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Variability in Apple Production Costs and Returns

178 Western New York Fruit Farms
1956 and 1957

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SUMMARY

New York is second only to the state of Washington in the volume of apples produced. Within the state apples are New York's leading tree fruit enterprise. Sizeable changes have taken place in the production of apples within the last 25 years. Many producers have gone out of business. Those remaining have become more specialized in producing apples.

To learn more about the present economic situation in commercial apple production a two-year study was conducted in the state's most important fruit area south of Lake Ontario. It included an examination of the influence of size of enterprise on production practices, costs and yields as well as the variability in these items. Enterprises on 88 farms in 1956 and 90 in 1957 were studied. Three size-groups were designated with approximately equal numbers of farms in each group.

Production costs were studied in physical and monetary terms and are presented on a per-acre basis. Growing costs, covering all of the resources used in bringing the crop up to the point of harvest, averaged about \$200 per acre for all three size groups. Within each size group considerable variability existed particularly in expenses for labor and spray materials. Harvesting costs, including the expense of picking and moving the crop to the first point of sale or storage, are discussed on a per-bushel basis since so many items making up these costs are dependent upon yield. Harvesting costs averaged about 40 cents per bushel both years.

Approximately 60 per cent of the apples from these farms went to processing outlets each year. Another 35 per cent were sold as fresh fruit while the remainder were used on the farm or sold for cider and other purposes.

The two crop years were quite different. In 1956 yields averaged just under 300 bushels per acre on these farms. The average price received for all fruit sold was \$149 per bushel. In 1957 both yields and prices were less favorable. Poor weather at bloom time reduced yields to an average of 223 bushels per acre on this group of farms. Average prices received were \$1.10 per bushel. As a result, net returns per acre were very different in the two years. In 1956, net returns ranged from a loss of \$125 to a net gain of \$659 per acre. Seventy-four of the 88 growers made money. In 1957 net returns ranged from a loss of \$223 to a profit of \$197 per acre. Largely because of reduced yields and lower prices, only 25 of the 90 growers posted a profit.

About 80 per cent of the variation in profits or net returns per acre in any one year were caused by differences in (1) yield per acre, (2) price received per bushel, (3) harvesting costs per bushel, and (4) growing costs per acre. Individual growers have some control over each of these variables. One of the best places to start improving one's financial success in producing apples is in the orchard and packing shed.

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INTRODUCTION

The most important tree fruit enterprise in New York State is apples. During most seasons this crop accounts for 70 to 80 per cent of all tree fruit sales. From three to five per cent of total farm receipts in New York come annually from the sale of apples. As such they rank as the state's most important cash crop.

Major Producing Areas

New York ranks second only to the state of Washington in apple production (table 1). During the period 1954-57 the New York crop averaged 17,100,000 bushels annually and accounted for 15 per cent of the nation's output. Virginia, Michigan, and Pennsylvania are New York's major competitors in apple production in the East.

TABLE 1. APPLE PRODUCTION IN SELECTED STATES
1954-57

State	Production	Per cent of total
	(million bushels)	
Washington	25.0	23
New York	17.1	15
California	9.3	9
Virginia	9.3	9
Michigan	9.0	8
Pennsylvania	6.4	6
Other states (29)	<u>33.2</u>	<u>30</u>
United States	109.3	100

Source: Crop Reporting Board, U. S. Department of Agriculture, Statistical Bulletin No. 192, September 1956, and Fruit-Non Citrus by States, 1956 and 1957, Production, Use and Value, Part 2, July 1958.

The three principal commercial areas of apple production in New York State consist of two counties in the Lake Champlain Valley, 12 counties bordering the Hudson River, and 15 counties in Western New York. Western New York is, by far, the most important region, accounting for over 60 per cent of the state's total production. Within this area the most intensive production occurs in the four counties bordering Lake Ontario. During 1955 almost 10 million bushels of apples were produced in these four counties equivalent to 55 per cent of the state's output.

Within New York State, the major area producing apples for processing is made up of the four counties bordering Lake Ontario. In most years, at least two-thirds of the crop from this area is processed. On the other hand, only a small proportion of the crop in the Hudson Valley goes to processors. The total is in the general range of from 10 to 15 per cent of the crop.

TABLE 2. APPLE PRODUCTION IN COMMERCIAL AREAS OF NEW YORK STATE, 1954
(U. S. Census Data)

Areas	Production (million bushels)	Per cent of total
Western New York:		
Wayne County	4.7	
Niagara County	2.0	
Orleans County	2.0	
Monroe County	1.3	
Other 11 Counties	<u>1.0</u>	
Total Western New York	11.0	61
Hudson Valley	6.6	36
Champlain Valley	<u>0.5</u>	<u>3</u>
New York State	18.1	100

Disposition of Crop

From the average annual production of 17.1 million bushels of apples during the period 1954-57 about 96 per cent were sold. The other four per cent either were not harvested or were used on the farm. Sales to fresh fruit outlets accounted for 49 per cent of the total (table 3). Sales to processors amounted to 8.3 million bushels or 51 per cent of sales. The most important processing outlets were canned apple slices and sauce. During this period, 33 per cent of the crop was canned. New York is the country's leading producer of canned apples accounting for 30 per cent of the total supply.

Frozen apple slices are a relatively new and increasingly important method of processing apples. Three per cent of the crop sold in 1957 was frozen. New York, producing 25 per cent or more of the nation's total, is second to California in the production of frozen apple slices.

TABLE 3. DISPOSITION OF THE NEW YORK STATE APPLE CROP
1954-57

Use	Amount (thousand bushels)	Per cent of total
For processing:		
Canned	5,306	33
Frozen	550	3
Dried	126	1
Other *	<u>2,301</u>	<u>14</u>
Total processing	8,283	51
For fresh market	<u>8,089</u>	<u>49</u>
New York State	16,372	100

* Including vinegar, cider, and juice.

Source: Crop Reporting Board, U. S. Department of Agriculture, Statistical Bulletin No. 192, September 1956, and Fruit-Non-Citrus by States, 1956 and 1957; Production, Use and Value, Part 2, July 1958.

Generally, there is an inverse relationship between the proportion of the total crop processed in the important apple producing states and the price received by growers (table 4). In Washington where about 10 per cent of the crop is processed, the price per bushel averaged \$3.05 during the period, 1954-57. In California, 64 per cent of the crop is processed and the price averaged much less, \$1.61 per bushel. In New York 51 per cent of the apple crop was processed annually during 1954-57. During this period the season average price per bushel, for all methods of sale was \$1.66.

TABLE 4. PROPORTION OF THE APPLE CROP PROCESSED AND SEASON AVERAGE PRICE RECEIVED BY GROWERS IN SELECTED STATES 1954-57

State	Per cent processed*	Price per bushel**
Washington	10	\$3.05
Michigan	35	1.85
New York	51	1.66
Pennsylvania	53	1.75
Virginia	55	1.63
California	64	1.61
United States Average	33	2.11

Source: U. S. D. A. Crop Reporting Board

* Amount processed as a per cent of total sold.

** Season average price for all methods of sale.

Organization of the Study

Fruit farming has gone through many changes in the last 20 to 30 years. Only 25 per cent as many men produce apples for sale today in New York as did 25 years ago. Many orchards have gone out of production. Areas, where soils and climate do not allow a man to obtain high yields regularly, have experienced the greatest changes. A few trees are no longer enough to justify commercial care. Size of enterprise has increased rapidly. One man now cares for a much larger acreage of fruit than formerly. Specialization has also increased. More farmers are not full-time fruit producers. Some grow nothing but apples.

In this kind of setting many questions are raised about what the future holds for New York apple growers. What size of business is most efficient? Where do efficiencies in operating a fruit farm occur? Are the risks of specialization worthwhile?

To get some information which might help to answer these questions a two-year study of apple production was organized in 1956. It was designed to determine:

- (1) The effect of size of enterprise on production practices, costs, and yields and
- (2) The amount of variability within size groups in practices followed and costs, as well as reasons for this variability.

Since the most important fruit-producing area in the state is located south of Lake Ontario in Western New York it was chosen as the location for this study. Apples are grown under a wide variety of conditions there. In many cases, the apple enterprise is only one part of a large business. In others it is the sole source of income. As a result, only the bearing apple enterprise rather than the whole farm business was studied.

