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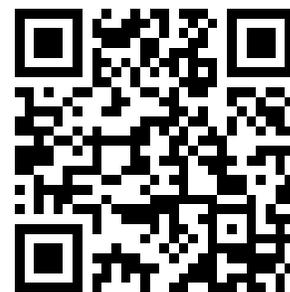
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***COST OF HARVESTING, PACKING
AND STORING APPLES FOR THE
FRESH MARKET WITH REGIONAL
AND SEASONAL COMPARISONS***



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**U.S. DEPARTMENT OF AGRICULTURE
ECONOMIC RESEARCH SERVICE**

COSTS OF HARVESTING, PACKING AND STORING APPLES FOR THE FRESH MARKET WITH REGIONAL AND SEASONAL COMPARISONS

by

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ABSTRACT: Harvesting, storing and packing costs for fresh apples during the 1972/73 season were obtained in a regional survey of apple grower-packers and packers. These results were compared with costs from a similar survey conducted during the 1969/70 season. Total harvesting cost in 1972/73 varied from 46 cents per bushel for Winesap apples in the Northwest to 75 cents for McIntosh in the Northeast. In all major production regions except the Northeast, a comparison of the surveys indicated lower or constant charges for regular and controlled atmosphere storage. Total packing and selling charges during the 1972/73 season for tray packed Red Delicious apples ranged from \$1.30 per carton in the Lake States to \$1.83 in the Northwest.

KEY WORDS: Apples, costs, harvesting, storing, packing, selling.

This article reports the findings of a regional mail survey of fresh apple grower-packers and packers for the 1972/73 season. The respondents, contacted during the summer of 1973, were chosen from a list of firms which had provided complete and consistent information in a similar survey performed during 1970¹. Data on costs of harvesting, storing, packing and selling fresh apples were collected in both surveys for the major U.S. apple production regions—the Northeast, Appalachia, Lake States and the Northwest. The 1970 survey also included information for California, whereas the 1973 survey did not.

¹ ERS publications resulting from or related to the survey have included: (a) *Regional Costs of Harvesting, Storing and Packing Apples*, ERS-496 reprinted from the *Marketing and Transportation Situation*, November 1971; (b) *An Interregional Intertemporal Activity Analysis Model of the U.S. Apple Industry*, a paper presented at the 70th Annual Meeting of the American Society for Horticultural Science, North Carolina State University, Raleigh, August, 20, 1973; and (c) *Harvesting, Storing, and Packing Apples for the Fresh Market: Regional Practices and Costs*, MRR 1009, September 1973.

The 1970 and 1973 surveys differed in two other respects: (1) no varietal information was obtained in 1970; in 1973, costs for Red Delicious apples were requested in each region as well as for McIntosh apples in the Northeast, Jonathans in the Lake States, and Winesap in the Northwest, and (2) the 1973 survey concentrated on obtaining a more detailed breakdown on harvesting and packing costs. Therefore, the data from the two surveys are not directly comparable but, where possible, comparisons are included to indicate the nature of changes in costs.

Regional cost estimates in this report are weighted averages derived from the respondents' cost and volume statistics. Harvesting costs and storage charges were weighted by each firm's total sales of apples while packing costs and selling charges were weighted by the individual firm's volume packed of the particular varieties surveyed.

Harvesting Costs

Harvesting expenditures include costs associated with picking, bins (rental or depreciated value) and hauling apples from the orchard to the packing or

storage facility. Picking is further subdivided into picking labor, supervision and fringe benefits (i.e., social security payments and the cost of providing housing for temporary workers). In the 1973 survey, total harvesting costs varied from 46 cents per bushel for Winesap apples in the Northwest to 75 cents for McIntosh in the Northeast (table 1), a difference of 29 cents per bushel. Harvesting costs for Red Delicious apples in these same two regions differed by 27 cents. The data indicate virtually no variations in harvesting costs between varieties within any region. The only exception was a 1-cent spread in picking labor costs in some regions that may be attributed to the handling characteristics of the varieties.

