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*Ed Keare*

LABOR REQUIREMENTS AND COSTS OF  
OPERATING FIELD CHOPPERS IN  
ONEIDA COUNTY, NEW YORK, 1949

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## INTRODUCTION

This report contains information on farmers' experiences and costs in operating field choppers. It is hoped that the findings can be helpful to farmers who may be buying and using field choppers.

How long will a field chopper last? What is the annual cost of using a field chopper? How can a farmer reduce field chopper costs? These important questions confront the farm operator when he decides whether or not to buy a machine.

## PURPOSE

The purpose of this study was to obtain information on the cost of operating field choppers on Oneida county farms in 1949 and to study some of the important factors related to efficiency of operation. Numerous requests have been made to the New York State College of Agriculture by farmers concerning field choppers on New York farms; it was believed that such information would prove helpful.

## METHOD OF STUDY

Data were obtained by personal interviews with farmers in April 1950 Oneida County, New York. Farms which had operated field choppers for one or more years were located through the assistance of machinery dealers. Fifty-seven farms were visited in March 1950, and survey records were obtained on the use of field choppers and the expenses incurred in chopper operations during the 1949 crop season.

An attempt was made to concentrate on the operation of field choppers. However, sufficient information was obtained to describe the complete operation including machinery, equipment and manpower used with the field chopper in order to study some of the factors related to efficient chopper operation.

The data presented represent one year's results on a small group of farms. They are not presented as necessarily typical of the operation of field choppers in all of New York State. The costs presented in this study are the costs involved in operating the field chopper itself and do not include the labor and equipment used with the machine.

## LOCATION AND DESCRIPTION OF THE FARMS STUDIED

All of the farms included were in the southern two-thirds of Oneida County with most of them in the southern one-half.

Dairy cows were kept on all farms. The number of milk cows per farm ranged from 13 to 150 and averaged 42 (table 1). These farms had an average of 29 acres in corn silage and 6 acres in grass silage. The number of acres in corn silage ranged from 5 to 100, while the area occupied by grass silage varied from 3 to 65 acres.

Since only farms having field choppers were studied, these farms are not representative of Oneida County. The average size of herd for farms in this study was about double the average for the entire county.

Table 1. DESCRIPTION OF FARMS USING FIELD CHOPPERS  
57 Farms, Oneida County, 1949

Item	Average Per Farm	Range	
		Smallest	Largest
Total acres operated	316	82	1,500
Total acres of crops	158	40	1,035
Acres in corn silage	29	5	100
Acres in grass silage	6	3	65
Number of cows	42	13	152

#### DESCRIPTION OF MACHINES

With a forage crop harvester, the amount of man labor required to harvest and store a crop is reduced to a minimum; the investment in equipment, however, is large in comparison with some other methods.<sup>1/</sup> By using a field chopper, unloader and blower, grass silage, corn silage, dry chopped hay and straw can be placed in storage without manually handling the crop.

The field choppers have been classified for purposes of this study into (1) the power take-off type, and (2) those supplied with an auxiliary engine to operate the chopping mechanism.

Fifty-seven farms were visited and information was obtained on 58 field choppers; one farm reported the use of two machines. On the average these cost \$1,844 when new and were valued at an average of \$1,447 in April 1950. The average purchase price was \$1,163 for the 17 power take-off machines, and \$2,090 for the 41 machines with auxiliary motors. After two years of use, the power take-off machines were valued at an average of \$928 in April 1950, and those with auxiliary motors at \$1,730. Two power take-off models were purchases second hand; the remaining machines were purchased new.

<sup>1/</sup>Kalbfleisch, W. H. Equipment for Harvesting Hay and Silage, Experimental Farms Service, Division of Field Husbandry, Soils and Agricultural Engineering. Dominion Department of Agriculture, Farmers Bulletin 158, September 1949.

About one-third of the machines had been used one year, one-third two years and one-third had been used for three years or more. The oldest machine had been in operation for 9 years, four had seen 5 years of service and the remainder had been used for less than 5 years.

Fifty of the machines were owned and operated by individual farmers, seven were owned jointly by two farmers, and one machine was owned jointly by three farmers.