To observe the effect of size of enterprise on production practices, three different groups of apple producers were designated:

<u>Size of Enterprise</u>	<u>Acres of Bearing Apples</u>
Small	10-25
Medium	26-50
Large	51-150

Anyone with less than 10 acres of apples was considered a non-commercial producer. Likewise there were so few growers with more than 150 acres of apples that this upper limit was established.

These three size groups include most of the commercial acreage in the state. Decisions on when an enterprise ceases to be "small" and should be considered "medium sized" were rather arbitrary. It was hoped that production practices within each of the size groups might be similar.

Enterprise records were obtained for the 1956 and 1957 crop years. A random sample of apple growers in Wayne, Monroe, Orleans, and Niagara counties were selected in each of the three size categories. A total of 30 records were obtained in each size classification. The number selected in each county was proportional to the total number of apple trees reported in that county in the 1954 census. Original lists were developed with the help

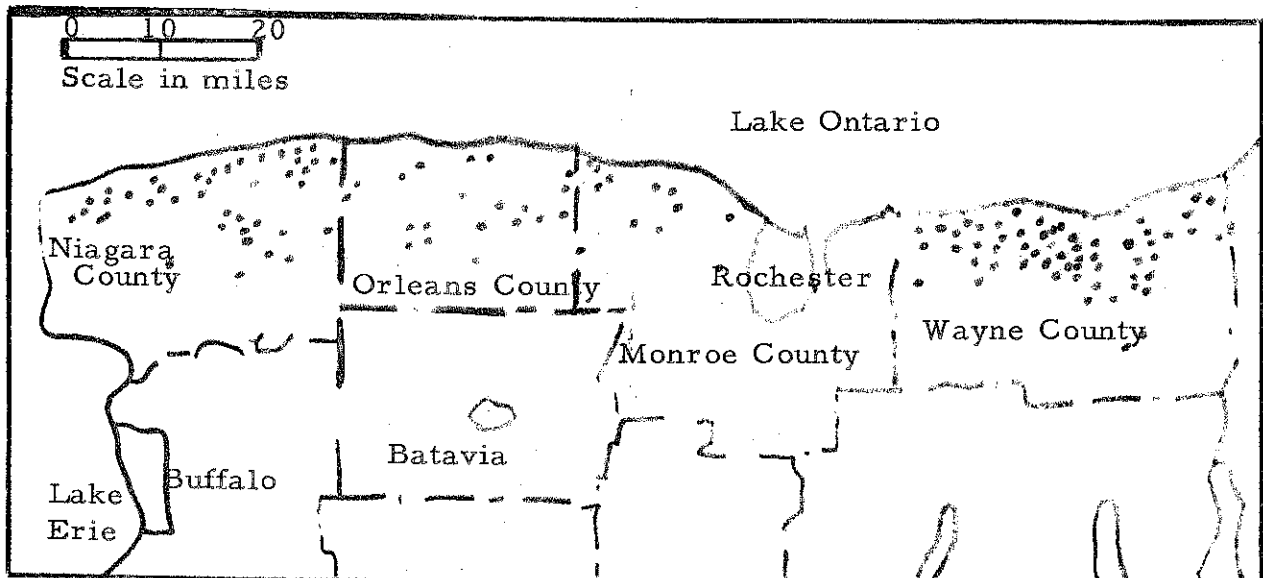


FIGURE 1. LOCATION OF APPLE PRODUCERS STUDIED
(178 Western New York Farms, 1956 and 1957)

of the Western New York Apple Growers Association, county agricultural agents and census data. About one-third of those drawn in the original sample refused to give records in 1956. Most of these were in the small size group. Since so many alternates were required to obtain 30 records there is more reason to question the representativeness of averages and information for this size group than the other two.

Two contacts during the year were made with each grower - one during the summer months while the crop was being grown, the second after the crop was harvested. In 1956, 88 of the 90 records were completed. In 1957, records were obtained from all 90 growers who were selected for study. The farmers studied in 1957 differed from those in 1956 in the following manner. Half of those completing records in 1956 were randomly chosen to provide records a second year. The other half were chosen from the original lists using the same methods as when the original sample was drawn. The differences between the old and new groups in the 1957 sample in such items as growing costs and yields were not significant. The location of all the farms studied is shown in figure 1.

Description of Farms Studied

Apples were naturally an important enterprise on all of the farms studied in each of the three size groups. A picture of the amount of specialization in apples or fruit can be obtained from the following table. All of the farms were first classified into two groups - those which were and were not full time farms. Any unit with less than 300 work units was considered to be less than a full time farm even though the operator had no other job or source of income. All of the full-time farms were further divided into four groups. If 60 per cent of their work units were devoted to apples, all tree fruit, dairy, poultry, or vegetables, they were so designated. All of the rest were considered general farms.

TABLE 5. TYPES OF FARMS STUDIED
(132 Western New York Farms, 1956 and 1957)

Type of farm	Size of enterprise		
	10-25 acres	26-50 acres	51-150 acres
	(number of farms)		
FULL TIME			
Apples	8	16	27
Fruit	13	16	13
General	13	10	4
Dairy, vegetable, or poultry	2	1	0
NOT FULL TIME	9	0	0
Total number	45	43	44

Only four of the group with large apple enterprises were not specialized fruit farms. About two-thirds could be considered apple farms as such. All were big businesses in terms of gross income, capital investment, or productive man work units. The four so-called general farms in this size group had either large vegetable enterprises or dairies in addition to apples. The need for specialization with this acreage of apples seems clear.

TABLE 6. CHARACTERISTICS OF FARMS STUDIED
(132 Western New York Farms, 1956 and 1957)

Description	Size of enterprise		
	10-25 acres	26-50 acres	51-150 acres
Number of farms	45	43	44
Acres operated:			
Owned	97	143	231
Rented	3	20	24
Total acres	<u>100</u>	<u>163</u>	<u>255</u>
Use of cropland (acres):			
Bearing orchard			
Apples	17	37	81
Peaches	3	2	4
Sour cherries	3	6	12
Sweet cherries	1	1	3
Pears	1	1	3
Other	1	2	1
Non-bearing orchard			
Apples	5	6	18
Other	2	2	7
Small fruit	0	1	0
Vegetables	7	13	15
Corn and small grain	21	28	21
Forage	12	21	29
Idle cropland	5	5	10
Total cropland	<u>78</u>	<u>125</u>	<u>204</u>
Productive man work units:			
Crops	422	833	1526
Livestock	86	147	85
Total work units	<u>508</u>	<u>980</u>	<u>1611</u>

Most of the farms with medium sized apple enterprises were classified as apple or fruit farms. Twenty per cent fitted the general farm category. Most were two man businesses with seasonal picking labor.

The small apple enterprises were located on a wide range of farms. Some were not large enough to keep one man fully employed. A few were operated by men who had full-time jobs off the farm. A number with small orchards had either a dairy or good sized vegetable enterprise along with their apples. This was easily the most variable of the three groups.

Besides apples, sour cherries were commonly grown on nearly all of the farms. Only 10 farms in the two years had no other tree fruits except apples. Peaches, sweet cherries and pears were important enterprises on some of the farms. On the other hand, small fruit, such as berries and grapes, were of no importance.

Many apple growers also had one or more vegetable enterprises. Tomatoes for processing was most common. Cabbage, snap beans, and peas were also produced in some volume. Forage and grain crops of some type were grown on nearly all of the farms as well. Part of the growers feed these crops to livestock. Wheat, corn and hay were commonly sold as cash crops. No livestock were found on 50 per cent of the farms. Only 12 of the growers had as many as 20 cows.

PRODUCTION COSTS

Apple production is an intensive type of farming. Large amounts of money, labor, and other resources are involved on every bearing acre. Risks are high but the rewards for excellent management can be large.

The following presentation of production costs including averages by size groups and the variability which exists in practices followed, costs, and input use is intended to provide a better understanding of the apple industry. It should allow growers to compare their own business with other similar businesses. It also highlights some of the major reasons for the great variability in practices and costs which exists from farm to farm.

Production costs will be considered in both physical and money terms. Very often the amount of labor or number of bushels is as important as the price received or costs. Growing costs will be considered separately from harvesting costs since their nature is so different. Selling, storage, and marketing costs were not included in this study because these practices are so widely different from farm to farm that averages would not be very meaningful.

