk boxes containing from 18 to 24 bushels of fruit. On the whole, however, the equipment used for picking and dumping in the orchard is similar from farm to farm.

Differences in harvesting methods arise from procedures used to level and haul fruit to storage. While each grower organized harvesting somewhat differently, three general harvest patterns were observed as most important:

(1) Single layer - Apples are picked in Wells and Wade picking bags, emptied into standard field crates, and hauled to storage in single layers on trailers or trucks. Leveling takes place in the orchard, when loading, or at storage.

(2) Stacked or Palletized - Apples are picked in Wells and Wade picking bags, emptied into standard field crates, and hauled to storage on pallets or stacked on trailers. Leveling usually takes place at the point of loading in the orchard.

(3) Bulk box - Apples are picked in Wells and Wade picking bags, emptied into 18 to 24 bushel wooden boxes, and moved to storage on trucks or trailers; a fork lift is required in the orchard.

The single layer system is by far the most important method of handling apples in the Hudson Valley with 78% of the growers interviewed using this method. Its popularity is undoubtedly due to its adaptability to steep slopes and rough terrain. Leveling, if desired, can take place at the storage rather than in the orchard.

Stacking or palletizing, although allowing larger loads to be moved at one time and requiring less tractor time per bushel hauled, is suited only to orchards which are located on flat or gently rolling land. Under conditions other than these the time spent in securing the load for transport may be so great as to make the single layer system just as economical.

Three of the growers interviewed handled some of their apples in 20 bushel bulk or pallet bins. None of them handled all of their crop in this manner. As a result, a clear picture of a complete bulk operation can not be drawn.

Generally there is some saving of labor in the hauling operation. The leveling process is not necessary. The use of the fork lift in the orchard plus the economies inherent in moving 20 bushels at a time can greatly increase the productive capacity per man in the harvest operation if bruising or physical damage is not increased.

Description of Farms Studied

All of the farms visited could be classified as fruit farms. Apples was the most important enterprise on 47 of the 49 farms. Twelve of the farms grew apples exclusively. Twenty-three had small plantings of other fruits while apples were still the major enterprise. Two other farms were solely engaged in fruit production but had fruits other than apples which accounted for a majority of their work units. Twelve of the farms combined vegetables or livestock with the fruit enterprise but not to the extent of replacing apples as the major source of income.

TABLE 2. CLASSIFICATION OF FRUIT FARMS STUDIED
(49 Hudson Valley Farms, 1960)

Type of farm	Number of farms	Average work units per farm: Apples	Other fruit	Other	Total
Specialized apple	12	1347	-	-	1347
Specialized fruit farms:					
Primarily apples	23	1027	183	-	1211
Primarily other fruit	2	1025	1722	-	2748
Fruit with other enterprises:					
Fruit and vegetables	3	1337	267	244	1848
Fruit and livestock	9	1000	80	102	1182
Average	49	1119	187	34	1341

The largest farm visited was a specialized apple farm with 400 acres of bearing apples as its only enterprise. The second largest farm was a fruit farm with 125 acres of bearing apples and 225 acres of other fruit of bearing age. The smallest farm visited was a specialized apple farm with 9.5 acres of bearing apples.

TABLE 3. VARIETIES OF APPLES HARVESTED
(35 Hudson Valley Farms, 1960)

Variety	Number of farms reporting	Total number of trees	Per cent of total trees
McIntosh	35	33,351	38
Red Delicious	34	13,630	16
Rome	32	12,713	15
Cortland	32	7,626	9
Golden Delicious	26	4,357	5
Other Varieties	34	15,582	17
Total		87,259	100

Thirty-five farmers supplied information concerning the number of trees of each variety of apples. The 87,000 trees on these farms make up approximately 12 per cent of all the apple trees on commercial fruit farms in the four counties.

McIntosh was the most common variety with every grower having some. Nearly forty per cent of the trees were of this one variety. Red Delicious, Rome, Cortland and Golden Delicious were next in order of importance. There were over twice as many McIntosh trees as there were Red Delicious. Romes were of about equal importance to Red Delicious. Seventeen per cent of the trees were of still other varieties. Greenings, Northern Spys, Baldwins and Stayman Winesaps were the most important of these minor varieties.

USE OF HARVEST LABOR AND COSTS

Information was obtained from 49 growers concerning the use of labor during the apple harvest and the costs involved. The average cost of labor to harvest a bushel of apples was 27 cents in 1960.