Regional differences in harvesting costs are to be expected. These result from the types of trees harvested (standard, semi-dwarf and dwarf), the availability of and demand for picking labor, and the amount of labor housing necessary. High density plantings of semi-dwarf and dwarf trees (relatively more prevalent in the Northwest) lend themselves to more efficient picking since workers are able to harvest a greater proportion of apples from the ground. Picking costs are tempered by a number of factors which vary by region. These factors include: the size of the apple crop, alternative crop picking opportunities, and the mix of types of labor (local versus migrant) ordinarily used within a locale. Much of the variation in harvesting costs between the Northwest and Northeast is a result of differences in fringe benefits. Growers in the Northeast apparently have made rather large investments in labor housing in recent years to furnish living facilities for their migrant picking labor force (about 80 percent of pickers in the Northeast were migrants in the 1969/70 apple crop year). The Northwest relies much more heavily on local labor (only about 56 percent were migrants in 1969/70) and thus incurs a much smaller total housing fringe benefit cost.

A comparison of picking costs per bushel with those for the 1969/70 season is as follows:

Picking cost per bushel				
Region	1969/70 All apples	1972/73 Deli- cious	Abso- lute increase	Percent- age increase
	Cents	Cents	Cents	Percent
Northeast	36	55	19	53
Lake States	37	47	10	27
Appalachia	33	36	3	9
Northwest	24	35	11	46

All regions experienced increases in picking costs. The Appalachia area, which relies heavily on Jamacian labor, had the smallest increase. An increase in labor housing costs as well as higher picking rates accounted for most of the Northeast's 53 percent rise in total picking costs between 1969/70 and 1972/73.

Bin rental (or depreciation) costs are rather uniform among the regions at 7 to 8 cents per bushel except in the Northeast where they are about 10 cents (table 1). No 1969/70 figures are available for comparison. Hauling costs approximated those in 1969/70 with the Northeast hauling expenditure being considerably above those in other regions. If the bin and hauling costs are added for each of the regions, total hauling costs are higher in the Northeast relative to other regions.

Storage Charges

Fresh apples are stored in two types of cold storage facilities: regular atmosphere (RA) and controlled atmosphere (CA). Although CA is about twice as expensive as RA storage, it has become increasingly popular and currently represents slightly more than one-third of all apples placed in storage. The popularity of CA storage results from its effectiveness in maintaining apple quality during

Table 1.—Apple harvesting costs per bushel by variety, four major production regions, 1972/73 season

Region	Picking labor	Fringe benefits ¹	Super- vision	Other	Total picking	Bin	Hauling	Total hauling	Total all harvesting
	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents
Northeast									
Red Delicious	30	14	9	2	55	10	9	19	74
MacIntosh	31	14	9	2	56	10	9	19	75
Lake States									
Red Delicious	37	4	5	1	47	8	6	14	61
Jonathan	37	4	5	1	47	8	6	14	61
Appalachia									
Red Delicious	28	3	4	1	36	7	6	13	49
Northwest									
Red Delicious	29	3	2	1	35	7	5	12	47
Winesap	28	3	2	1	34	7	5	12	46

¹ Includes Social Security payments and housing for temporary non-local workers.

storage, thus making it possible to store apples into the summer. This capability provides the consumer with year-round fresh apples and the producer with expectation of higher returns and greater flexibility in his marketing decisions.

In all regions except the Northeast, the survey data show lower or constant RA and CA charges between 1969/70 and 1972/73. These data are consistent with recent trends in apple production and storage space. U.S. apple production has fallen consistently below the 1969/70 record crop with about a 950 million pound smaller crop in 1972/73. At the same time estimates of cold storage space indicate a rather steady increase in capacity. Thus, there has been little pressure toward rising storage charges.

Cold storage charges per bushel for an entire season

Region	RA		CA	
	1969/70	1972/73	1969/70	1972/73
	Cents	Cents	Cents	Cents
Northeast	33	40	64	71
Lake States . . .	29	29	57	54
Appalachia . . .	30	28	63	58
Northwest . . .	35	33	69	63

Storage charges in the Northwest and Appalachia varied considerably from respondent to respondent while in the other regions they were generally consistent. The variations in the Northwest and Appalachia show differences in local competitive conditions as to storage of apples as well as other storable commodities.

Packing Costs and Selling Charges

Apples usually enter the packing plant in bulk bins from the orchard or storage facility. They are dumped onto a conveyor or lowered into a water trough from which they move to mechanical sizers and then are graded by hand. They are then placed into bags, trays or boxed bulk using one of many combinations of hand labor and laborsaving devices. Once they are packed in their master container they usually are loaded directly onto a truck (rail shipments are only important in the Northwest where the distance to market may involve a cross-country haul) or temporarily placed into holding rooms to provide inventories for later selection of specific varieties and packs. Selling activities may be performed by the individual packer but are increasingly being done by large cooperatives or selling organizations.