# USE OF MACHINES

## Total Use

The total hours of use per machine ranged from 20 to 310 and averaged 101 (table 2). This includes work done on other farms as well as on the "home farm". About one-fourth of the machines operated less than 65 hours, one-fourth from 65 to 89, one-fourth from 90 to 130 hours and the remainder were operated for more than 130 hours. About three-fourths of the total use was on corn silage, one-eighth on grass silage, and one-tenth on dry hay.

Table 2. AVERAGE HOURS OF USE OF FIELD CHOPPERS FOR ALL FARMS,  
AND PER FARM REPORTING BY TYPE OF CROP  
57 Farms, Oneida County, New York, 1949

Crop	Average hours of chopped	All farms		Farms reporting use	
		Average hours of use per chopper	Per Cent of Total	Hours of use per machine reporting	Number of machines
Corn silage	40.0	75	74	77	56
Grass silage	6.5	13	13	44	17
Dry Hay	7.4	10	10	51	12
Straw	4.3	3	3	16	12
Total	58.2	101	100	--	--

Fifty-five of the farms reported the use of 56 field choppers on corn silage and used the machines an average of 77 hours on corn. Sixteen farms used 17 choppers on grass silage an average of 44 hours. On twelve farms dried hay was chopped an average of 51 hours and 12 chopped straw for an average of 16 hours per farm.

As the total hours of work per machine increased, there was a tendency for farmers to use their field choppers proportionately more on dry hay and grass silage and less on corn silage (table 3). Those machines which chopped for less than 90 hours operated 80 per cent of the time on corn silage while those farms which operated for 90 hours or more devoted only 71 per cent of the total hours of use to corn silage.

Table 3. RELATION OF HOURS OF USE TO CROPS HARVESTED  
58 Field Choppers in Oneida County, 1949

Total hours of use	Number of choppers	Per Cent of total hours of use on				
		Corn silage	Grass silage	Dry Hay	Straw	Total
Less than 90	29	80	12	6	2	100
90 or more	29	71	13	12	4	100
Average of all choppers	58	74	13	10	3	100

Farmers increased the total hours of use of their machines, not only by increased use on the home farm, but also by increasing their work on other farms. Those farmers who used their machines less than 65 hours did 96 per cent of their total hours of work on the home farm (table 4).

Table 4. RELATIONSHIP BETWEEN TOTAL HOURS OF USE, AND USE ON  
HOME AND OTHER FARMS

58 Field Choppers, Oneida County, 1949

Hours of use	Number of choppers	Use of field chopper			
		On home farm		On other farms	
		Average hours use	Per Cent of total use	Average hours use	Per cent of total use
Under 65	15	42	96	2	4
65-89	14	55	73	20	27
90-130	15	89	81	21	19
over 130	14	123	68	57	32
Average or total all choppers	58	77	76	24	24

On those farms where field choppers were used from 90 to 130 hours, the per cent of the total work on the home farm was reduced to 81 with 19 per cent of the work on other farms. Choppers which were used for over 130 hours in 1949, worked only 68 per cent of their time on the home farm, and 32 per cent on other farms.

Choppers used from 65 to 89 hours during the season did about the same number of hours of work on other farms as did the choppers used from 90 to 130 hours for the season, but they did fewer hours of work on the home farm.

Fifty-six of the 58 field choppers were used to harvest corn silage; the greatest proportion of the total work was on this crop (table 5). Forage harvesters of the auxiliary engine type were used to a considerable degree on grass silage, corn silage and on straw. Conversely, the power take-off field choppers did very little work on crops other than corn. Only one power take-off chopper was utilized on grass silage or on dry hay, while two of these machines chopped straw.

Table 5. DISTRIBUTION OF FIELD CHOPPERS BY TYPE OF CROP HARVESTED  
58 Choppers, Oneida County, New York, 1949

Type of field chopper	Number of Machines Reporting Use On Total				number of choppers
	Corn silage	Grass silage	Dry hay	Straw	
Power take-off	17	1	1	2	17
Auxiliary motors	39	14	11	10	41
Total	56	15	12	12	58

#### THE TOTAL COST OF FIELD CHOPPER OPERATION

In calculating the annual cost of operating field choppers no consideration was given to labor and other equipment used with the chopper. The annual costs include depreciation, interest, maintenance (including gas, oil and labor), repairs and housing.