Harvesting a crop of apples includes all of the jobs associated with picking fruit and moving it from the orchard to storage or a packing shed. To study the use of labor and make comparisons from farm to farm, the total amount of labor required to do all of the jobs during the harvest season was determined. The value or cost of each type of labor was established with the help of the operator. Comparisons were made by dividing total harvest costs by the number of bushels picked.

Average Cost of Labor per Bushel

The average cost of labor to harvest a bushel of apples was similar whether the single layer or palletized system was used. In general those using pallets or hauling stacked field crates had larger operations than those using the single layer method.

TABLE 4. LABOR COSTS IN HARVESTING APPLES BY DIFFERENT HANDLING METHODS (49 Hudson Valley Farms, 1960)

	Method of handling	
	Stacked and palletized	Single layer
Number of farms	11	38
Average production	33,565 bu.	24,707 bu.
Cost of labor to harvest		
Average cost per bushel	26¢	27¢
Range in cost per bushel	20 - 36¢	22 - 35¢

There was more variation in costs among farms using the same method than between the two systems. In other words the way in which the apples were brought from the orchard to storage did not by itself have a definite effect on labor efficiency or costs. The range in average costs per bushel is more striking than anything else.

A more complete picture of the way in which labor is used in these two methods of harvest can be obtained by examining the component parts of labor costs.

TABLE 5. BREAKDOWN OF LABOR COSTS IN HARVESTING APPLES (49 Hudson Valley Farms, 1960)

	Method of handling	
	Stacked and palletized	Single layer
Average cost per bushel to:		
Pick	18.2¢	18.8¢
Supervise	2.7	2.2
Level	1.3	2.5
Haul	4.0	3.7
Total	26.2¢	27.2¢

Picking is the primary cost in harvesting apples. About two-thirds of the labor bill goes for this item. Nearly all growers pay on a piece-rate basis. The most common rate paid in 1960 was 18 cents. The range in rates was from 15 to 25 cents depending on varieties, bonuses and other special arrangements. However, when the average rate per bushel was determined for each farm on the basis of all the apples harvested, the range was much narrower, from 16 to 21 cents per bushel.

Supervision, leveling, and hauling are the three other tasks involved in harvesting apples. Together they make up about one-third of the labor bill. Most of the variation in harvesting costs results from differences in the way these three jobs are handled. The variability in labor costs per bushel for this part of the harvest operation is shown in table 6.

TABLE 6. VARIATION IN LABOR COSTS PER BUSHEL FOR SUPERVISION, LEVELING, AND HAULING (49 Hudson Valley Farms, 1960)

Labor cost per bushel	Method of handling	
	Stacked and palletized	Single layer
(cents)	(number of farms)	
0 - 4.9	1	6
5.0 - 9.9	8	21
10.0 - 14.9	1	11
15.0 - 19.9	1	-

While the range in picking costs was only 16 to 21 cents, the cost of other labor ranged from 3 to 17 cents per bushel. Farm to farm differences were obvious and striking. While more than half of the growers had costs between 5 and 10 cents per bushel for the labor involved in supervision, leveling, and hauling, the degree of variability was greater than expected. Hence, further study of the use of this labor seemed appropriate.

One of the major reasons for differences from farm to farm was the leveling operation. Only 4 of the 11 growers who stacked or palletized their fruit had a separate leveling crew or treated leveling as a separate operation. Either the pickers or those who loaded and hauled the fruit did this job.

Leveling Costs

The leveling of field crates during harvest was accomplished in a wide variety of ways. Of the 49 growers interviewed, 10 did no leveling as a separate operation. In fact they indicated no need to level as such.

TABLE 7. LABOR COSTS FOR LEVELING FIELD CRATES
(29 Farms, 1959)

	Where leveled		
	In the orchard	Before unloading	After unloading
Number of farms	5	9	15
Average number bushels handled	21,830	23,330	32,350
Cost of leveling			
Range in cost per bushel	1.3-6.2¢	1.6-9.0¢	1.1-8.1¢
Average cost per bushel	4.2¢	4.6¢	3.1¢

The average cost of leveling for operators who did this as a separate operation was 3.7 cents per bushel. Generally the more bushels handled the lower the cost of leveling per bushel. Of the 39 growers who leveled 29 used a separate crew for the job -- five leveled in the orchard, nine before unloading at storage, 15 after unloading. Ten others had the hauling crew perform the job either in the orchard or at storage while unloading.