Information was obtained for two crop years. Whenever wide differences occurred between the two years results for both years are presented. Where results were the same or very similar, data for 1957 was judged adequate. A preliminary report on costs and returns for 1956 has already been issued by the same authors and will provide greater detail for the 1956 crop year if desired.¹

Growing Costs Per Acre

Growing costs averaged about \$200 per acre in both 1956 and 1957. These included all of the costs of resources used to bring an apple crop up to the point of harvest. Size of enterprise had little effect on this total. In both years there was much more variation in growing costs among farms within each size group than among the three groups themselves.

The major costs in growing a crop of apples are for labor, spray materials, power and equipment. Together they make up about 75 per

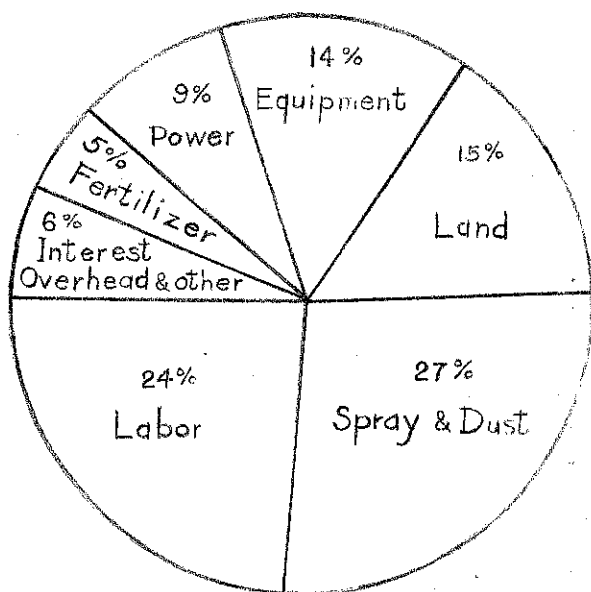


Figure 2. COMPONENTS OF COSTS IN GROWING ONE ACRE OF APPLES (90 Western New York Farms, 1957)

cent of the total on most farms. Including a charge for the use of the land and trees in the orchard they account for most of the costs and variability which occurs.

It makes the most sense to consider growing costs on an acre basis rather than discussing growing costs per bushel. Most of these costs and expenditures of resources go on regardless of the size of crop. Pruning and spraying must be done even if there is only a small crop. Most other jobs during the growing season follow the same pattern. As a result making comparisons of growing costs per bushel from farm to farm may be very misleading since the size of the crop is so important in making these calculations. A large or small crop

effectively obscures unusual expenses which will show up in looking at growing costs per acre.

1. Stanton, B. F. and Dominick, B. A. Jr., "Costs and Returns in Producing Apples", 88 Western New York Farms, 1956, Department of Agricultural Economics, Cornell University, Preliminary Report, July 1957.

TABLE 7. AVERAGE GROWING COSTS PER ACRE OF BEARING APPLES
(90 Western New York Farms, 1957)

Items of cost	Size of enterprise		
	10-25 acres	26-50 acres	51-150 acres
Number of farms	30	30	30
Yield per acre (bushels)	204	223	241
Labor	\$ 58	\$ 48	\$ 40
Spray and dust	50	53	59
Land	29	29	30
Equipment	31	27	26
Power	20	18	16
Fertilizers	10	10	12
Other cash expenses	3	5	4
General overhead	3	3	3
Interest	5	5	5
Total growing costs	\$209	\$198	\$195

Yields in 1957 were reduced by adverse weather at bloom time and frost damage soon after bloom in May. In 1956 better weather conditions prevailed in Western New York. Yields averaged about 300 bushels per acre on the farms studied. However, growing costs per acre were essentially the same as those presented in table 7 for 1957. The differences between the two years were small enough to have occurred for random reasons. It is clear that growing costs will be relatively stable from year to year compared with yields. While the total amount spent in growing a crop has some effect on yields over a period of years, there is no consistent relationship in any one year.

Comparing growing costs for the three different sizes of enterprises in both years points up greater similarities than might have been expected. Average total growing costs per acre are not significantly greater on the smaller enterprises than on the large ones when tested by inspection or analysis of variance. There was much more variability within each size group than among them.

However, there were important differences by size groups in the two most important items making up growing costs - labor and spray materials. The direction of these differences tended to balance each other in the totals. Growers with small enterprises used more labor per acre than did large growers. They also used less expensive and smaller amounts of spray materials. Small growers also had higher power and equipment costs per acre. However, this difference was not so clear cut.

TABLE 8. AVERAGE GROWING COST PER ACRE OF BEARING APPLES
(88 Western New York Farms, 1956)

Items of cost	Size of enterprise		
	10-25 acres	26-50 acres	51-150 acres
Number of farms	30	29	29
Yields per acre (bushels)	296	283	305
Labor	\$ 61	\$ 51	\$ 49
Spray and dust	48	51	60
Land	30	30	30
Equipment	24	22	25
Power	17	13	13
Fertilizers	13	10	11
Other cash expenses	2	2	4
General overhead	3	3	3
Interest	5	5	5
Total growing costs	\$203	\$187	\$200

The amount of variability in total growing costs per acre within size groups can be illustrated effectively with a frequency distribution. While the average cost of bringing an acre of apples up to harvest was about \$200, some spent as little as \$120, others as much as \$300. These differences become very important when yields are not increased along with the additional expenditures. About two-thirds of the producers in each of the size groups were putting from \$150 to \$240 worth of resources into each acre of bearing apples annually. Most of those with the highest yields had growing costs within the central range.

TABLE 9. VARIATION IN GROWING COSTS PER ACRE
(178 Western New York Farms, 1956 and 1957)

Growing cost per acre	Number of farms	
	1956	1957
Less than \$120	4	3
\$120 - 149	11	13
150 - 179	22	12
180 - 209	19	23
210 - 239	17	21
240 - 269	6	13
270 and over	9	5
Total Number	88	90

The primary reasons for this variability resulted from differences in the amounts of labor, spray materials, and equipment used in growing apples. Each of these components of growing costs will be considered individually to show what accounted for the differences.

Labor

It takes from 25 to 50 hours of labor per acre to grow a crop of apples on most farms. The big jobs are pruning and spraying. And these are easily the most variable from farm to farm.

TABLE 10. AVERAGE TIME SPENT IN GROWING ONE ACRE OF APPLES
(90 Western New York Farms, 1957)

Jobs	Size of enterprise		
	10-25 acres	26-50 acres	51-150 acres
	(man hours per acre)		
Pruning	22.5	20.4	13.9
Spraying and dusting	9.5	6.6	5.4
Chopping and burning brush	2.7	2.2	1.6
Mowing	2.6	1.7	1.5
Fertilizing	1.4	1.2	1.0
Other jobs and supervision	5.2	5.2	6.6
Total hours on growing	43.9	37.3	30.0

In both 1956 and 1957 small growers spent more hours per acre than did those with larger enterprises. This relationship holds true for nearly all of the individual jobs. The larger the acreage the less time is usually spent in getting started and finishing up. In most cases the smaller growers did a large share of the work themselves. Alternative uses of their time in other productive work were often not very great. This was especially true for pruning.

Pruning took about half of the man hours on the average for each of the size groups. The variability from farm to farm was tremendous. A few men did no pruning. Others spent as much as 50 hours per acre. Over a period of two or three years this variability in man hours per acre is reduced. Heavy pruning one year is followed by less the next. As might be expected there was the smallest amount of variation from farm to farm among those with 50 or more acres of apples. They all pruned at least part of their orchard every year. Some of the small growers also did some pruning to nearly all of their trees each year. As one man said, "I have nothing better to do during the winter months." This may partly explain the greater number of man hours spent in pruning on the smaller farms.

The amount and type of equipment used also affects labor requirements. This is especially true for spraying. All of the men with large orchards had one or more air-blast sprayers. Many of those with small orchards used high pressure rigs. It took almost twice as many man hours to spray with older, less expensive spray equipment.

TABLE 11. SOURCES OF LABOR USED IN GROWING APPLES
(90 Western New York Farms, 1957)

Source	Size of enterprise		
	10-25 acres	26-50 acres	51-150 acres
	(cost per acre)		
Operator	\$39	\$23	\$13
Regular hired	10	9	21
Day and hour	6	12	5
Family	3	4	1
Total labor cost per acre	\$58	\$48	\$40

The differences in labor organization by size of enterprise is illustrated in table 11. The operator and his family do most of the work in the smaller orchards. A few producers with 30 to 40 acres of apples did not have a full time man during the growing season. However, most with 40 or more acres do have one or more full time hired men. Those with medium sized enterprises relied the most on day and hourly help. This is again logical since they have a number of times when there is too much for one man to do alone but not enough to justify hiring a man regularly. Where day or hourly help is available this practice has a great deal of merit for most operators with less than 50 acres of apples on specialized fruit farms.

