COSTS AND LABOR USED TO HARVEST HAY BY DIFFERENT METHODS IN NEW YORK, 1945

A Preliminary Report

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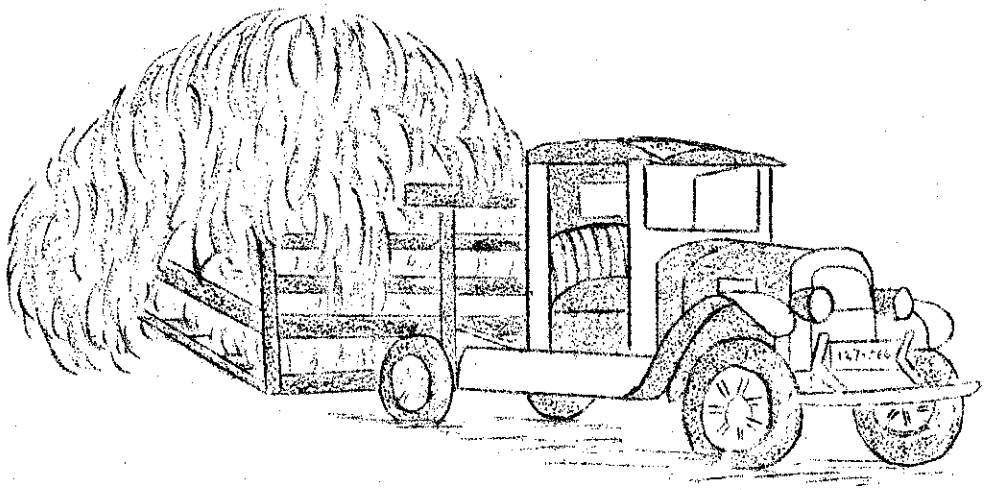

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The number of farms selected for study in the Western New York area was large so that enough cases would be available in some one area for detailed statistical analysis. It was believed that smaller numbers in the other areas would be sufficient to show any outstanding differences among the areas. Simple averages of the figures presented by areas are used in this report to present averages for the State where there is a probability that geographic differences may have an effect. The close relationship between the simple averages for the three areas and the State averages shown in table 1, would suggest that usually this approach is adequate. Obviously, if averages weighted by the number of cases in each area were used, the Western New York area would have too heavy a weighting.

Farms included in the study were selected to represent the important haymaking methods and kinds of hay and the different sizes of farms. County Agricultural Agents and cooperating farmers helped provide information that was useful in making up the lists of farms to be visited. Insofar as possible about an equal number of farms using each of the major methods of harvesting hay was visited. The farms selected are not a cross-section of haymaking methods on New York State farms, but the farms using each of the common methods of harvesting hay are representative of the farms in the State using that method.

Method of Study

For each field from which hay was harvested on each farm, the following information was obtained:

(1) The number of hours to do each job; that is, mowing, raking, tedding, turning, baling, and hauling and storing.

(2) The number of persons in the crew for each job

(3) The kind of power and the number of hours it was used

(4) The kinds of other equipment used for each job and the number of hours of use.

The cost per hour of labor calculated for each farm was based on the total cost of labor used on the farm divided by the total hours of work done on the farm during the year. The average labor rates, therefore, include a higher-than-average value attached to the operator's own labor because of his managerial responsibility. They also include the lower-than-average value given to the labor of women and children. The cash wages and the operator's estimate of the value of farm perquisites given regular and seasonal hired workers are another component of the rates.

For each item of equipment used in making hay, except tractors and trucks, detailed information was obtained as to the cost and hours of use (both for hay and other uses) for the year.

The amount of hay cut a second time varied between the farms and between the different methods of harvesting hay. In order to make the data for different farms and different methods as nearly comparable as possible, the first and second cuttings of hay were enumerated and analyzed separately.

Characteristics of the Areas

Essentially New York is a dairy state. However, there are important variations within the State.

Western New York is a fairly level area with dairying, fruit, and cash crops as the major farm enterprises.

Cortland County is an area of fertile valleys and not so fertile hills. The agriculture of the area is centered primarily around dairy cattle, with cash crops an important but minor source of income on most farms.

Washington County borders on the State of Vermont. To some extent the county typifies the agriculture in neighboring areas of this State, as well as that in Eastern New York. Dairying is by far the most important type of farming. Vegetables are a minor source of income.

Methods of Harvest

The figures in this report do not indicate the proportion of hay in the State that was harvested by any of the methods studied. To obtain a number of records sufficient for analysis on the methods studied, the enumerators deliberately sought farms where buckrakes and pickup balers were used. Therefore, the proportion of hay harvested by using buckrakes, balers, choppers, and other newer or less common types of haying equipment is high and that with loaders is low when compared with the percentages using these methods either throughout the State or in the areas studied.

An estimate of the proportions of the total 1944 hay crop handled by the several methods has been made by the Bureau of Agricultural Economics from information furnished by crop reporters in response to a mailed questionnaire. 3/ These replies were tabulated

3/ Brodell, A.P., Engebretson, T.O., and Carpenter, C.G., "Harvesting the Hay Crop" F.M. 57, Bureau of Agricultural Economics, Washington, D. C., April 1946.

by crop reporting districts. District 6, Eastern New York, is represented by Washington County in this report; District 5, Central New York, by Cortland County; and Districts 4 and 7, Western New York, by Livingston and adjoining counties. The percentages taken from the results of the questionnaire, presented in table 1 are for 1944, and probably are lower for the newer methods of harvest than was the case in 1945. They show, however, that balers, buckrakes and choppers together handled only about one-seventh of the total 1944 hay crop in New York. The figures showing the percentages loaded by hand includes that part of the baled hay that was loaded by hand from the ground, in addition to the loose hay pitched on to the wagons from windrows or shocks. Loaders are still used for considerably more than half of the New York hay crop.

Additional evidence on the comparative infrequency of use of some of the newer methods is furnished by the County Agents' estimates of the number of farms on which different kinds of equipment were used in 1944. 4/ Buckrakes were used on 45 Cortland County farms and pickup balers on 15. According to these estimates, no field choppers were used in the county. Only 30 farmers used buckrakes, and 7 used pickup balers in Washington County where no field choppers were reported. Because pickup balers were used for larger tonnages than were buckrakes, these estimates are in general agreement with those made from the BAE questionnaire.

A comparison of the averages for the three study areas with the averages for the State shows that, when combined to form simple averages, the areas represent the State very well insofar as the use of different methods is concerned. Whether or not they would be equally representative for other items such as costs, wage rates, crew size, and the like, is uncertain. The areas are well distributed geographically, with different soils, climate, topography, and farming systems; so it can logically be assumed that they are fairly representative.