On the average, it cost \$299 per season to operate these field choppers although the annual operating costs of individual machines varied from \$107 to \$499.

Power take-off machines had an average annual cost of \$193 as compared with \$343 for auxiliary-engined choppers (table 6). On both types of machines, the charge for depreciation was the largest proportion of the total annual cost of operation. With an average investment in power take-off machines considerably lower, depreciation charges amounted to \$106, as compared with \$179 for the higher priced auxiliary-engined machines. Similarly, the annual interest charge was much higher on field choppers with a separate engine.



Table 6. SUMMARY OF THE COST OF OPERATING 58 FIELD CHOPPERS  
57 Farms, Oneida County, 1949

Item	Power take-off	Auxiliary Engine	All choppers
Depreciation	\$106	\$179	\$157
Interest	49	91	79
Repairs	16	19	18
Maintenance, gas, oil, grease, etc.	12	44	35
Housing	10	10	10
Average total annual cost	\$193	\$343	\$299

The major portion of the difference in annual costs of operation may be attributed to lower depreciation and interest charges on power take-off machines. However, this comparison does not tell the whole story. No information was obtained on the extra cost of gasoline, oil, grease and other expenses, required to pull the power take-off machines as compared with auxiliary-engine choppers.

#### INDIVIDUAL COST FACTORS

##### Depreciation

Depreciation was calculated on the basis of information obtained from the farmers themselves. Farmers were asked to report the number of years they had used each machine as well as their opinion of the anticipated future use of each chopper. The annual depreciation was calculated on the basis of this information, using the straight-line method, allowing for 10 per cent scrap value at the end of the useful life of each machine.

Farmers estimated that the life of a field chopper would average about 11 years. Some farm operators estimated the life of the machines as low as 7 years, and others as high as 17 years. It is interesting to note that farmers estimated the life at about 11 years regardless of the number of years they had used their choppers.

As the total annual hours of use increased, the estimated life of the field choppers decreased as shown in table 7. Field choppers utilized for less than 65 hours had an average estimated life of 13.3 years, those used from 65 to 89 hours 11.1 years, and those used from 90 to 130 and over 130 hours had average estimated useful life spans of 10.7 and 9.9 years respectively.

Table 7. RELATIONSHIP BETWEEN HOURS OF USE AND ESTIMATED LIFE  
58 Field Choppers, Oncida County, 1949

Hours of use in 1949	Estimated life in years	Number of choppers
Less than 65	13.3	15
65-89	11.1	14
90-130	10.7	15
130 or more	9.9	14
Average all farms	11.3	58

#### Interest on Investment

For calculating interest, five per cent of the average investment at the beginning and end of the year was used. Although this is less than is usually paid when machinery is purchased on credit, it is more than could be realized by a farmer investing his funds during normal times, and more than he would generally pay on long term loans.

#### Maintenance and Operation

The amount of gasoline consumed per hour by auxiliary engine choppers was estimated by the farm operator and multiplied by the total hours of use to obtain total consumption. Gasoline was charged at the rate of 16 cents per gallon.<sup>1</sup>

An estimate of the labor required for daily maintenance was obtained at the farm and charged at the rate of 85 cents per hour. For other maintenance and operating costs such as oil and grease, the actual cash outlay was estimated by the owner.

<sup>1</sup>/Farm Cost Accounts, Department of Agricultural Economics, Cornell University Agricultural Experiment Station.

## Repairs

The total repair cost included not only cash expenditures for parts and hired labor to repair the chopper, but also the labor of the farmer himself in making his own repairs.

On the average, the total cost of repairs amounted to \$18.30 during 1949. Seven farms who had operated their choppers for an average of one year reported no repair costs, while others who had had serious breakdowns reported repair costs as high as \$70 in 1949. However, there was a noticeable increase in the cost of repairs as the field choppers increased in years of use (table 8).