Spray Materials

The spray bill is usually the largest out-of-pocket cost a producer has during the growing season. It is the most variable of the major items making up growing costs. It is also one of the most difficult expense categories to discuss intelligently.

Most producers use spray materials primarily to protect their crops, although thinning, keeping apples on the trees and color are also important. As a result a grower must constantly try to buy the most protection possible at the lowest cost and still maintain a high level of quality in his fruit. Low spray costs per acre usually do not mean that a good management job is being done. Very often poor quality fruit are produced resulting in lower final prices for apples sold. High spray costs per acre are also questionable. Using the more expensive of two control materials in many cases will not give any more.

effective control of insects and diseases. Some risks must be taken on each side. Commonly the best quality fruit are produced by growers who spend average or slightly above average amounts for spray materials.

TABLE 12. SPRAY AND DUST COSTS
(90 Western New York Farms, 1957)

Factors	Size of enterprise		
	10-25 acres	26-50 acres	51-150 acres
Number of farms	30	30	30
Yield per acre (bushels)	204	223	241
Range in costs of materials per acre	\$15-97	\$21-95	\$23-104
Costs of materials per acre	\$50	\$53	\$59
Number of sprays	13	14	14
Cost per spray per acre	\$3.89	\$3.90	\$4.27
Trees per acre	32	31	33
Cost per tree per spray	12.7¢	12.8¢	13.4¢

A general picture of how spray materials were used is shown in table 12. Average costs were similar for each size group in both 1956 and 1957. Large growers spent the most for materials on the average. They commonly used concentrate solutions. Small operators used dilute solutions in their high pressure rigs. About half of the growers in each of the three size groups applied 13 to 15 sprays. There was less variability in costs per spray per acre than in the total.

A frequency distribution of spray and dust materials costs per acre makes the nature of the variability which exists more evident. It is hard to find evidence of much central tendency in table 13. One should expect quite a bit of variability because of individual differences in weather, quality of fruit desired, and special problems. However, this amount of variation suggests that growers have widely different ideas of what is necessary and what should be done in a good spray program.

TABLE 13. DISTRIBUTION OF SPRAY COSTS PER ACRE
(90 Western New York Farms, 1957)

Spray cost per acre	Size of enterprise		
	10-25 acres	26-50 acres	51-150 acres
	(number of farms)		
Less than \$30	2	4	3
30 - 39	7	3	4
40 - 49	7	8	5
50 - 59	6	3	4
60 - 69	3	5	2
70 - 79	3	5	6
80 and over	<u>2</u>	<u>2</u>	<u>6</u>
Total number	30	30	30

Land

Establishing a fair value for the annual use of a bearing orchard is also difficult. When growers cash rented, this cost was charged to the apple enterprise. Very few, however, rented even a part of the orchards they operated. Growers were asked to estimate the value of their orchards if they tried to rent some of similar quality. In most cases they indicated that they had very little basis for such an estimate. Finally they gave their best estimate of the current market value of their orchard. Rent was charged at 8 percent of this estimated value to cover interest, taxes, and maintenance. In cases where none of these estimates could be obtained a flat charge of \$30 per acre was made.

Variability in the land charge was consequently small. The importance of this major resource in producing a crop was recognized. However, variation in the productivity of the different orchard sites was not reflected very well in this type of rental charge.

Equipment

Capital in the form of specialized equipment is commonly used to substitute for labor as businesses get larger. This was true for these apple enterprises. Spray equipment and power pruners were the two most important types of specialized equipment commonly used.

TABLE 15. ECONOMIC CHARACTERISTICS OF SELECTED SPECIAL EQUIPMENT
(90 Western New York Farms, 1957)

Description	Size of apple enterprise		
	Small	Medium	Large
Number of farms	30	30	30
<u>Air-blast sprayer:</u>			
Number of farms using	17	22	28
Number of this type sprayer used	17	22	35
Per cent of use on apples	80	87	87
Original cost per farm	\$3764	\$4110	\$6198
Annual operating cost for apples	552	776	1293
Average operating cost per acre	31.45	20.34	15.71
<u>High pressure sprayer:</u>			
Number of farms using	13	9	7
Number of this type sprayer used	14	9	7
Per cent of use on apples	85	80	75
Original cost per farm	\$1343	\$1361	\$1057
Annual operating cost for apples	195	261	162
Average operating cost per acre	12.65	7.38	2.49
<u>Power pruner:</u>			
Number of farms using	5	14	17
Number of power pruners used	5	14	17
Per cent of use on apples	74	92	87
Original cost per farm	\$628	\$658	\$789
Annual operating cost for apples	68	113	130
Average operating cost per acre	3.59	2.90	1.63

Air blast speed sprayers are now used on nearly every farm where there are 50 or more acres of tree fruit in production. One highly skilled operator can spray at least twice as many acres per hour with air blast equipment as with a high pressure rig. The real economic questions relate to how small a business can be and still support the original investment and operating costs for such a sprayer.

In 1957 over half of the growers with 10 to 25 acres of apples were using air blast equipment. Their primary use was on apples. Annual operating costs made up primarily of depreciation, interest, repairs and fuel, averaged over

\$30 per acre compared with \$16 on the large farms. Most of these small growers managed to keep their costs as low as they were by purchasing used sprayers and depreciating them over a longer period than those with larger acreages.

High pressure spray rigs are much cheaper to operate on the basis of equipment costs per acre. A full time farmer with less than 25 acres of bearing fruit can do an adequate job with this type of equipment. If he has major vegetable enterprises it is easier to adapt this type of sprayer for both needs. A part time farmer or one who has another major enterprise, like dairy cattle and forages, besides apples can make the best economic case for owning air blast equipment when there are less than 25 acres of apples.

TABLE 16. FACTORS ASSOCIATED WITH THE USE OF AIR BLAST AND HIGH PRESSURE SPRAY EQUIPMENT
(178 Western New York Farms, 1956 and 1957)

Primary method of spraying	Number of farms	Average per acre				
		Acres of apples	Man hours spraying	Tractor hours spraying	Cost spray materials	Yield in bushels
				<u>1956</u>		
Air blast	52	57	5.2	4.6	\$56	309
High pressure	36	24	12.4	8.4	44	270
				<u>1957</u>		
Air blast	62	52	5.8	5.4	\$57	238
High pressure	28	27	11.0	7.5	45	178

A direct comparison of air blast and high pressure spraying is shown in table 16. All farms regardless of size of orchard are included. The same basic relationships held true in both 1956 and 1957. About twice as many tractor and man hours were used per acre by farmers using air blast equipment. The higher yield obtained can not be attributed to the type of spray equipment used. It does indicate that growers obtaining high yields have been able to buy this more expensive equipment.

Experience with power pruners is difficult to evaluate. The original investment is not large compared to many pieces of specialized equipment. Annual operating costs per acre are quite low. If three or four hours of pruning time per acre could be saved by this equipment it should pay for itself. However, this has not been clearly demonstrated. A tractor or motor is required to operate this equipment as well.

TABLE 17. LABOR AND POWER USED WITH POWER PRUNERS
(90 Western New York Farms, 1957)

With or without power pruners	Number of farms	Acres of Apples	Average per acre		Yield per acre (bu.)
			Man hours pruning	Tractor hours pruning	
<u>Small enterprises</u>					
With	5	19	25	4.1	234
Without	25	17	22	0.1	198
<u>Medium enterprises</u>					
With	14	39	20	6.7	247
Without	16	36	21	0.9	207
<u>Large enterprises</u>					
With	17	86	14	4.7	266
Without	13	76	13	0.3	208

At first glance, the evidence presented in table 17 might suggest that power pruners are not very useful. As many hours were used in pruning per acre with this equipment as without it regardless of size of enterprise. The kind of job done while pruning is not measured. Over a period of years better pruning will be reflected in both yields and the quality fruit produced. Saving physical effort and doing a better job may pay for this equipment if there is no apparent savings in labor.