4/ Bierly, Ivan R., "Progress Report on Time Studies of Different Methods of Harvesting Hay," A.E. 498, Department of Agricultural Economics, Cornell University, Ithaca, New York, April, 1945.

TABLE 1. PERCENTAGE OF HAY IN SELECTED AREAS OF NEW YORK THAT WAS HANDLED BY SPECIFIED METHOD, 1944 1/

Method	Percentage of all hay in area 2/				
	Eastern	Central	Western	Simple averages of 3 areas	State 1/
Baled from windrow or shock with:					
Pickup baler	4.8	7.8	11.6	8.1	8.6
Stationary baler	1.2	2.1	2.4	1.9	2.0
Hauled with:					
Auto or tractor buckrake	1.6	2.7	5.0	3.1	3.0
Horses and wagon	59.6	57.0	57.7	58.1	57.3
Tractor and wagon	28.7	29.6	23.2	27.2	24.7
Trucks	9.7	10.5	13.2	11.1	14.2
Loaded by hand	36.4	16.7	34.4	29.2	29.8
Unloaded by hand	15.2	5.7	9.4	10.1	12.5
Chopped before storing	1.8	0.4	2.0	1.4	1.4
Sold before storing	2.7	2.0	3.7	2.8	2.8
Cured artificially	0	0	.13	*	*

* Less than one-half of 1 percent.

1/ Based on mailed questionnaires returned to the Bureau of Agricultural Economics, and on data reported in Brodell, A.P., Engebretson, T.O., and Carpenter, C.G., "Harvesting the Hay Crop", F.M. 57, Bureau of Agricultural Economics, Washington, D. C., April 1946.

2/ These percentages do not add to 100 because of duplications and omissions.

FARM BACKGROUND OF THE HARVESTING METHODS

The farmer does not choose his method of harvesting hay solely on the basis of the costs involved. A costly method may be better for his particular farm than some less expensive method. It is pertinent, therefore, to examine the farm organization, the labor force, and the equipment needed when various methods are used.

Acres of Hay

Acres of hay per farm is one of the most important factors to consider in choosing the method used to harvest the hay. In general, the larger the acreage of hay the greater may be the investment in haymaking machinery.

With few exceptions the farmers using balers and field choppers had a greater acreage of hay than farmers using any of the other methods studied, table 2. The farmers who pitched their hay by hand in Western New York had smaller hay acreages than did farmers using any other method studied. For most methods the hay acreage per farm was larger, and the acreage in other crops was smaller in Eastern New York than in either of the other areas studied.

The Labor Force

The labor force used in hay harvesting varied from farm to farm both in size and composition. There seemed to be no important difference among areas in the average size of the crew, but there were differences in the crew composition which may have been significant, table 3. In general, as one travelled from Western to Eastern New York, the dependence on family labor increased and that on hired regular workers decreased. Most of the increase in the proportion of family labor arose from a higher percentage of male family workers over 18 years of age.

There were notable differences among sizes of farms in both the size and the composition of haying crews, table 4. As the size of the hay enterprise increased, the size of the crew became greater. In every area the average crew on the large farms was about twice as large as were those on the farms with small hay enterprises. In each area the largest farms had the highest percentage of regular hired workers and of "all male workers" and the smallest percentage of "all family labor". More seasonal hired workers than regular hired workers were used on the small farms in all three areas, but with the exception of Eastern New York this condition was reversed on the large farms.

TABLE 2. ACRES OF HAY PER FARM BY VARIOUS METHODS OF HARVESTING HAY

412 Farms in Three Areas of New York, 1945

Method of harvest	Eastern		Central		Western		Average	
	No. of farms	Acres of hay	No. of farms	Acres of hay	No. of farms	Acres of hay	No. of farms	Acres of hay
Loader & wagon	15	57	24	52	38	41	77	50
Loader & truck	10	68	11	70	29	50	50	63
Loader & chopper	1	53	1	40	7	37	9	43
Loader & blower	--	--	--	--	5	36	5	36
Auto buckrake	4	41	28	32	25	42	57	38
Tractor buckrake	1	44	7	43	11	43	19	43
Buckrake & blower	3	42	1	35	21	48	25	42
Buckrake & chopper	--	--	--	--	6	36	6	36
One-man baler	13	72	9	63	25	56	47	64
Three-man baler	7	77	15	66	26	72	48	72
Four-man baler	2	52	--	--	30	60	32	56
Pitched on by hand	8	45	--	--	21	22	29	33
Field chopper	--	--	--	--	6	70	6	70
Buckrake to stationary baler	--	--	1	54	1	34	2	44

TABLE 3. COMPOSITION OF AVERAGE LABOR FORCE, OTHER THAN OPERATOR, IN HAY HARVESTING, BY AREA STUDIED

412 Farms in Three Areas of New York, 1945 1/

Area of New York	No. of farms 2/	Number of workers per farm	Percentage of total number of workers								
			Family Labor					Hired Labor			All male workers
			Male			Female	All family labor				
			18 & over	Under 18	Total	Total		Regular	Seasonal	Total	
Western	249	2.6	14	12	26	10	36	35	29	64	90
Central	97	2.8	18	10	28	14	42	29	29	58	86
Eastern	64	2.5	27	10	37	14	51	16	33	49	86
All Areas	410	2.6	19	11	30	13	43	27	30	57	87

1/ These data for number of workers are based upon the maximum number of people available to help the operator in moving hay from the windrow to the barn. All workers did not necessarily work during the entire job.

2/ Number of farms does not total to 412 because there were two farms on which labor classification was incomplete.

TABLE 4. COMPOSITION OF AVERAGE LABOR FORCE, OTHER THAN OPERATOR, IN HAY HARVESTING, BY SIZE OF HAY ENTERPRISE

412 Farms in Three Areas of New York, 1945 1/

Size of hay enterprise	No. of farms 2/	Number of workers per farm	Percentage of total number of workers								
			Family Labor					Hired Labor			All male workers
			Male			Female	All family labor				
			18 & over	Under 18	Total	Total		Regular	Seasonal	Total	
Small 3/	133	1.8	16	12	28	22	50	14	36	50	78
Medium 4/	157	2.4	21	14	35	15	50	20	30	50	85
Large 5/	120	3.8	19	8	27	7	34	38	28	66	93
All farms	410	2.6	19	11	30	13	43	27	30	57	87

1/ These data for number of workers are based upon the maximum number of people available to help the operator in moving hay from the windrow to the barn. All workers did not necessarily work during the entire job.