Table 8. RELATION OF AGE TO REPAIR COSTS  
58 Field Choppers, Oneida County, New York, 1949

Age of chopper in years	Number of choppers	Repair labor	Cost of parts	Total Repair Cost
1 year	19	\$ 4.15	\$ 6.41	\$10.86
2 years	21	4.69	13.60	18.29
3 years	11	4.70	11.36	16.06
4 years or more	7	17.34	24.71	42.05
Total or average all choppers	58	\$ 6.04	\$12.26	\$18.30

Machines which had been used for only one year had an average repair cost of \$10.86, while for those in their second season of use repair costs were increased to about \$18 and to an average of approximately \$42 after more than three years of use.

## Housing

A standard charge of \$10 per machine for housing was used in this study. This estimate was based upon the average annual cost of housing a combine-harvester, as calculated from New York State College of Agriculture Farm Cost Accounts. It was assumed that the space requirements for field choppers were reasonably similar to combine-harvesters.

## FIELD CHOPPER COSTS PER UNIT OF SERVICE

### Cost Per Hour of Use

As might be expected, the hourly cost declined as the amount of work per machine increased. Machines such as a field chopper, which are relatively expensive to purchase, and are used only a few days a year have a high cost per hour of use.

Auxiliary-engined forage harvesters were used an average of 97 hours per year at an average cost of \$3.43 per hour (table 9). The hourly costs varied greatly on different farms and ranged from an average of \$1.51 to \$12.14 per hour of service. Field choppers of the auxiliary engine type that were used less than 65 hours had an average annual hourly cost of \$7.23, while those machines used more than 130 hours averaged only \$2.31 per hour of use.

The group of field choppers used for less than 65 hours included 3 choppers which were used for less than 30 hours in the 1949 crop year. The average cost per hour, omitting those 3 farms is \$6.12 per hour of use.

With an average of 113 hours of work, 17 power take-off harvesters averaged \$1.71 per hour. The group of choppers that were used less than 65 hours averaged \$2.88 per hour.

Table 9. RELATIONSHIP OF HOURS OF USE AND COST PER HOUR,  
POWER TAKE-OFF AND AUXILIARY ENGINE FIELD CHOPPERS  
58 Field Choppers, Onocida County, 1949

Hours of total use for season	Number of choppers	Average total hours of use	Average cost Per hour
Type of field chopper		<u>Auxiliary Engine</u>	
Less than 65	10	41.2	\$7.23
65-89	11	75.4	4.46
90-130	11	114.0	3.17
More than 130	9	163.4	2.31
Total or average all choppers	41	96.7	\$3.43
Type of field chopper		<u>Power Take-off</u>	
Less than 65	5	49.4	\$2.88
65-89	3	72.0	2.62
90-130	4	99.5	1.63
More than 130	5	211.0	1.28
Total or average all choppers	17	112.7	\$1.71

Despite the fact that the hourly costs reported in the above table do not include the extra gasoline, oil and grease required by a tractor to haul a power take-off machine as compared to the tractor power required to haul those choppers with auxiliary motors, it appears that auxiliary-motored choppers must be utilized a great deal more than power take-off machines in order to reduce hourly costs to the same level. In view of this fact it would appear that the power take-off chopper, with the smaller capital investment has a place on the smaller farm, and choppers with auxiliary engines could be used most efficiently on the larger farm units or on small farms when used for custom work on other farms as well.

If \$2 per hour of use is accepted as a reasonable maximum cost it would appear that power take-off field choppers must be used at least 85 hours per year and auxiliary engined machines a minimum of 150 hours per year.

#### Cost Per Acre of Corn Silage

The average field chopper costs per acre of handling grass silage, dry hay and straw are not presented in this study as the number of farms reporting the use of field choppers on these crops were too few in number. It was felt that average costs, calculated from this small group of farms would not be useful.

The cost per acre of corn silage for the use of an auxiliary-motored field chopper averaged \$6.53 as compared to \$3.51 for power take-off machines. A part of this difference, however, is due to the fact that power take-off choppers were used an average of 113 hours as compared with 97 hours of total use for the auxiliary-motored machines.