Power

Tractors and trucks were used by all but one of the farmers in growing their crops of apples. Tractors made up 80 per cent of the power costs on most farms regardless of size.

About half of the tractor time was used in spraying and dusting. Pruning and mowing were the other two big jobs. Trucks were used primarily in hauling fertilizer and spray materials. On some farms handling brush and pruning were also important.

TABLE 18. TRACTOR AND TRUCK USE IN GROWING ONE ACRE OF APPLES
(89 Western New York Farms, 1957)

Description	Size of enterprise		
	10-25 acres	26-50 acres	51-150 acres
Number of farms	29*	30	30
<u>Physical inputs per acre</u>			
Tractor hours	14	13	11
Truck miles	21	20	22
Automobile miles	13	17	21
<u>Average cost per acre</u>			
Tractor	\$16.08	\$14.51	\$12.25
Truck	2.53	2.39	2.34
Auto	1.04	1.33	1.64
Total Power Cost	\$19.65	\$18.23	\$16.23

* One farm used horses.

Fertilizer

All but 4 of the 90 growers applied some commercial fertilizer in 1957. Ammonium nitrate was the source of nitrogen used on three-fourths of the farms. The most common rate of application was about five pounds per tree or an equivalent of 40 to 60 pounds of available nitrogen per acre.

An increasing number of fruit growers are having soil and leaf analyses made. As a result some of the men in each size group applied some complete analysis fertilizer. The analysis used most commonly was 10-10-10. Some of the fruit soils have a low potash supplying power. In this case potash was applied at rates of 60 pounds of more per acre.

Nineteen growers applied lime on some of their bearing orchard. Manure was used by one-third of the group - usually those who had dairy herds. The

value of lime and manure was pro-rated over a three year period. Fifty per cent was charged the first year, 30 per cent the second, and 20 per cent the third. Mulching and cover crops were uncommon. Where used the materials were charged at cost.

TABLE 19. AVERAGE AMOUNTS OF FERTILIZER USED PER ACRE
(90 Western New York Farms, 1957)

Ingredients	Size of enterprise		
	10-25 acres	26-50 acres	51-150 acres
Number of farms	30	30	30
		(pounds per acre)	
Commercial fertilizer:			
N	45	51	54
P ₂ O ₅	4	8	6
K ₂ O	9	15	22
Average cost per acre:			
Commercial fertilizer	\$6.86	\$7.76	\$8.70
Lime, manure, cover crops	<u>2.74</u>	<u>1.80</u>	<u>2.91</u>
All fertilizer	\$9.60	\$9.56	\$11.61

Other Costs of Growing

Bee rental, mouse bait, grafting compound and replacement trees made up most of the other direct costs which were charged to the apple enterprise as costs of growing the crop. On an acre basis they made up a very small portion of the total and were not very variable from farm to farm.

A flat charge of \$3.00 per acre was made to cover general overhead. Such items as electricity, telephone, dues, magazines, and other general farm expenses which could not be directly charged to the apple enterprise were covered by this item.

Interest on growing costs was also charged. Enough cash and other resources are tied up in the apple crops during the growing season so that an interest charge for the use of this short term capital is in order. Interest was charged at 6 per cent for a five month period on all growing costs. This amounted to about \$5.00 per acre on the average and ranged from \$3.00 to \$8.00 per acre.

HARVESTING COSTS PER ACRE

Harvesting costs include expenses for picking the crop and moving it either into storage or to the point of first sale. They do not include storage charges, special packages, commissions, or selling costs.

While growing costs are most easily discussed on an acre basis, harvesting costs require a different basis for study and comparison. There are so many costs in harvesting a crop of apples that are directly related to the number of bushels handled, such as picking and the use of containers, that studying harvesting cost per bushel is quite logical. Harvesting costs per acre and yields are directly related except where yields are very low. In this case some of the fixed costs of moving apples from the fields, the use of special picking equipment and the like are important enough to make harvesting costs per bushel very high.

TABLE 20. THE AVERAGE COST OF HARVESTING ONE ACRE OF APPLES
(178 Western New York Farms, 1956 and 1957)

Description	Size of enterprise		
	10-25 acres	26-50 acres	51-150 acres
		<u>1956</u>	
Number of farms	30	29	29
Yield per acre (bushels)	296	296	305
<u>Average cost per acre</u>			
Labor	\$ 73	\$ 73	\$ 84
Tractors and trucks	10	11	12
Containers	11	10	12
General equipment	5	5	5
General overhead	<u>2</u>	<u>2</u>	<u>2</u>
Total	\$101	\$101	\$115
		<u>1957</u>	
Number of farms	30	30	30
Yield per acre (bushels)	204	223	241
<u>Average cost per acre</u>			
Labor	\$54	\$56	\$64
Tractors and trucks	8	10	10
Containers	8	8	10
General equipment	5	5	5
General overhead	<u>2</u>	<u>2</u>	<u>2</u>
Total	\$77	\$81	\$91

Since yields were about 75 bushels higher on the average in 1956 than in 1957 harvesting costs per acre were quite different in the two years. Labor was the big item of expense both years. Power and container expense were roughly equivalent in importance after the labor charge.

Size of enterprise had little effect on harvesting efficiency. In both years differences in average costs reflect differences in average yields. A flat charge, \$5.00 per acre, was made on all farms to cover the use of special picking equipment such as ladders and pails. The general overhead item was also a flat charge covering telephone, electricity and the like.

TABLE 21. AVERAGE COSTS IN HARVESTING ONE BUSHEL OF APPLES
(178 Western New York Farms, 1956 and 1957)

Description	Size of enterprise		
	10-25 acres	26-50 acres	51-150 acres
		<u>1956</u>	
Yield per acre (bushels)	296	283	305
<u>Average harvesting cost per bushel</u>			
Special picking labor	\$ 0.12	\$ 0.16	\$ 0.18
All other labor	0.14	0.10	0.11
Containers and other	<u>0.10</u>	<u>0.11</u>	<u>0.11</u>
Total	\$ 0.36	\$ 0.37	\$ 0.40
		<u>1957</u>	
Yield per acre (bushels)	204	223	241
<u>Average harvesting cost per bushel</u>			
Special picking labor	\$ 0.15	\$ 0.17	\$ 0.17
All other labor	0.13	0.09	0.11
Containers and other	<u>0.12</u>	<u>0.14</u>	<u>0.13</u>
Total	\$ 0.40	\$ 0.40	\$ 0.41

The average cost of harvesting a bushel of apples was about 40 cents in 1957. Less than half of this total was for picking the apples although this job was still by far the most important component of the total. Nearly all of the apples were picked on a piece-rate basis. The rate most commonly paid was 15 cents per bushel. A few growers paid as little as 12 cents per bushel for some processing varieties. On the other hand rates of 18 and 20 cents per bushel were common for picking Mc Intosh and Delicious to be sold on the fresh market.

The cost of the additional labor used in moving the apples from the field to storage, a processing plant, or a buyer made up an important part of harvesting costs. These costs were highest on small farms or where yields were low. As might be expected there are some definite efficiencies in the use of this labor when yields are high, sales are concentrated, or where mechanical lifting is possible. Growers, who used 20 bushel boxes and fork lifts in handling processing apples, had lower labor costs per bushel and lower total harvesting costs when compared with other growers who had similar yields. Supervision was an important part of the "other labor" costs in harvesting especially on large enterprises.

Most farmers used standard eastern apple boxes to move their apples from the orchard. Commonly a charge of 6 to 8 cents per bushel was made for the use of these boxes. These were the usual rental rates charged by processors to farmers for the use of their boxes.

TABLE 22. DISTRIBUTION OF HARVESTING COSTS PER BUSHEL
(178 Western New York Farms, 1956 and 1957)

Harvesting costs per bushel	1956	1957
	(number of farms)	
\$.20 - .24	2	2
.25 - .29	12	9
.30 - .34	24	20
.35 - .39	10	23
.40 - .44	19	18
.45 - .49	11	8
.50 and over	<u>10</u>	<u>10</u>
Total Number	88	90

Variation in harvesting costs per bushel for the two years is shown in table 22. Differences by size of enterprise were not significant. In both years a few growers with high yields, who sold the bulk of their apples to processors, had costs below 30 cents per bushel. All of those with costs over 50 cents per bushel had yields under 125 bushels per acre.