In 1960 the lowest cost was obtained by the crews who leveled after unloading at storage (table 6). The highest average cost per bushel occurred when crews did the job before unloading. However, there was great variation in the cost of leveling regardless of where the job was done.

TABLE 8. DISTRIBUTION OF COSTS PER BUSHEL TO LEVEL FIELD CRATES OF APPLES
(29 Hudson Valley Farms, 1960)

Cost of leveling	Where leveled		
	In the orchard	Before unloading	After unloading
(cents per bushel)		(number of growers)	
1.1 - 2.0	1	2	5
2.1 - 3.0	-	1	4
3.1 - 4.0	1	2	3
4.1 - 5.0	1	1	-
Over 5.0	2	3	3
Total	5	9	15

It was not possible to determine leveling costs separately from hauling costs when the hauling crew did both jobs. By examining the cost of labor for hauling for those who had the hauling crew level and those who hired special labor for leveling, an indication of the cost of leveling may be obtained. The 10 growers, who had their hauling crew level, had an average labor cost for both jobs of 5.7 cents per bushel compared with 3.4 cents for those who hired special labor for leveling. If it is assumed that labor for hauling costs 3.4 cents in both cases, then the labor for leveling would cost the remainder or 2.3 cents per bushel. This cost is generally lower than that experienced by growers treating leveling as a separate operation.

Cost for Supervision of Labor

It was found that the average cost of supervision per bushel was not affected directly by the number of bushels handled (table 9). The supervisory force changed as more bushels were harvested. The owner-operator generally provided direct supervision on farms producing less than 30,000 bushels. Hired labor plus the owner-operator were involved on farms producing more apples. Farmers producing 40,000 bushels or more not only employed special supervisory help but also spent the majority of their time at this job in order to insure proper picking of the apples.

TABLE 9. EFFECT OF VOLUME HANDLED ON COST OF SUPERVISION OF HARVESTING OPERATION (49 New York Farms, 1960)

Number of bushels harvested	Number of farms	Number employing supervisor	Cost of supervision per bushel
			(cents)
Under 10,000	5	1	2.6
10,000-19,999	17	7	2.5
20,000-29,999	13	5	2.2
30,000-39,999	6	3	2.2
Over 40,000	8	6	2.6
Total or average	49	22	2.4

Labor Costs in Hauling

As the volume of production rises the cost of labor to haul a bushel of apples generally declines (table 10). Except for those producers in the 20,000-40,000 bushel range the relationship is rather definite. In this group there were several growers who had extremely high costs per bushel either due

to inefficiencies in the organization of the hauling operation or due to a light crop. The eight growers producing 40,000 bushels or more were, as a whole, extremely efficient in the use of labor on this job. The hauling operation on these large farms is necessarily a full-time operation. Part-time hauling crews are generally less efficient unless the grower himself is involved in the job.

TABLE 10. EFFECT OF VOLUME ON COST OF LABOR FOR HAULING FROM ORCHARD TO STORAGE (49 New York Farms, 1960)

Number of bushels harvested	Number of farms	Cost of labor for hauling per bushel
		(cents)
Under 10,000	5	4.8
10,000-19,999	17	3.6
20,000-29,999	13	3.9
30,000-39,999	6	4.0
Over 40,000	8	2.9
Total or average	49	3.8

Comparison with Previous Studies

One might naturally wonder whether the cost figures presented for harvest labor in 1960 are representative compared with other years and other regions. A similar study on the use of labor during harvest was conducted in the Hudson Valley in 1959 [1]. Cost figures were also obtained in 1956 and 1957 in Western New York [2].

1/ Mullen, T. I., "Costs and Physical Damage in Harvesting Apples for Fresh Market." (Preliminary report.) A. E. Res. 50. Mimeographed publication of the Department of Agricultural Economics, Cornell University, November 1960.

2/ Stanton, B. F., Dominick, B. A., Jr., and Fan, S. C., "Variability in Apple Production Costs and Returns." A. E. Res. 17. Mimeographed publication of the Department of Agricultural Economics, Cornell University, May 1959.