These choppers with separate motors which were used for a short period each year, or less than 65 hours, had an average cost of \$8.90 per acre of corn silage (table 10). However, three farms in this group used their choppers for a total of less than 30 hours whereas no farm using power take-off choppers reported less than 30 hours of total use for the season.

Forage harvesters with auxiliary motors used from 65 to 89 hours during the 1949 crop year, cost the farmers an average of \$7.99 per acre on corn. Those choppers utilized from 90 to 130 hours had an average cost of \$5.47 per acre and machines utilized more than 130 hours had a per acre cost of \$5.26. It should be noted that the machines in the latter group were used an average of 163 hours as compared with 211 hours for power take-off choppers in the same group.

The average cost per acre for 17 farms using power take-off machines was \$3.51 on ensilage corn. As the hours of total use increased from less than 65 to more than 130 hours the costs per acre decreased from

Table 10. RELATIONSHIP OF HOURS OF USE TO COST PER ACRE,  
OF HARVESTING CORN SILAGE, POWER TAKE-OFF AND AUXILIARY ENGINE FIELD CHOPPERS  
56 Field Choppers, Oneida County, 1949

Hours of total use for season	Number of choppers	Average yield per acre	Average cost per acre (corn)
Type of Field Chopper		<u>Auxiliary Engine</u>	
Less than 65	9	11.2	\$8.90
65 - 89	10	10.7	7.99
90 - 130	11	9.9	5.47
More than 130	9	10.2	5.26
Total or average all choppers	39	10.3	\$6.53
Type of Field Chopper		<u>Power Take-off</u>	
Less than 65	5	12.5	\$5.49
65 - 89	3	8.8	6.34
90 - 130	4	8.3	4.60
More than 130	5	10.1	2.31
Total or average all choppers	17	10.0	\$3.51

\$5.49 to \$2.31. The group with from 65 to 89 hours of total use had a higher per acre cost than those farms who chopped for less than 65 hours. This inconsistency is probably accounted for by the small number included. Those choppers which were used for more than 130 hours, had an annual average cost of \$2.31 per acre. One of the choppers in this group was used for a total of 310 hours in 1949, and greatly reduced the group average. With this chopper omitted, the group average was \$2.98 per acre on corn.

# COST PER TON OF CORN SILAGE

## Method

The average cost per ton was calculated in the following manner. The average cost per hour of use for each farm was calculated. By multiplying this figure by the total hours of use on a specific crop, the total cost of using a field chopper on that crop was obtained. The sum of these total costs was obtained for any desired group. This sum was divided by the total tonnage chopped by that group, to obtain the average cost per ton.

The cost per ton for choppers with auxiliary engines decreased steadily as the hours of use increased (table 11). The cost per ton for the 19 machines used less than 65 hours was \$0.77 per ton on those machines used less than 90 hours. The cost per ton fell to \$0.54 for machines used 130 hours or more for the season. The average cost per ton for all 39 auxiliary engine choppers was \$0.64 per ton.

Table 11. RELATION OF HOURS OF USE AND COST PER TON ON CORN  
SILAGE, POWER TAKE-OFF AND AUXILIARY ENGINE FIELD CHOPPERS  
56 Field Choppers, Oneida County, 1949

Hours of total use for season	Type of Field Chopper					
	Auxiliary Engine			Power Take-off		
	Number of choppers	Tons per acre	Average cost per ton	Number of choppers	Tons per acre	Average cost per ton
Less than 90	19	10.8	\$0.77	8	11.0	\$0.53
90 or more	20	9.9	0.54	9	9.8	0.28
Total or average all choppers	39	10.3	\$0.64	17	10.1	\$0.35

The average cost per ton for power take-off model choppers averaged \$0.35 during the 1949 crop season. Those forage harvesters used for less than 90 hours had an average cost per ton of \$0.53 as compared to \$0.28 for those power take-off choppers used for more than 130 hours.