Under normal conditions harvesting costs fell in a range from \$.30 to \$.50 per bushel. Those who sold most of their crop on the fresh market usually had higher harvesting costs per bushel than those aiming for the processing market. However, the difference was less than five cents per bushel for the group as a whole.

RETURNS FROM PRODUCING APPLES

Total Returns Per Acre

Total dollar returns in apple production depends upon the combination of the number of bushels sold and the price received per bushel. In 1956 total returns ranged from an average of \$472 for the group with over 50 acres of bearing apples to a low of \$414 for the middle group. Decreased yields and lower prices in 1957 reduced total returns considerably over the preceding year. Yields decreased by an average of 24 per cent. Prices averaged 26 per cent less than in 1956. As a result there was a decrease of 45 per cent in total returns per acre. As a group the largest growers received over \$30 more in total returns per acre during both years than did the smallest growers.

TABLE 23. TOTAL RETURNS PER ACRE FROM PRODUCING APPLES
(178 Western New York Farms, 1956 and 1957)

Description	Size of enterprise		
	10-25 acres	26-50 acres	51-150 acres
		<u>1956</u>	
Number of farms	30	29	29
Yield per acre (bushels)	296	283	305
Average price per bushel	\$1.47	\$1.44	\$1.56
Total returns per acre	\$440.00	\$414.00	\$472.00
		<u>1957</u>	
Number of farms	30	30	30
Yield per acre (bushels)	204	223	241
Average price per bushel	\$1.10	\$1.09	\$1.10
Total returns per acre	\$232.00	\$238.00	\$267.00

These averages hide the extreme variations in total dollar returns that occurred on the apple enterprises included in each of the three size groups during both years. During each season there were growers who had total returns of less than \$200 per acre. In 1956 there were 17 growers whose returns were more than \$600 per acre. None of the growers had returns this high in 1957.

TABLE 24. DISTRIBUTION OF TOTAL RETURNS PER ACRE FROM
PRODUCING APPLES
(178 Western New York Farms, 1956 and 1957)

Total returns per acre	Size of enterprise					
	10-25 acres		26-50 acres		51-150 acres	
	1956	1957	1956	1957	1956	1957
Less than \$200	3	17	2	14	1	11
200 - 399	10	8	16	13	8	14
400 - 599	11	5	6	3	14	5
600 and over	6	0	5	0	6	0

Net Returns Per Acre

In this study net return indicates the amount a grower had left after all the resources used in growing, harvesting, and moving the crop to storage or the point of first sale were paid for including a charge for his own labor. The differences in net returns between 1956 and 1957 were very striking. Growing costs averaged approximately \$200 per acre both years. Harvesting costs averaged about \$23 higher in 1956 than in 1957. Total returns, however, were much smaller in 1957. As a result most growers made a profit in 1956, while over two-thirds lost money in 1957. Differences by size of enterprise also appear more important when all of the different factors such as costs, yields, and prices are reflected in net returns. Both in 1956 and 1957 those with the largest enterprises averaged higher net returns per acre than those in the two smaller groups.

As was true for practically every important variable associated with the apple enterprise, extreme variations occurred in net returns among farms within each of the three size groups. Net returns ranged from a loss of \$125 to a gain of \$659 per acre in 1956. During that year 14 growers failed to show a profit. Three growers had a profit of over \$400 per acre.

Again in 1957 extreme variations were present. The range was from a loss of \$223 to a profit of \$197. Only 25 of the 90 growers had returns high enough to show a positive net return. Those who made profits in 1957 were quite equally divided among the three size groups. As many small growers made money as did large operators. Size of business was not as important as individual management in determining profits and losses on these apple enterprises.

TABLE 25. NET RETURNS PER ACRE FROM PRODUCING APPLES
(178 Western New York Farms, 1956 and 1957)

Description	Size of enterprise		
	10-25 acres	26-50 acres	51-150 acres
		<u>1956</u>	
Growing costs	\$203	\$187	\$200
Harvesting costs	<u>101</u>	<u>101</u>	<u>115</u>
Total production cost	\$304	\$288	\$315
Total returns	\$440	\$414	\$472
Net return	\$136	\$126	\$157
		<u>1957</u>	
Growing costs	\$209	\$198	\$195
Harvesting costs	<u>77</u>	<u>81</u>	<u>91</u>
Total production cost	\$286	\$279	\$286
Total returns	\$232	\$238	\$267
Net return	\$-54	\$-41	\$-19

TABLE 26. DISTRIBUTION OF NET RETURNS PER ACRE FROM
PRODUCING APPLES
(178 Western New York Farms, 1956 and 1957)

Net returns per acre	Size of enterprise					
	Small		Medium		Large	
	<u>1956</u>	<u>1957</u>	<u>1956</u>	<u>1957</u>	<u>1956</u>	<u>1957</u>
\$-300 - -201	0	2	0	0	0	0
-200 - -101	2	10	0	7	1	5
-100 - -1	6	9	3	16	2	16
0 - 99	7	5	12	6	5	5
100 - 199	6	4	9	1	10	4
200 - 299	2	0	0	0	6	0
300 and over	7	0	5	0	5	0

There are two items of cost on which it was particularly difficult to place values. These are the operator's labor and the charge for the use of land and bearing orchard. Another way to look at success in apple production is to omit these two items from production costs to determine the payment the operator received for the use of his time, his management, and his land in producing apples.

TABLE 27. RETURNS TO LAND, OPERATOR'S LABOR, AND
MANAGEMENT PER ACRE OF APPLES
(178 Western New York Farms, 1956 and 1957)

Description	Size of enterprise		
	Small	Medium	Large
		<u>1956</u>	
Net returns to operator's management	\$136	\$126	\$157
Value of land and operator's labor	<u>87</u>	<u>67</u>	<u>52</u>
Returns to land, operator's labor and management	\$223	\$193	\$209
		<u>1957</u>	
Net returns to operator's management	\$-54	\$-41	\$-19
Value of land and operator's labor	<u>82</u>	<u>64</u>	<u>51</u>
Returns to land, operator's labor and management	\$28	\$23	\$32

In 1957, average returns were too small to cover all costs leaving no positive return to management. Adding the value of the operator's labor and land charge to net returns resulted in average returns to land, operator's labor and management of only \$28 for the small, \$23 for the medium and \$32 for the large enterprises. This method of showing profits or losses in apple production, reduces the variability in returns by size groups and helps to explain why the small operator stays in business.

Disposition of the Crop

In 1956 approximately 7.5 million bushels of apples were processed from New York State's crop. This represented 53 per cent of the total production. In 1957 the proportion processed declined to 44 per cent of the crop or a total of 6.9 million bushels.

The farms studied are located in one of the nation's leading apple processing regions. All but three growers in 1956 and seven the following season sold some apples to this type outlet. In each of the groups about 60 per cent of the production went to processors. This was true during each year. Most growers sold some apples on the fresh market but the amount was only about one-third of the total sold. Only about 20 per cent of the growers sold as much as 60 per cent of their crop in fresh fruit channels.

TABLE 28. DISPOSITION OF CROP
(178 Western New York Farms, 1956 and 1957)

Disposition	Size of enterprise		
	10-25 acres	26-50 acres	51-150 acres
(per cent of total crop)			
<u>1956</u>			
Processing	59	62	61
Fresh market	32	31	34
Other*	9	7	5
<u>1957</u>			
Processing	62	60	61
Fresh market	33	36	35
Other*	5	4	4

* Includes apples for home use and those sold for cider.

Farm Prices

The season average price received by New York State growers for all methods of sale, fresh as well as all types of processing, averaged \$2.06 per bushel in 1956. In 1957 the season average price was \$1.54 per bushel.¹ During the 1956 season the price for apples sold for fresh use averaged \$2.85 per bushel while those sold for processing averaged \$3.12 per hundredweight or \$1.31 for a 42-

1. U. S. D. A. Crop Reporting Board, "Fruits, Non Citrus by States, 1956 and 1957-Production, Use and Value", Part 2, July 1958, Washington, D. C.

pound bushel. In 1957 fresh market apples averaged \$2.36 per bushel while apples for processing averaged \$2.06 per hundredweight or only \$.87 per 42-pound bushel. These are farm prices as reported by a sample of growers. While the processing prices are for apples alone, fresh market prices reflect the cost of the container, packing, storage and selling costs, so the two prices are not comparable. Even so, during both years fresh market prices were over twice as high as the processing prices reported.