2/ Number of farms does not total to 412 because there were two farms on which labor classification was incomplete.

3/ Less than 70 tons. 4/ 70 - 120 tons. 5/ Over 120 tons.

There was no typical crew organization for any of the methods used. Fewer hired workers were employed when auto buckrakes were used than with any of the other methods, table 5. In the methods for which tabulations were made in all areas the proportion of women workers was highest when auto buckrakes were used. This may have resulted partially from the concentration of buckrakes on the smaller farms.

Only in Western New York were there sufficient cases to give information of much value as to the size of crew most frequently employed. In this area the crew most frequently found in the case of hay pitched on by hand consisted of the operator only. When buckrakes were used with blowers or with stationary choppers, the operator most commonly had one helper. Two helpers were most frequent if loaders and wagons, auto or tractor buckrakes, or field choppers were used. The most common crew size for all types of balers was three men, in addition to the operator. Many one-man baler operators put a second man on the baler in addition to the man driving the tractor.

The minimum sized crew reported by farmers may also be of interest. Occasionally buckrake operators did the entire job without help. A number of loader and wagon or truck operators had only one helper. Several farmers had only one additional person in their one-man baler crew. A few four-man baler operators were able to get along with only two helpers by having one man tie on both sides of the machine.

Tables 3, 4, and 5 show the labor force used other than the operator. They do not show the occasional use of youngsters or women on such odd jobs as mowing or raking for a few hours when other workers are busy. They should not be interpreted as showing the proportions of the total work done in haying by various members of the crew, because women and children often worked only at the lighter jobs and during only a fraction of the time. However, on some jobs young boys and women can take the place of an able-bodied man with little or no loss in efficiency.

Average labor rates:

Differences between methods in the cost of labor per hour may arise from three principal sources. (1) The rates for the operator and unpaid family labor were based on estimates by each operator and showed great variations. (2) The type of labor required to operate different haymaking machines may vary. The percentage of women and young boys was high where buckrakes were used and their labor was usually given a lower value than was the work performed by an adult male. (3) Both the methods used and the composition of the labor force varied among farms with different-sized hay enterprises. Thus any difference in rates arising from the size-of-farm would carry over into the rates between methods, table 6.

TABLE 5. COMPOSITION OF AVERAGE LABOR FORCE, OTHER THAN OPERATOR, IN HAY HARVESTING, BY METHOD OF HARVEST

412 Farms in Three Areas of New York, 1945 1/

Method of harvest	No. of farms 2/	Number of workers per farm	Percentage of total number of workers								
			Family Labor					Hired Labor			All male workers
			Male			Female	All family labor	Regular	Seasonal	Total	
			18 & over	Under 18	Total	Total					
Loader-wagon	77	2.2	16	10	26	14	40	29	31	60	86
Loader-truck	50	3.1	20	13	33	10	43	34	23	57	90
Loader-chopper 3/	7	2.3	13	0	13	6	19	69	12	81	94
Loader-blower 3/	4	2.0	25	13	38	0	38	37	25	62	100
Auto buckrake	57	1.7	28	22	50	21	71	16	13	29	79
Tractor buckrake 4/	19	1.9	15	17	32	26	58	17	25	42	74
Buckrake-chopper 3/	5	1.6	13	25	38	12	50	38	12	50	88
Buckrake-blower 5/	23	1.8	17	4	21	15	36	32	32	64	85
One-man baler	48	3.2	24	8	32	8	40	29	31	60	92
Three-man baler	48	4.3	20	8	28	10	38	25	37	62	90
Four-man baler 5/	31	3.4	25	17	42	15	57	11	32	43	85
Field chopper 3/	6	3.0	0	6	6	0	6	78	16	94	100
By hand 4/	28	1.4	14	3	17	16	33	27	40	67	84
Other methods	7	2.7	23	0	23	8	31	4	65	69	92
All methods	410	2.6	19	11	30	13	43	27	30	57	87

1/ These data for number of workers are based upon the maximum number of people available to help the operator in moving hay from the windrow to the barn. All workers did not necessarily work during the entire job.
2/ Number of farms does not total to 412 because there were two farms on which labor classification was incomplete.
3/ Figures for Western New York only.
4/ Eastern New York not included.
5/ Central New York not included.

TABLE 6. HOURLY LABOR RATES FOR THE DIFFERENT METHODS OF HANDLING HAY BY AREAS

412 Farms in Three Areas of New York, 1945

Method	Estimated labor rate per hour			
	Eastern New York	Central New York	Western New York	Average
Loader-wagon	$0.51	$0.51	$0.57	$0.53
Loader-truck	0.54	0.53	0.52	0.53
Loader-truck & wagon	0.54	0.52	0.55	0.54
Loader-chopper	0.58	0.45	0.55	0.53
Loader-blower	--	--	0.52	0.52
Auto buckrake	0.50	0.51	0.49	0.50
Tractor buckrake	0.58	0.45	0.56	0.53
Buckrake-chopper	0.52	--	0.50	0.51
Buckrake-blower	0.50	0.41	0.48	0.46
Hired baler 1/	0.50	0.60	0.54	0.55
Owned balers:				
1-man	0.57	0.52	0.57	0.55
3-man	0.48	0.54	0.60	0.54
4-man	0.47	--	0.53	0.50
Stationary baler	--	0.50	0.52	0.51
By hand	0.58	0.43	0.51	0.51
Field chopper	--	--	0.60	0.60

1/ These figures apply only to the labor supplied by the farmer. The value of the labor furnished by the operator of a custom baler could not be separated from other items included in the charge for custom baling.

There was no significant difference among areas in average labor rates and no definite relation among methods of harvesting hay.

Haying Equipment

Farm equipment has been almost as scarce as farm labor during the past few years. Now that heavy peace time production of farm machinery is in prospect, farmers are particularly interested in the investment required in equipment and in the cost of its operation.

Investment in Haying Equipment

Balers and field choppers required heavier investments than were needed for any other types of hay harvesting equipment, table 7. For example the average farmer who used a tractor mower, side-delivery rake, and a one-man baler with two wagons and loaded by hand, would have an investment of $1,925 in haying equipment exclusive of his tractor. Substitution of a loader and a fork and rope at the barn for his baler would reduce the average investment to $460.

The figures in the table are based on the owner's valuation under normal prices. The State average shown is the simple average computed from the area figures. In a few instances there were too few cases in some areas to establish a reliable average for the area, and for these the State average is not representative of actual conditions. Differences in the value of most pieces of equipment were very small among the three areas.