# NUMBER OF MEN AND EQUIPMENT USED IN FIELD CHOPPER OPERATIONS

## Size of Tractor Used With Field Choppers

A study was made of the tractor power used with the various field choppers, the results of which are shown in table 12.

Table 12. DISTRIBUTION OF FIELD CHOPPERS BY SIZE AND TYPE OF TRACTOR USED

58 Field Choppers, Oneida County, New York, 1949

Size of tractor	Number of Tractors	
	Auxiliary engine choppers	Power take-off choppers
One-plow	2	0
Two-plow	20	5
Three-plow	18	12
Four-plow	<u>1</u>	<u>0</u>
Total	41	17

Almost all of the auxiliary engine choppers were pulled by two and three-plow tractors, whereas, 12 out of the 17 power take-off models were pulled by three-plow tractors. Two auxiliary engine choppers used a one-plow tractor and one used a four-plow tractor.

Five of the operators using one and two-plow tractors with auxiliary engined choppers claimed that the tractors were not satisfactory for efficient operations, especially on muddy ground. All of the owners of power take-off machines expressed their satisfaction with the tractors used during the 1949 crop season.

## Hauling Equipment

Slightly more than fifty per cent of the farms used trucks to haul chopped feed crops from the field to the barn. Most of these farms used two trucks, although one farm reported the use of four, and two used only one truck for hauling. The remainder of the farms generally used two wagons, with three farms combining the use of trucks and wagons.

On those farms where wagons were used to haul feed crops, two tractors were generally used. One of the tractors was commonly used to haul the field chopper and the wagons, while the other was utilized in a stationary position on the blower at the barn. Three of the farms using wagons reported the use of one tractor for all of the harvesting operations. None of the farms used horses for this work.



Most of the farms using trucks to transport the chopped feeds, utilized two tractors in the operation, one tractor being used on the forage harvester and the other on the stationary blower at the barn. A few of these farms made use of a third tractor to operate the false fronts and canvas unloading equipment.

#### Unloading Equipment

Although there are many factors related to efficient forage harvester operation, it appears that the method used to unload forage crops at the barn has an important bearing on the efficiency of harvesting crops by this method. The methods used by 55 farm operators to unload corn silage are presented in Table 13.

Table 13. SUMMARY OF METHODS OF UNLOADING CORN SILAGE FROM TRUCKS AND WAGONS DURING FIELD CHOPPER OPERATIONS  
55 Farms, Oneida County, New York, 1949

Method of unloading	Number of farms by type of carrier			Total
	Wagons	Trucks	Wagons and trucks	
Pitched by hand	6	2	0	8
False front	7	3	0	10
Canvas bottom	7	7	2	16
Dump	0	16	0	16
Combination of above	0	4	1	5
Total	20	32	3	55

Sixteen of the 55 farms unloaded corn silage by dumping directly into the blower trough and the same number used canvas bottoms. Ten used a false front, eight pitched off by hand and five used a combination of the above to unload the chopped corn into the blower at the barn.

#### The Stationary Blower

Thirty of the 58 blowers were powered by 2-plow tractors, 23 of these farms used 3-plow tractors, and the remaining 5 farms 1 or 4-plow tractors. Of the farmers interviewed, all but ten expressed their satisfaction with their blowing operations into the silo or the barn.

Those farmers that appeared dissatisfied gave the following reasons for their discontent:

1. Two-plow tractors do not give sufficient power to blow corn into a high silo.
2. The augur type feeder in blowers was too dangerous. (They prefer the chain-type of feeder).
3. The capacity of their present blower was inadequate for their operation, when using two dump trucks.
4. The tables and troughs on the blower were too short.

#### Capacity of Field Choppers

In an effort to determine the capacities of power take-off and auxiliary engined choppers under relatively similar conditions, a comparison was made between the two different types of forage harvesters using three-plow tractors (table 14).