Prices reported in this study are F. O. B. farm prices at the time the apples were ready to be packed for sale or placed into storage without a charge for a package. Therefore, the cost of grading, packing and packages and selling charges were not included. This was done to make prices as comparable as possible and reduce the variation in net returns caused by different marketing procedures. During 1956 the average price received by growers in the three size groups for all methods of sale averaged \$1.49 per bushel compared with \$1.10 in 1957.

TABLE 29. AVERAGE FARM PRICE OF APPLES
(178 Western New York Farms, 1956 and 1957)

Description	Size of enterprise		
	Small	Medium	Large
	(dollars per bushel)		
	<u>1956</u>		
Processing	\$1.42	\$1.33	\$1.43
Fresh market	1.86	2.04	1.94
Average	1.47	1.44	1.56
	<u>1957</u>		
Processing	\$0.93	\$0.89	\$0.92
Fresh market	1.73	1.63	1.66
Average	1.10	1.09	1.10

Apples sold on the fresh market brought higher prices than those sold for processing and averaged \$1.95 per bushel in 1956 and \$1.67 in 1957. Apples sold for processing averaged \$1.40 per bushel in 1956 and \$.91 the following year. Differences by size of enterprise were not significant because of the large variation within each size group.

The variation in prices received by growers was sizeable during both years for apples sold on the fresh market as well as to processing outlets. In 1956, 70 of the 85 growers selling apples for processing received \$1.25 or more per bushel.

1. New York State Department of Agriculture and Markets, AMA Release No. 32, "Statistics Relative to the Fruit Industry in New York State, 1940-57", October 1958, Albany, New York.

The next season, no grower received a price as high as \$1.25 per bushel for apples sold in this outlet. The farm price of apples for fresh market varied considerably more than processing prices from farm to farm. In 1956, prices ranged from a low of less than \$1.25 per bushel to a high of over \$2.50 per bushel. In 1957, greater extremes occurred.

TABLE 30. DISTRIBUTION OF FARM PRICE OF APPLES PER BUSHEL
(178 Western New York Farms, 1956 and 1957)

Farm price per bushel	Processing		Fresh market	
	1956	1957	1956	1957
Less than \$1.00	10	58	0	2
\$1.00 - 1.24	5	25	2	12
1.25 - 1.49	37	0	4	16
1.50 - 1.74	30	0	12	18
1.75 - 1.99	3	0	22	14
2.00 - 2.24	0	0	21	6
2.25 - 2.49	0	0	7	4
2.50 and over	0	0	7	7

Yield Per Acre

Yields per acre were determined from the total bushels stored or sold.

TABLE 31. DISTRIBUTION OF YIELD
PER ACRE
(178 Western New York Farms, 1956 and 1957)

Yield per acre	1956	1957
Less than 150 bushels	7	26
150 - 199	8	16
200 - 249	19	16
250 - 299	17	12
300 - 349	11	8
350 - 399	11	7
400 - 449	7	2
450 and over	8	3

Sales in fresh markets and processing outlets including cider apples were all included while culls and drops were omitted. Apple yields in 1956 averaged 295 bushels per acre while in 1957 the average was 223 bushels. During each year wide departures from these averages occurred on most farms. In 1956, the lowest individual yield was 46 bushels per acre and the highest was 568 bushels. All but 15 growers had yields over 200 bushels per acre and on 12 farms the output per acre exceeded 400 bushels.

In contrast to this, the following year 42 farmers had yields of less than 200 bushels while only 5 growers produced over 400 bushels per acre. Poor weather at bloom time was the most important factor reducing yields in 1957.

YIELD NECESSARY TO BREAK EVEN

The yield per acre is the most important factor influencing the size of net returns. In both years over 50 per cent of the variation in net returns was accounted for by yields. On most farms in 1956 an average yield of 170 bushels or more per acre was required to cover all costs or break even with an average price of \$1.49 per bushel. Only two farms having a yield of less than this amount showed a profit. Yield, while highly important, is not the only factor influencing net returns as indicated by the six growers who had yields higher than 170 bushels but yet failed to make a profit. The scatter of the dots in Figure 3 indicates that per-acre yield does not account for all of the variation in net returns. Each dot represents the relationship between yield and net return on one of the 88 apple enterprises in 1956. If yield were the only factor influencing net returns, all the dots would fall on a line starting in the lower left corner of the diagram and extending to the upper right hand corner.

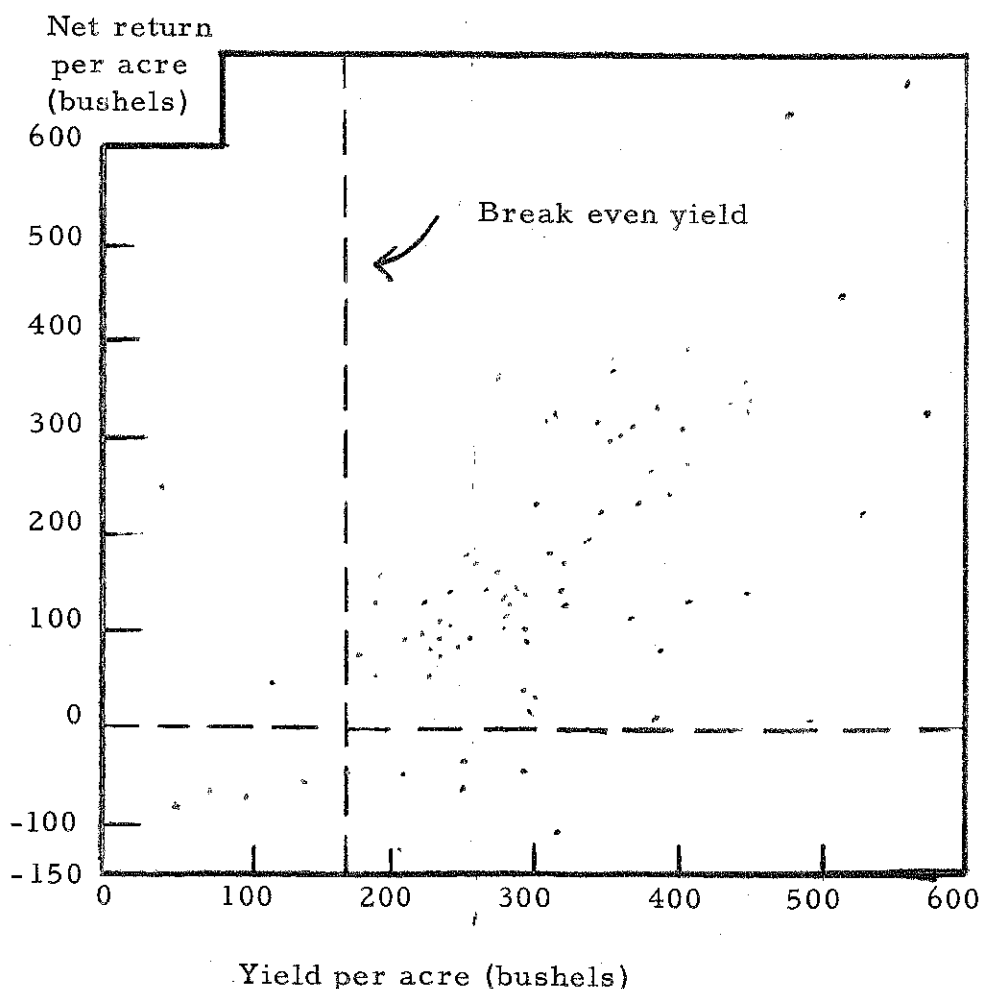


Figure 3. RELATIONSHIP BETWEEN APPLE YIELDS AND NET RETURN PER ACRE (88 Western New York Farms, 1956)

The relationship between yields and net returns in 1957 on the 90 farms studied is shown in Figure 4. A yield of 287 bushels per acre was required to break even during this season with an average price of \$1.10 per bushel. Only seven growers with an average yield lower than this showed a profit. Because of high costs or low prices or a combination of the two, six growers with yields higher than 287 bushels, suffered losses in producing apples during this year.