Items used on farms having large hay enterprises usually were rated higher than were corresponding pieces of equipment on farms with less hay. There was no uniform tendency for the age of haying equipment to differ between sizes of farms.

Operating Costs:

The farmers estimated the costs of depreciation, repairs, gas, oil, electricity, twine, and wire for equipment used in harvesting hay. Interest was calculated at 5 percent on the owner's valuation of the machine. Housing costs were estimated from "Costs of Farm Power and Equipment", Cornell University, Agricultural Experiment Station, Bulletin 751, by J. P. Hertel and Paul Williamson, supplemented by recent field studies. Insurance was calculated at $4.00 per $1,000 valuation.

The costs for 1945, summarized in table 8, show only minor differences among areas except for a few items where the number of machines was not sufficient to establish an adequate basis for comparison.

TABLE 7. INVENTORY VALUE OF EQUIPMENT USED IN HARVESTING HAY

412 Farms in Three Areas of New York, 1945

Item	Number and average inventory value of machines						Aver.
	Eastern		Central		Western		
	No. of machines	Value	No. of machines	Value	No. of machines	Value	Value
5' horse mowers	8	$ 39	35	$ 38	102	$ 34	$ 37
6' horse mowers	13	41	17	48	29	64	51
Tractor mowers	48	91	61	95	131	97	94
Tedders	5	21	12	18	15	14	18
Dump rakes	16	31	11	17	33	14	21
Side-delivery rakes	50	86	88	74	211	73	78
Hay loaders	29	70	50	82	99	76	76
Auto buckrakes	7	141	31	176	56	185	167
Tractor buckrakes	2	84	7	98	16	101	94
Rubber-tired wagons	51	67	68	64	167	72	68
Steel-tired wagons	20	37	24	41	43	36	38
One-man balers	14	1,715	9	1,652	25	1,483	1,617
Three-man balers	8	856	15	726	28	905	829
Four-man balers	2	844	--	--	33	729	786
Stationary balers	--	--	1	625	3	88	356
Blowers	3	87	1	125	30	124	112
Field choppers	--	--	--	--	6	1,216	1,216
Stationary choppers	5	167	1	250	24	260	226
Hay forks, ropes, etc.	45	82	81	75	164	72	76
Hay hoists	5	108	12	54	6	153	105
Bale elevators in barn	9	128	8	95	24	122	115
Bale elevators in field	--	--	2	191	5	200	196

TABLE 8. ANNUAL COST OF OPERATING EQUIPMENT USED IN HARVESTING HAY

412 Farms in Three Areas of New York, 1945

Item	Average annual cost of operating haymaking equipment						
	No. of machines	Eastern	No. of machines	Central	No. of machines	Western	Average
5' horse mowers	8	$ 15	35	$ 15	102	$ 17	$ 16
6' horse mowers	13	15	17	15	29	19	16
Tractor mowers	48	24	61	25	131	29	26
Tedders	5	6	12	4	15	4	5
Dump rakes	16	7	11	5	33	5	6
Side-delivery rakes	50	24	88	21	211	24	23
Hay loaders	29	17	50	20	99	19	19
Auto buckrakes	7	53	31	56	56	71	60
Tractor buckrakes	2	30	7	17	16	21	23
Rubber-tired wagons	51	13	68	12	167	13	13
Steel-tired wagons	20	7	24	7	43	7	7
One-man balers	14	756	9	970	25	850	859
Three-man balers	8	384	15	394	28	357	378
Four-man balers	2	318	--	--	33	310	314
Stationary balers	--	--	1	152	3	60	106
Blowers	3	11	1	11	30	35	19
Field choppers	--	--	--	--	6	321	321
Stationary choppers	5	29	1	54	24	48	44
Hay forks, ropes, etc.	45	10	81	12	164	11	11
Hay hoists	5	12	12	8	6	20	13
Bale elevators in barn	9	13	8	13	24	14	13
Bale elevators in field	--	--	2	34	5	30	32

Unit costs of operating hay equipment

The total cost of operating machinery may be divided roughly into two parts -- fixed and operating costs. The fixed costs such as interest, housing, and insurance are not greatly affected by the amount of work done. Operating costs such as repairs, fuel, twine, and wire vary with the use of the machine. Depreciation has some of the features of both types of cost. Heavy use increases the annual rate of depreciation somewhat but diminishes the rate per hour of use.

With few exceptions haying equipment was also used for other purposes. This had the effect of spreading fixed costs over a wider base and reducing costs per unit of work done. This effect is illustrated by the fact that although the total cost of operating equipment for the year was usually highest on the large farms where it was used more hours, the cost per hour of use was generally lowest on these farms.

For most items the differences among areas either in the units of hay handled or in the cost of equipment per unit handled were very small, table 9. The unit costs of operating one-man balers were extremely high in Cortland County and exceptionally low in Western New York. The low cost in Western New York was probably due to the large amount of use. The one-man balers in this area were used on the average 310 hours compared to 211 hours in Cortland County and 174 in Washington County. Much of the high cost in Cortland County arose from the fact that owners depreciated their balers at a higher figure than in the other two areas. Whether or not the balers in Cortland County were actually depreciating enough faster than those in the other areas to justify the higher figure is uncertain.

In comparing the costs of operating auto and tractor buckrakes it should be remembered that power costs are included in the case of the auto buckrake but are not included where the tractor buckrake is used. If the average charge of 50 cents per hour for the use of the tractor is added to the tractor buckrake cost, the cost for the two machines becomes more nearly comparable.

Other uses of haying equipment

With few exceptions haying equipment was used for many things in addition to the hay enterprise. The additional use is especially pronounced in the case of wagons, pick-up balers, and choppers, table 10.

Much of the other use for pickup balers was in doing custom work. Income received from custom operation of equipment has not been credited to the machine in these calculations, but the hours of custom use have been included in determining the cost per hour of use.