This study defined packing costs to include labor, containers and other supplies, and overhead expenditures. Each is discussed separately.

Labor Costs

Labor was subdivided into hourly and piece workers, supervisory personnel, and fringe benefits. Labor costs for packing fresh apples ranged from 33 cents for bagged cartons of Delicious and Jonathans in the Lake States to 57 cents for Winesaps tray packed in the Northwest (table 2). In the Northwest, labor costs for packing Winesaps in tray pack cartons were about 2 cents per carton higher than they were for Red Delicious.

This varietal difference in cost may have prevailed because a larger quantity of Red Delicious can be run per hour. Red Delicious are hauled in larger lots and also longer runs can be made since they are produced in greater volume. In addition there is a greater cullage of Winesaps because they are generally packed in RA storage rather than CA. Supervisory labor costs were rather consistent among regions and among varieties. Fringe benefits varied from 3 cents for Red Delicious in Appalachia to 8 cents for bagged Jonathans and Red Delicious in the Lake States.

Container and Other Supply Costs

Container and other supply costs include expenses for molded trays, bags, master carton, liners, labels, staples, and applications of fungicide and wax. The total cost of containers and other supplies for tray packed apples varied from 66 cents per carton for Winesaps in the Northwest to 76 cents for Delicious in the Lake States (table 3). However, the cost for bagged apples varied little between regions. Regional cost variations are due to each region's buyer requirements (fungicide and waxing), varying quality of packaging supplies and the distance to market (the longer the distance, the more protection needed). Only minor differences in container and supply costs were found among similar (tray or bag) packs for alternative varieties. A varietal variation in costs occurred in the Northwest for tray packed Red Delicious and Winesap which can be attributed in

Total container and supply costs per carton excluding those for wax and fungicide

Region	1969/70	1972/73	Absolute increase	Percentage increase
	All apples	All apples		
	Cents	Cents	Cents	Percent
Northeast				
Tray	58	71	13	22
Bag	46	59	13	28
Lake States				
Tray	53	72	19	36
Bag	46	56	10	22
Appalachia				
Tray	50	69	19	38
Northwest				
Tray	55	63	8	15

Table 2.—Apple packing labor costs per carton by variety and pack, four major production regions, 1972/73 season¹

Region	Hourly and piece workers	Supervisory	Fringe benefits	Total
	<i>Cents</i>	<i>Cents</i>	<i>Cents</i>	<i>Cents</i>
Northeast				
Delicious				
Tray pack cartons	31	4	7	42
Bag cartons	32	4	7	43
MacIntosh				
Bag cartons	32	4	7	43
Lake States				
Delicious				
Tray pack cartons	23	3	8	34
Bag cartons	22	3	8	33
Jonathans				
Bag cartons	22	3	8	33
Appalachia				
Delicious				
Tray pack cartons	46	4	3	53
Northwest				
Delicious				
Tray pack cartons	46	4	5	55
Winesap				
Tray pack cartons	47	6	4	57

¹ One carton of tray packed apples is equivalent to 42 pounds. Bagged cartons contain 12 three-pound poly bags.

Table 3.—Apple packing container and supply costs per carton by variety and pack, four major production regions, 1972/73 season¹

Region	Master carton	Trays	Bags	Wrapper and liner	Wax	Fungicide	Other	Total
	<i>Cents</i>	<i>Cents</i>	<i>Cents</i>	<i>Cents</i>	<i>Cents</i>	<i>Cents</i>	<i>Cents</i>	<i>Cents</i>
Northeast								
Delicious								
Tray pack cartons	46	23	---	2	1	(²)	---	72
Bag cartons	49	---	10	---	1	(²)	---	60
MacIntosh								
Bag cartons	49	---	10	---	1	(²)	---	60
Lake States								
Delicious								
Tray pack cartons	48	22	---	---	4	(²)	2	76
Bag cartons	43	---	10	---	1	1	2	57
Jonathan								
Bag cartons	45	---	10	---	3	1	2	61
Appalachia								
Delicious								
Tray pack cartons	42	25	---	1	1	1	1	71
Northwest								
Delicious								
Tray pack cartons	39	17	---	10	2	1	(²)	69
Winesap								
Tray pack cartons	36	14	---	10	2	1	3	66

¹ One carton of tray packed apples is equivalent to 42 pounds. Bagged cartons contain 12 three-pound poly bags. ² Less than .5 cents.

part to the fancier packages used on Red Delicious than on Winesaps.