The yield per acre of apples necessary to break even depends mainly on growing costs per acre, harvesting costs per bushel and the average price received per bushel. The concept of a break even yield and the formulas to compute them can be of considerable help to a grower in more thoroughly

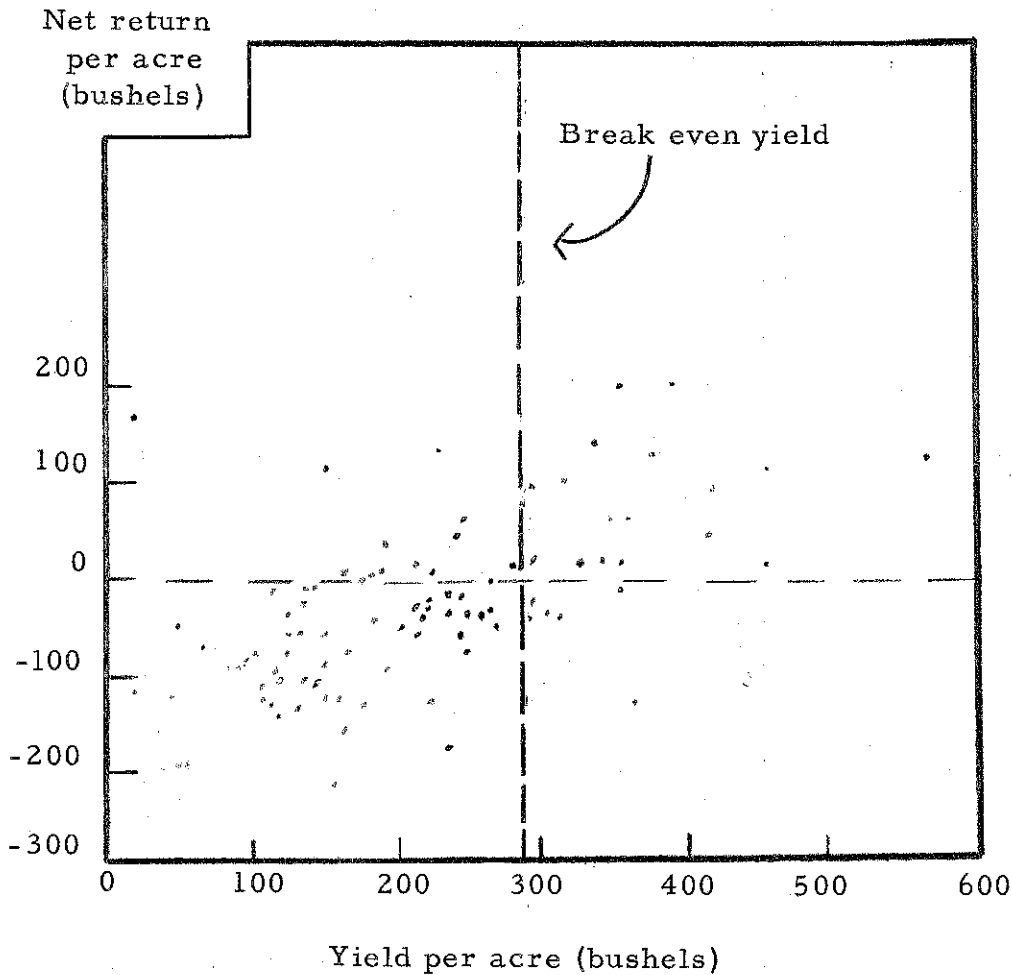


Figure 4. RELATIONSHIP BETWEEN APPLE YIELDS AND NET RETURN PER ACRE (90 Western New York Farms 1957).

examining the factors influencing net returns on his apple enterprise. On the farms included in this study, growing costs averaged about \$200 per acre and harvesting costs amounted to about 40 cents per bushel. The number of bushels of apples required to break even with different prices received and the three levels of growing costs per acre are shown in table 32. If a grower received \$1.20 per bushel or \$2.86 per 100 pounds of apples sold, had growing costs totaling \$200 per acre and harvesting costs of 40 cents per bushel, it would take an average yield of 250 bushels just to cover production and harvesting costs including the value of the grower's labor, land and equipment. The yield figure is computed by subtracting 40 cents from \$1.20 which leaves 80 cents to apply toward growing costs. Dividing 80 cents into \$200 results in the yield of 250 bushels necessary to break even.

TABLE 32. YIELD OF APPLES PER ACRE NECESSARY TO BREAK EVEN WITH SELECTED COSTS AND PRICES

Average price received at the farm		Harvesting costs per bushel	Difference per bushel to apply toward growing costs	Yield in bushels necessary to break even with growing costs of:		
Per bushel	Per 100 pounds			\$150 per acre	\$200 per acre	\$250 per acre
\$0.60	1.43	\$0.40	\$0.20	750	1,000	1,250
0.80	1.90	0.40	0.40	375	500	625
1.00	2.38	0.40	0.60	250	333	417
1.20	2.86	0.40	0.80	188	250	312
1.40	3.33	0.40	1.00	150	200	250
1.60	3.81	0.40	1.20	125	167	208
1.80	4.29	0.40	1.40	107	143	178
2.00	4.76	0.40	1.60	94	125	156

Formulas can be useful in determining the yield necessary to break even as well as to determine the price necessary to break even once yields and growing and harvesting costs are known.

Using the formula which follows, the break even yield can be figured for a producer using his average price received, growing costs per acre, and harvesting costs per bushel. For example, a grower receiving an average price of \$1.07 per bushel and with growing costs of \$223 per acre and harvesting costs of 34 cents per bushel would have to produce an average yield of at least 305 bushels of saleable apples per acre just to cover all costs.

FORMULA TO ESTIMATE YIELD OF APPLES NECESSARY TO BREAK EVEN:

Price per bushel	\$ <u>1.07</u>	-	Harvesting cost per bushel	\$ <u>0.34</u>	=	Difference per bushel to apply toward growing costs	\$ <u>0.73</u>
Growing costs per acre				\$ <u>223</u>	=	Yield necessary to break even (bushels)	<u>305</u>
Difference per bushel to apply towards growing costs				\$ <u>0.73</u>			

The price necessary to break even can also be computed when growing costs per acre, harvesting costs per bushel and yield are given. For example, a grower with growing costs of \$263 per acre, average harvesting costs of 43 cents per bushel and a yield of 207 bushels per acre would have to receive an average price of \$1.70 per bushel to break even on all costs. Assuming a 42 pound bushel, this grower would have to average \$4.08 per 100 pounds of apples if they were sold for processing.

FORMULA TO ESTIMATE PRICE NECESSARY TO BREAK EVEN:

Harvesting cost per bushel	\$ <u>0.43</u>	X	Yield	<u>207</u>	=	Price per bushel necessary to break even	\$ <u>1.70</u>
Total production costs				\$ <u>352</u>			
Yield per acre (bushels)				\$ <u>207</u>			
Price per bushel necessary to break even	\$ <u>1.70</u>	X	2.4	=	\$ <u>4.08</u>	Price per 100 pounds necessary to break even	

CONCLUSIONS

Fruit farming is a dynamic, high risk business especially when apples are the principal enterprise. Rewards to excellent management may be high over a period of years. But, large losses may occur on any farm in a given year.

This study indicated that size of enterprise was not a major factor determining overall efficiency in the use of resources actually used in producing apples. Net returns per acre were often as high on small enterprises as on large ones. Large operators were able to use capital in the form of speed sprayers and specialized equipment more effectively than smaller operators. Hence, their labor efficiency was higher, labor costs per acre were lower. Small operators were not able to use their own time as efficiently as those with 50 or more acres of fruit. Lack of an alternative way to use time not spent in the orchard or packing shed will continue to force those with small operations to get a large apple business, add some complimentary enterprise or do something else. The trend toward larger enterprises should continue even though net returns per acre may not be increased by greater size. After all, total income and not income per acre is the final criterion of how large a business must be to exist successfully.

The great variation in yields, growing costs per acre and prices received in any one year reflects how differently individual growers are managing their businesses. While apple production must be variable by the nature of the production process, this amount of variation indicates that many producers could improve their businesses in a wide variety of ways.

Most of the variation in profits or net returns per acre in any one year were caused by differences in:

- (1) yield per acre
- (2) price received per bushel
- (3) harvesting cost per bushel
- (4) growing cost per acre

Individual growers have some control over each of these important factors. One of the best places to work on one's financial success in producing apples is in the orchard and packing shed. Study and control of growing and harvesting costs, production of high yields, obtaining the quality of fruit demanded by the markets in which apples are sold, and effective use of full time labor will pay big dividends over a period of years.