TABLE 9. UNITS HANDLED AND COST OF OPERATING EQUIPMENT PER UNIT HANDLED IN HARVESTING HAY

412 Farms in Three Areas of New York, 1945

Item	Unit	Unit costs on own hay							
		Eastern		Central		Western		Average	
		Units handled	Cost	Units handled	Cost	Units handled	Cost	Units handled	Cost
5' horse mowers	acre	45	$0.33	36	$0.36	38	$0.32	40	$0.34
6' horse mowers	"	46	0.31	49	0.29	56	0.25	50	0.28
Tractor mowers	"	74	0.25	61	0.33	77	0.22	71	0.27
Tedders	acre	24	0.25	19	0.19	21	0.17	21	0.20
Dump rakes	"	41	0.17	26	0.20	31	0.11	33	0.16
Side-delivery rakes	"	101	0.19	84	0.22	96	0.17	94	0.19
Hay loaders	ton	86	0.19	94	0.20	61	0.27	80	0.22
Auto buckrakes	ton	61	0.73	67	0.56	71	0.62	66	0.64
Tractor buckrakes	"	60	0.19	63	0.24	58	0.26	60	0.23
Rubber-tired wagons	ton	73	0.08	70	0.07	53	0.07	65	0.07
Steel-tired wagons	"	59	0.07	41	0.07	42	0.06	47	0.07
One-man balers	ton	146	1.66	110	2.20	126	0.88	127	1.58
Three-man balers	"	160	1.01	159	0.97	146	1.08	155	1.02
Four-man balers	"	95	1.30	--	--	104	1.47	100	1.38
Stationary balers	"	--	--	21	7.23	37	1.23	29	4.23
Blowers	ton	60	0.18	100	0.10	64	0.39	75	0.22
Field choppers	"	--	--	--	--	144	1.48	144	1.48
Stationary choppers	"	37	0.36	70	0.55	42	0.45	50	0.45
Hay forks, ropes, etc.	ton	79	0.13	89	0.14	70	0.15	79	0.14
Hay hoists	"	71	0.09	109	0.07	42	0.43	74	0.20
Bale elev. at barn	"	165	0.06	165	0.06	115	0.08	148	0.07
Bale elev. in field	"	--	--	198	0.10	135	0.20	166	0.15

TABLE 10. USE OF HAY HARVESTING EQUIPMENT

412 Farms in Three Areas of New York, 1945

Item	Hours of use and percentage used on own hay							
	Eastern		Central		Western		Average	
	Hours of use	Percentage on own hay	Hours of use	Percentage on own hay	Hours of use	Percentage on own hay	Hours of use	Percentage on own hay
5' horse mowers	61	100	48	86	57	72	55	86
6' horse mowers	49	93	60	90	68	75	59	86
Tractor mowers	61	77	58	79	79	59	66	72
Tedders	15	100	10	83	11	92	12	92
Dump rakes	30	100	11	95	24	72	22	89
Side-delivery rake	74	79	52	88	80	68	69	76
Hay loaders	88	95	77	92	64	87	76	91
Auto buckrakes	54	85	71	67	78	62	68	71
Tractor buckrakes	83	38	58	91	56	71	66	67
Rubber-tired wagons	156	42	190	38	151	31	166	37
Steel-tired wagons	133	61	121	42	152	34	135	46
One-man balers	174	32	211	25	310	13	232	23
Three-man balers	139	42	152	39	138	44	143	42
Four-man balers	118	39	--	--	124	49	121	44
Stationary balers	--	--	16	100	38	76	27	88
Blowers	43	100	40	95	61	70	48	88
Field choppers	--	--	--	--	93	66	93	66
Stationary choppers	69	46	68	71	83	39	73	52
Hay forks, ropes, etc.	73	100	69	100	58	96	67	99
Hay hoists	38	53	55	100	23	93	39	82
Bale elev. at barn	31	72	36	71	30	62	32	68
Bale elev. in field	--	--	121	59	61	87	91	73

MOVING HAY FROM WINDROW TO MOW

About two-thirds of the total expense and labor in harvesting hay is spent in moving the hay from the windrow to storage. The variations in method for this part of the harvest are greater than they are for the operations in cutting and curing. This report does not include a discussion of cutting and curing.

The general methods of handling hay after it is cured are by use of loaders, buckrakes, balers, and pitched on by hand. Certain details concerning each general method may vary greatly from farm to farm. For example loaders may be used with trucks or with horse or tractor-drawn wagons. Unloading at the barn may be by a rope and fork or sling, pitched into a stationary blower or chopper, or pitched into the mow by hand.

In the following discussion and tables information on factors associated with various methods is presented. The analysis has been made on a field rather than a farm basis. The area averages in these tables have usually been weighted by the tonnage or the acreage handled; therefore the figures reflect the influence of the larger farms.

For some methods there were not enough fields to establish reliable averages. In general, little significance should be attached to any data based on less than 20 observations. Such data are presented in this report because they may indicate some similarities or differences among areas, and information on infrequently used methods may be of interest to farmers and others.

No distinction has been made between cash and non-cash costs. The costs presented in the following tables are the costs of moving hay from the windrow to storage as determined by the accounting procedures explained in this report. They do not show the cash outlay required to harvest hay by any of the methods. Many farmers might prefer to use a high cost method to harvest their hay if by so doing they could utilize family labor or equipment already on hand and reduce their cash costs.

Factors That May Influence the Choice of Method

In all areas the farmers using balers handled larger-than average tonnages of hay. Farms on which buckrakes were used, produced smaller-than-average tonnages.

The fields on which buckrakes were used, except for buckrake-blower combinations, were below average in size, table 11. Fields on which pickup balers were used were larger than the average. The fields on which the same method was used in the different areas did not differ greatly in size.

TABLE 11. SIZES OF FIELDS AND THE DISTANCES OF FIELDS FROM THE BARN ASSOCIATED WITH METHODS OF HANDLING FIRST-CUTTING HAY

412 Farms In Three Areas of New York, 1945

Method	Number of fields			Average size of field in acres				Distance from field to barn in miles			
	Eastern	Central	Western	Eastern	Central	Western	Average	Eastern	Central	Western	Average
Loader:											
wagon	90	146	149	7.8	8.2	8.5	8.2	.28	.40	.29	.32
truck	38	66	114	10.9	7.4	9.1	9.1	.32	.45	.41	.39
truck & wagon	12	39	23	18.1	7.0	8.7	11.3	.42	.43	.33	.39
chopper	6	3	24	11.7	10.7	9.9	10.8	.32	.23	.62	.39
blower	--	--	18	--	--	9.1	9.1	--	--	.40	.40
Buckrake:											
auto	22	115	119	5.8	7.2	7.9	7.0	.24	.23	.30	.26
tractor	4	29	45	8.2	6.7	8.2	7.7	.32	.17	.23	.24
auto & blower	9	4	69	6.9	8.8	10.4	8.7	.19	.18	.27	.21
tractor & blower	3	--	8	13.0	--	5.9	9.4	.37	--	.34	.35
chopper	3	--	32	3.3	--	7.6	5.4	.16	--	.30	.23
Baler:											
hired	29	22	76	7.6	13.8	11.2	10.9	.54	.96	.66	.72
owned:											
1-man	84	40	94	10.1	11.8	13.7	11.9	.44	.38	.42	.41
3-man	51	86	145	11.2	11.0	12.3	11.5	.55	.32	.65	.51
4-man	11	--	173	9.0	--	9.3	9.2	.33	--	.49	.41
stationary	--	9	10	--	5.6	8.0	6.8	--	.49	2.85	1.67
Pitched on by hand	38	8	60	8.2	1.8	8.0	6.0	.27	.20	.29	.25
Field Chopper	--	--	30	--	--	11.4	11.4	--	--	.38	.38

The average length of haul varied among the different methods. The average distance from the field to the barn when the different buckrake combinations were used or when the hay was pitched on by hand, ranged from 0.2 to 0.3 miles. When the loader combinations were used, the distance hauled averaged 0.3 to 0.4 miles. The average haul was greater than 0.4 miles when the hay was baled. There were no significant differences among areas in this respect.