A comparison of total container and supply costs without regard to variety is presented above. Costs for wax and fungicide have been excluded since these data were not obtained in the 1970 survey. Every region experienced substantial increases in container costs. The absolute change was reasonably similar in each region except for tray packed apples in the Northwest where the increase was substantially below that found in the other regions.

Selling Charges

Selling charges cover the salary and commission of salesmen and the costs of telephone and wire services used in selling and billing. Total selling charges ranged from 11 to 18 cents per carton in Appalachia, Lake States and Northwest and up to 49 cents in the Northeast (table 4). The substantially higher selling charges in the Northeast resulted in part from larger commission rates characteristic of this region. Also, these commission rates were applied to relatively high Northeast f.o.b. fresh apple prices, thereby boosting Northeast selling charges even more. Within any region, the selling charges varied between varieties for the same type of pack. These

differences resulted from applying estimated commission rates to differing varietal f.o.b. prices.

Overhead

Overhead costs include management and office salaries, business taxes, depreciation on buildings and equipment, rent, repairs, bad debts, advertising, interest, insurance and other operating costs. Data on overhead costs for each of these categories were collected but proved to be insufficient on a regional basis to warrant itemization.

Overhead costs varied substantially from region to region (table 4). They were somewhat over 50 cents per carton in the Northwest, in the mid-twenties in the Northeast and Appalachia, and generally under 10 cents in the Lake States. The relatively high Northwest overhead was consistent with the 1969/70 results. Regional differences in overhead costs are attributable to the capacity of the packing sheds, the quantity of apples (or a particular variety) packed, the age of packing plants, the degree of mechanization, local business taxes and utility costs.

All regions except the Lake States showed increases in overhead costs between the two survey periods. The increase ranged from 25 percent in the Northeast to 62 percent in the Northwest. However, the 1972/73 figures are not representative of all varieties packed but only indicate costs allocated to specific varieties.

Table 4.—Apple packing costs and selling charges per carton by variety and pack, four major production regions, 1972/73 season

Region	Labor	Containers and supplies	Overhead	Total packing	Selling	Total packing and selling	Total packing and selling ¹
	Dollars ²	Dollars ²	Dollars ²	Dollars ²	Dollars ²	1972/73	1969/70
Northeast							
Delicious							
Tray pack cartons . . . .	.42	.72	.19	1.33	.49	1.82	1.34
Bag cartons . . . . .	.43	.60	.25	1.28	.35	1.63	1.22
McIntosh							
Bag cartons . . . . .	.43	.60	.25	1.28	.32	1.60	
Lake States							
Delicious							
Tray pack cartons . . . .	.34	.76	.06	1.16	.14	1.30	1.17
Bag cartons . . . . .	.33	.57	.10	1.00	.17	1.17	1.10
Jonthans							
Bag cartons . . . . .	.33	.61	.08	1.02	.17	1.19	
Appalachia							
Delicious							
Tray pack cartons . . . .	.53	.71	.27	1.51	.11	1.62	1.39
Northwest							
Delicious							
Tray pack cartons . . . .	.47	.69	.51	1.67	.16	1.83	1.58
Winesap							
Tray pack cartons . . . .	.57	.66	.55	1.78	.18	1.96	

¹ The 1969/70 costs are for all varieties packed. ² One carton of tray packed apples is equivalent to 42 pounds. Bagged cartons contain 12 three-pound poly bags.

Total Packing Costs and Selling Charges

The accumulation of costs for packing labor, containers and other supplies, and overhead provide an estimate of total packing costs (table 4). Within any region, total packing costs were greater for tray packed apples than for bagged apples due to additional expenses for containers and other supplies. The additional cost for Red Delicious apples varied from 5 cents per carton in the Northeast to 16 cents in the Lake States. The total costs of tray packing Red Delicious apples was 16 cents higher in the Northwest than the next most costly region, Appalachia. The essential cause of the higher costs was larger overhead expenditures. Lowest packing

costs were in the Lake States. Bagged apples could be packed in the Lake States for slightly over 1 dollar per carton, while tray packing of Red Delicious apples could be accomplished at a lower cost than bagging apples in the Northeast. Labor and overhead costs in the Lake States were substantially below those in other regions.

When selling charges are also considered, the cost picture changes somewhat. With the addition of selling charges, the Northeast cost for tray packed Red Delicious approximates that for the Northwest. Rather low selling charges keep the Lake States' total packing costs and selling charges much below those of any other region.

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