Table 14. COMPARISON OF AVERAGE OUTPUT OF CORN SILAGE PER HOUR, AND ACRES PER HOUR, OF 12 POWER TAKE-OFF AND 18 AUXILIARY ENGINED FIELD CHOPPERS, USING THREE-PLOW TRACTORS  
30 Field Choppers, Oneida County, 1949

Item	Type of Field Chopper	
	Power take-off	Auxiliary engine
Number of machines	12	18
Average acreage chopped per season	54	45
Average number of acres per hour	.5	.5
Average number of tons per hour	4.9	5.7
Average yield per acre, tons	10.0	10.5

Auxiliary engined choppers had the greatest output per hour of use. Eighteen of these machines chopped an average of 5.7 tons per hour on 54 acres of corn.

Twelve of the farms reported the use of power take-off choppers with three-plow tractors on corn silage yielding an average of about 10 tons per acre. These machines chopped an average of 4.9 tons per hour on 0.5 acres of onsilage corn.

#### Size of Crew

On most of the farms, a crew of 3 or 4 men was generally used to make corn silage by the forage harvester method. Twelve of the operators used a man equivalent of two or less, 20 used a 3-man crew, 17 farms used 4 man while 7 farms used a crew of 5 men to make corn silage. None of the farms reported a crew of more than 5 men.

### Custom Work

Fourteen of the 58 different choppers were used for custom work. Custom work made up 51 per cent of the total hours of use for these 14 choppers. Those farms which gave complete and usable information on custom rates the usual charge was \$15 per hour including the chopper, blower, 2 tractors, 2 trucks and 4 men. This charge included the fuel and oil to operate all of the machinery supplied. The farms which supplied power take-off machines charged the same fee as those using field choppers and auxiliary motors. Six men with power take-off choppers did custom work as compared to 8 with auxiliary motored forage harvesters.

The average output of corn silage on the farms which had custom work done was 5.9 tons. This was equal to a cost of \$2.54 per ton with silage averaging 10 tons per acre. For grass silage, the output was 4.2 tons per hour, which is equal to \$3.57 per ton with an average yield of 6.2 tons per acre.

All of the farmers who did no custom work during 1949 said that they did not desire to do any in the future. Three of the farmers who were already doing custom work wished to put their machines to greater use. Two of these men had already been using their machines more than the average for the group. One of these choppers was operated for a total of 70 hours, another for 120 hours and the other for 272 hours during the 1949 crop season.

SUMMARY

1. On the average field choppers were owned by farmers who maintained about double the average size of dairy herd for the county (42 cows).
2. About one-third of the field choppers were used one year, one-third two years, and one-third had been used more than three years.
3. The average purchase price of the power take-off machines was \$1,163 and \$2,090 for the auxiliary motored choppers.
4. The 17 power take-off machines enumerated were valued at an average of \$925 in April 1950, and the 41 machines with auxiliary engines at \$1,730 on the same date.
5. About three-fourths of the total use of these machines was in corn silage, one-eighth on grass silage, one-tenth on dry hay, and the remainder on straw.
6. Power take-off machines had an annual cost of \$193 as compared with \$343 for auxiliary-motored choppers.
7. Power take-off field choppers received little use on grass silage and dry hay.
8. Depreciation and interest on the investment formed the greatest share of the total annual costs on all machines studied.
9. Farmers estimated the average useful life of their machines at 11 years.
10. Auxiliary-engined field choppers were used an average of 97 hours at an hourly cost of \$3.43. Power take-off machines were used an average of 113 hours and had an average cost of \$14.71 per hour of use.
11. Field choppers with auxiliary engines must be used a great deal more than power take-off machines in order to reduce the hourly costs to the same level.
12. Twelve of the 17 power take-off machines were drawn by three-plow tractors while 20 of the 41 auxiliary engined choppers used two-plow tractors to haul their choppers.
13. The most common methods of unloading corn silage was by the use of dump trucks or by the utilizing "canvas bottoms" on either wagons or stable-body trucks.
14. Slightly more than fifty per cent of the farms used trucks to haul chopped feed crops from the field to the barn. Most of these farms used two trucks.

15. On most of the farms, a crew of 3 to 4 men was generally used to make corn ensilage by the forage harvester method.
16. The usual custom rate was \$15 per hour, including the chopper, the blower, 2 tractors, 2 trucks, and four men.