The yield per acre in Cortland County was above the average of the three areas for all methods except when auto buckrakes were used or when loose hay was loaded by hand, table 12. This higher yield probably results from the fact that the sample in Cortland County was weighted with the better farms. Differences in yields on fields where the different methods were used were not pronounced. The smallest yields were obtained from fields harvested by hired balers, or from those where the loose hay was loaded by hand.

The number of workers needed is a factor of importance to the farmer who is considering which method to use. The figures in table 12 on the average number in the crew differ from those in table 5, in that the numbers in table 5 represent the maximum number of individuals working on each farm in addition to the operator during some portion of hay harvest, while table 12 shows the average number including the operator. The numbers employed on the different farms where the same methods were used showed wide range. The average number of workers used with buckrakes was lower than the number when most of the other methods were used. If baling and hauling and storing were done simultaneously, more workers would be needed than normally would be used if the hay were handled in some other way. However, if the numbers of workers is limited, hay can be baled, and then the same crew can shift to hauling and storing. Hay can be put in the barn less rapidly this way than if two crews are used, but the size of the crew needed is reduced. If two crews were used, hay could usually be baled as fast as, or faster than it could be hauled and stored when the baling was done by a one-man or three-man baler. If a four-man machine was used, baling was slower than hauling and storing and thus became the factor limiting the speed of the combined operation.

Rate of Performance

The time required to move hay from the windrow to storage is a critical factor because each hour of delay increases the probability of rain damage and amount of sun bleaching.

There are two distinct operations in handling baled hay: (1) the actual baling, (2) hauling and storing the baled hay. The figures in table 13 show that baled hay could be hauled and stored much faster than could long loose hay. Although baled hay could be hauled and stored more rapidly than could long loose hay, the extra

TABLE 12. YIELD OF HAY AND SIZE OF CREW ASSOCIATED WITH METHODS OF HANDLING FIRST-CUTTING HAY

412 Farms in Three Areas of New York, 1945

Method	Average yield of hay in tons per acre				Average number in crew: Baling				Average number in crew: Hauling and storing			
	Eastern	Central	Western	Average	Eastern	Central	Western	Average	Eastern	Central	Western	Average
Loader:												
wagon	1.7	2.2	1.9	1.9	--	--	--	--	2.7	3.4	2.7	2.9
truck	2.1	2.3	2.0	2.1	--	--	--	--	3.0	3.8	3.4	3.4
truck & wagon	1.8	2.1	1.8	1.9	--	--	--	--	2.7	5.6	4.2	4.2
chopper	1.7	2.2	1.8	1.9	--	--	--	--	2.2	2.7	3.8	2.9
blower	--	--	1.8	1.8	--	--	--	--	--	--	3.3	3.3
Buckrake:												
auto	2.3	2.1	1.9	2.1	--	--	--	--	2.7	2.8	2.7	2.7
tractor	1.5	2.0	1.9	1.8	--	--	--	--	2.0	3.1	2.6	2.6
auto & blower	1.8	3.0	1.8	2.2	--	--	--	--	1.9	2.0	2.5	2.1
tractor & blower	1.6	--	2.1	1.8	--	--	--	--	2.0	--	3.0	2.5
chopper	3.9	--	1.8	2.8	--	--	--	--	3.3	--	2.5	2.9
Baler:												
hired	1.5	1.9	1.8	1.7	1.7	2.2	2.2	2.0	3.1	3.1	3.3	3.2
owned:												
1-man	2.0	2.1	1.9	2.0	1.3	1.4	1.7	1.5	3.5	3.7	3.3	3.5
3-man	2.0	2.4	1.9	2.1	3.2	3.0	2.9	3.0	3.6	2.9	2.7	3.1
4-man	1.8	--	1.9	1.8	3.6	--	3.8	3.7	3.5	--	2.9	3.2
stationary	--	1.9	1.9	1.9	--	4.7	4.4	4.5	--	2.1	2.6	2.4
Pitched on by hand	1.7	1.7	1.8	1.7	--	--	--	--	2.8	3.4	2.5	2.9
Field chopper	--	--	2.3	2.3	--	--	--	--	--	--	4.0	4.0

TABLE 13. TONS OF HAY MOVED PER HOUR IN BALING AND HAULING AND STORING FIRST-CUTTING HAY BY VARIOUS METHODS

412 Farms in Three Areas of New York, 1945

Method	Tons of Hay Handled Per Hour of Crew Operation							
	Baling				Hauling and Storing			
	Eastern	Central	Western	Average	Eastern	Central	Western	Average
Loader:								
wagon	--	--	--	--	0.9	1.3	1.0	1.1
truck	--	--	--	--	1.3	1.3	1.2	1.3
truck & wagon	--	--	--	--	1.1	1.9	1.3	1.4
chopper	--	--	--	--	0.8	1.5	1.1	1.1
blower	--	--	--	--	--	--	1.2	1.2
Buckrake:								
auto	--	--	--	--	1.1	1.2	1.4	1.2
tractor	--	--	--	--	1.6	1.7	1.4	1.6
auto & blower	--	--	--	--	1.1	2.6	1.5	1.7
tractor & blower	--	--	--	--	2.7	--	2.1	2.4
chopper	--	--	--	--	2.9	--	1.3	2.1
Baler:								
hired	2.5	2.8	2.6	2.6	1.7	2.0	1.9	1.9
owned:								
1-man	2.6	2.1	3.3	2.7	2.1	2.1	2.6	2.3
3-man	2.8	2.7	2.4	2.6	3.1	2.4	2.3	2.6
4-man	2.1	--	1.7	1.9	4.8	--	2.3	3.6
stationary	--	1.7	1.6	1.6	--	2.7	2.8	2.8
Pitched on by hand	--	--	--	--	0.8	0.9	0.8	0.8
Field chopper	--	--	--	--	--	--	2.5	2.5

time required for baling offset most of this advantage, and the total hours of crew operation when balers and the more common loader or buckrake combinations were used did not differ greatly, table 14. The field chopper required fewer hours of crew operation per ton than any other method, but if two crews were used, hay could be baled and put under cover at about the same speed. Pitching hay by hand was the slowest of all methods.