TABLE 11. LABOR COSTS IN HARVESTING APPLES

	Western New York		Hudson Valley	
	1956	1957	1959	1960
Number of farms	88	90	50	49
Labor cost per bushel:				
Picking	16¢	17¢	18.4¢	18.7¢
All other labor	12¢	11¢	9.6¢	8.6¢
Average labor cost per bushel	28¢	28¢	28.0¢	27.3¢

The similarity of the results for these three studies is interesting in two respects. First, the data for 1956 and 1957 were obtained in Western New York where about two-thirds of the crop goes for processing. The 1959 and 1960 studies were conducted in the Hudson Valley where the crop is sold primarily fresh. This suggests that labor costs in the two regions are more nearly similar than many have thought. Secondly, the cost of labor per bushel has not changed significantly over the past five years.

The make-up of labor costs differs somewhat between the two regions. Picking costs more in the Valley. Other uses of labor account for more of the total in Western New York. The difference in picking costs per bushel is not surprising. First, piece rates have gone up in the past five years. More important, soft varieties make up a higher proportion of the total crop in the Valley. Pickers usually receive more for handling these varieties. The difference in hauling, supervision and other costs is more nearly related to differences in size of the operation studied in the two areas. More of the small growers were included in the Western New York study than in the Valley. There also was less effort placed on careful enumeration of other harvest labor in Western New York since this was only part of a much larger project.

The most interesting feature of this comparison remains in the striking similarity of the figures. Roughly two-thirds of the labor bill at harvest goes for picking. The remaining third covers hauling, supervision, leveling, and handling harvest equipment.

GENERAL OBSERVATIONS ON THE USE OF HARVEST LABOR

After studying how labor was used at harvest time, it is natural to think about improvements or changes that might be made. The great variability in the procedures used in handling apples after they were picked suggests that many growers could improve their efficiency without increasing physical damage to their fruit. Each of the three major jobs other than picking will be considered separately.

Leveling

The leveling operation was given special attention because some growers had successfully eliminated this job during harvest. All growers were questioned as to the role of leveling in their operation. Each grower was asked about the possibility of having his crew pick bushels which required little or no leveling. There was a feeling by many that the picker would not take the necessary time if he were asked to do the job. The cost of supervision necessary to carry this out successfully would be prohibitive in their opinion. On the other hand, several of the largest growers did no leveling other than that which their pickers did in the field. They admitted that the supervision in the orchard must be constant and intensive. They were convinced however that their pickers were making more money by picking a level bushel as opposed to one with as much as 10 per cent extra on the top. Moreover, they felt they were also obtaining savings by eliminating the leveling operation.

The average cost of leveling was 3.7 cents per bushel for those who did this job. One needs to gain an extra bushel from every five bushels picked to pay for leveling from extra apples alone. While most growers did not indicate that leveling was done to get extra apples, this was an end result. Every farmer must make his own decisions with respect to leveling. Physical damage will occur if apples are not level with or below the top of the box when another box is placed above it. Of all the jobs during harvest, leveling is the most open to question. Twenty per cent of the growers had found ways of eliminating it as a separate operation. Another 20 per cent had combined it with the job of hauling or unloading. In general these growers had lower costs per bushel for labor to harvest their apples.

One exception is worthy of note. When apples are sold direct from the orchard as orchard-run, the leveling process takes on a more important role. Here it serves as part of a field grading operation. Shrink must be controlled at approximately 10 per cent. In this case four cents per bushel is a very inexpensive grading process. Depending on the sales outlet, returns from selling on an orchard-run basis may well merit the cost of a special crew in the orchard.

Hauling

Considerable variation existed in the cost of labor to haul a bushel of apples from the orchard to storage or a packing shed. Part of this variation is clearly related to the length of haul and the location of storage relative to the various blocks picked. Another factor was the amount of work for a hauling crew to do. In general labor costs per bushel for hauling were lowest on the large farms. The type of equipment used in hauling was of small importance.

In looking for ways to make more efficient use of a hauling crew, simple job analyses should help. How much of the time is spent riding versus loading or unloading? How many men are necessary to do the job? Who should load and unload? The answers to these questions are different on different farms. A well organized hauling crew usually pays good dividends in terms of the quality of the fruit and in costs.

Management and Supervision

The range of the costs within each of the systems clearly illustrates the role of management in conducting a successful apple harvest. For each method of harvesting variation is great from farm to farm. Nearly any system when used skillfully can be efficient and economical. Proper management and supervision of the labor force appears to be the most decisive factor in determining the success of the apple harvest and the profitableness of the fruit business. The added cost of some hired supervision or a more active supervisory role on the part of the operator may well result in economies in the other sectors of the harvest operation. Higher quality fruit often will more than offset the additional cost of adequate supervision.