A farmer usually will not cut more hay than can be hauled to the barn in one afternoon. There is, therefore, some relationship between the acreage cut at one time and the over-all speed of handling hay. Exceptions occur where the hay is baled and left in the field overnight. This relationship is altered also when hay is hauled to the barn in the evening but not unloaded until the next morning. Smaller acreages were cut at one time when either a buckrake or hand loading was used than when balers were employed, table 15.

Labor Used and Its Costs

During periods when shortages of labor are prevalent, the farmer is especially interested in methods of doing his work with less labor. Labor is hard to find, and if found it is expensive.

Amount of labor used:

The man hours of labor used in Washington County per ton of hay moved from the windrow to storage were usually below the average for the three areas, but in Western New York they were generally above the average, table 16.

Fewer man hours per ton were needed with buckrake combinations and field choppers than with other methods. One-man balers required fewer man hours per ton than did either three-man or four-man machines. The data for hired balers show only labor furnished by the farmer. Additional labor furnished by the baler operator was about 0.7 man hours per ton in Washington County, 0.8 in Cortland and 1.1 in Western New York. The cost of this labor is included in the hired baler charge in table 18.

The greatest number of man hours per ton was needed when hay was pitched on by hand.

TABLE 14. HOURS OF CREW OPERATION PER TON OF FIRST-CUTTING HAY MOVED FROM WINDROW TO STORAGE BY VARIOUS METHODS

412 Farms in Three Areas of New York, 1945

Method	Hours of Crew Operation Per Ton of Hay:											
	Baled				Hauled and Stored				Baled and Hauled and Stored			
	Eastern	Central	Western	Average	Eastern	Central	Western	Average	Eastern	Central	Western	Average
Loader:												
wagon	--	--	--	--	1.1	0.8	1.0	1.0	1.1	0.8	1.0	1.0
truck	--	--	--	--	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
truck & wagon	--	--	--	--	0.9	0.5	0.8	0.7	0.9	0.5	0.8	0.7
chopper	--	--	--	--	1.2	0.7	0.9	0.9	1.2	0.7	0.9	0.9
blower	--	--	--	--	--	--	0.8	0.8	--	--	0.8	0.8
Buckrake:												
auto	--	--	--	--	0.9	0.8	0.7	0.8	0.9	0.8	0.7	0.8
tractor	--	--	--	--	0.6	0.6	0.7	0.6	0.6	0.6	0.7	0.6
auto & blower	--	--	--	--	0.9	0.4	0.7	0.7	0.9	0.4	0.7	0.7
tractor & blower	--	--	--	--	0.4	--	0.5	0.4	0.4	--	0.5	0.4
chopper	--	--	--	--	0.3	--	0.8	0.6	0.3	--	0.8	0.6
Baler:												
hired	0.4	0.4	0.4	0.4	0.6	0.5	0.5	0.5	1.0	0.9	0.9	0.9
owned:												
1-man	0.4	0.5	0.3	0.4	0.5	0.5	0.4	0.5	0.9	1.0	0.7	0.9
3-man	0.4	0.4	0.4	0.4	0.3	0.4	0.4	0.4	0.7	0.8	0.8	0.8
4-man	0.5	--	0.6	0.6	0.2	--	0.4	0.3	0.7	--	1.0	0.9
stationary	--	0.6	0.6	0.6	--	0.4	0.4	0.4	--	1.0	1.0	1.0
Pitched on by hand	--	--	--	--	1.3	1.1	1.3	1.2	1.3	1.1	1.3	1.2
Field chopper	--	--	--	--	--	--	0.4	0.4	--	--	0.4	0.4

TABLE 15. ACREAGE OF FIRST-CUTTING HAY AT ONE TIME WHEN THE COMMON METHODS OF HAY HARVESTING WERE USED

412 Farms in Three Areas of New York, 1945

Method	Acreage Cut at One Time			
	Eastern	Central	Western	Average
Loader:				
wagon	4.3	4.3	4.7	4.4
truck	6.1	4.0	5.1	5.1
truck & wagon	7.9	6.5	5.4	6.6
Buckrake:				
auto	3.6	3.4	4.4	3.8
tractor	4.1	4.4	4.8	4.4
auto & blower	3.3	5.0	6.9	5.1
Baler:				
hired	5.4	7.0	8.6	7.0
owned:				
1-man	6.3	7.5	10.5	8.1
3-man	6.2	6.5	7.2	6.6
4-man	4.5	--	7.2	5.8
Pitched on by hand	3.3	1.6	4.4	3.1

TABLE 16. AMOUNT OF LABOR[1] USED IN MOVING FIRST-CUTTING HAY FROM WINDROW TO STORAGE BY VARIOUS METHODS

412 Farms in Three Areas of New York, 1945

Method	Man hours of labor per ton for:											
	Baling				Hauling and Storing				Both			
	Eastern	Central	Western	Average	Eastern	Central	Western	Average	Eastern	Central	Western	Average
Loader:												
wagon	--	--	--	--	3.0	2.6	2.5	2.7	3.0	2.6	2.5	2.7
truck	--	--	--	--	2.3	2.8	2.8	2.6	2.3	2.8	2.8	2.6
truck & wagon	--	--	--	--	2.3	3.0	3.3	2.9	2.3	3.0	3.3	2.9
chopper	--	--	--	--	2.7	1.8	3.3	2.6	2.7	1.8	3.3	2.6
blower	--	--	--	--	--	--	2.4	2.4	--	--	2.4	2.4
Buckrake:												
auto	--	--	--	--	2.2	2.3	1.9	2.1	2.2	2.3	1.9	2.1
tractor	--	--	--	--	1.2	1.6	1.7	1.5	1.2	1.6	1.7	1.5
auto & blower	--	--	--	--	1.6	0.8	1.7	1.4	1.6	0.8	1.7	1.4
tractor & blower	--	--	--	--	0.8	--	1.4	1.1	0.8	--	1.4	1.1
chopper	--	--	--	--	1.1	--	1.9	1.5	1.1	--	1.9	1.5
Baler:												
hired	--	0.1	0.2	0.1	1.7	1.6	1.7	1.7	1.7	1.7	1.9	1.8
owned:												
1-man	0.5	0.7	0.5	0.6	1.5	1.8	1.2	1.5	2.0	2.5	1.7	2.1
3-man	1.1	1.1	1.2	1.1	1.2	1.2	1.4	1.3	2.3	2.3	2.6	2.4
4-man	1.7	--	2.2	2.0	0.8	--	1.2	1.0	2.5	--	3.4	3.0
stationary	--	2.7	2.5	2.6	--	0.9	0.9	0.9	--	3.6	3.4	3.5
Pitched on by hand	--	--	--	--	3.4	4.0	3.4	3.6	3.4	4.0	3.4	3.6
Field chopper	--	--	--	--	--	--	1.4	1.4	--	--	1.4	1.4

1/ The labor furnished by the operator of a hired baler is not included.

Cost of labor used:

The lowest labor costs were associated with the use of field choppers and various buckrake combinations, table 17. The cost for the auto buckrake and blower combination is probably unduly low, as it was greatly affected by the low figure in Cortland County where only four fields were harvested in this manner. The low field chopper costs reflected the high rate of performance.

The highest labor cost methods were pitching loose hay by hand and the use of a stationary baler. The labor costs associated with pickup balers were a little lower than those associated with most loader combinations.

Cost of Power and Equipment

In general, the power and equipment costs where the loader and buckrake combinations were used fell below those where balers or field choppers were employed, table 18. Except for stationary balers the highest cost for owned equipment was associated with the use of field choppers. Two tractors, one at the barn and one pulling the chopper were usually needed with this method. In addition, the fixed costs were high because of the high investment required and the relatively few hours of use. The field chopper typifies one choice that a farmer can make; he may buy equipment and reduce his labor costs, or he may choose to use more labor and hold down his equipment costs.

Although little equipment was needed when the hay was pitched on by hand, equipment costs were not reduced below those for loaders or buckrakes. The rate of performance was so low that equipment and power were in use a relatively long time per ton. The tonnage handled by this method was so low that fixed costs were not reduced.

When balers were used most of the power and equipment costs were incurred in the field operations, because the bales were commonly unloaded by hand at the barn. For other methods a larger share of the costs were for power and equipment at the barn.

All Costs; First Cutting

It should be remembered that the total costs presented in table 19 are applicable only to 1945. Costs will vary from year to year depending upon wage rates, yields, and weather and to some degree upon changes in the costs of power and machinery.

TABLE 17. COST OF LABOR[1] USED IN MOVING FIRST-CUTTING HAY FROM WINDROW TO STORAGE BY VARIOUS METHODS

412 Farms in Three Areas of New York, 1945

Method	Cost of labor per ton for:[2] Baling				Hauling and Storing				Both			
	Eastern	Central	Western	Average	Eastern	Central	Western	Average	Eastern	Central	Western	Average
Loader:												
wagon	--	--	--	--	$1.63	$1.33	$1.47	$1.48	$1.63	$1.33	$1.47	$1.48
truck	--	--	--	--	1.24	1.41	1.48	1.38	1.24	1.41	1.48	1.38
truck & wagon	--	--	--	--	1.29	1.55	1.80	1.55	1.29	1.55	1.80	1.55
chopper	--	--	--	--	1.55	0.80	1.95	1.43	1.55	0.80	1.95	1.43
blower	--	--	--	--	--	--	1.27	1.27	--	--	1.27	1.27
Buckrake:												
autc	--	--	--	--	1.05	1.17	0.92	1.05	1.05	1.17	0.92	1.05
tractor	--	--	--	--	0.73	0.79	1.01	0.84	0.73	0.79	1.01	0.84
auto & blower	--	--	--	--	0.77	0.30	0.81	0.63	0.77	0.30	0.81	0.63
tractor & blower	--	--	--	--	0.44	--	1.15	0.80	0.44	--	1.15	0.80
chopper	--	--	--	--	0.59	--	0.96	0.76	0.59	--	0.96	0.76
Baler:												
hired[1]	$0	$0.09	$0.12	$0.07	0.91	0.92	0.93	0.92	0.91	1.01	1.05	0.99
owned:												
1-man	0.31	0.34	0.27	0.31	0.89	0.85	0.67	0.80	1.20	1.19	0.94	1.11
3-man	0.55	0.63	0.72	0.63	0.58	0.65	0.83	0.69	1.13	1.28	1.55	1.32
4-man	0.78	--	1.19	0.99	0.35	--	0.65	0.50	1.13	--	1.84	1.49
stationary	--	1.29	1.25	1.27	--	0.53	0.45	0.49	--	1.82	1.70	1.76
Pitched on by hand	--	--	--	--	1.89	1.80	1.69	1.79	1.89	1.80	1.69	1.79
Field chopper	--	--	--	--	--	--	0.77	0.77	--	--	0.77	0.77

1/ The cost of labor furnished by the operator of a hired baler is not included. Labor costs in this case could not be separated from the charge for the baler.

2/ The man hours per ton multiplied by the cost of labor per hour may differ slightly from the labor cost per ton. The man hours and labor cost per ton is weighted by the number of tons while the cost of labor per hour is a simple average.

TABLE 18. COST OF POWER AND EQUIPMENT PER TON OF FIRST-CUTTING HAY MOVED FROM WINDROW TO STORAGE BY VARIOUS METHODS

412 Farms in Three Areas of New York, 1945

Method	Cost of power and equipment per ton			
	Eastern	Central	Western	Average
Loader:				
wagon	$1.07	$1.12	$1.20	$1.13
truck	0.80	0.76	1.06	0.87
truck & wagon	0.95	0.93	1.12	1.00
chopper	1.25	1.19	1.56	1.34
blower	--	--	1.55	1.55
Buckrake:				
auto	1.16	1.02	1.15	1.11
tractor	1.19	0.75	0.91	0.95
auto & blower	1.32	0.61	1.34	1.09
tractor & blower	0.62	--	0.45	0.53
chopper	1.20	--	1.54	1.37
Baler:				
hired	4.69 1/	3.96 2/	3.87 3/	4.17 4/
owned:				
1-man	2.20	3.30	1.60	2.37
3-man	1.40	1.51	1.58	1.50
4-man	1.82	--	2.10	1.96
stationary	--	3.51	2.79	3.15
Pitched on by hand	1.16	1.51	1.25	1.31
Field chopper	--	--	2.63	2.63

1/ Includes a custom charge of $4.45 for hired baling.
2/ Includes a custom charge of $3.62 for hired baling.
3/ Includes a custom charge of $3.56 for hired baling.
4/ Includes a custom charge of $3.88 for hired baling.

TABLE 19. TOTAL COST PER TON TO MOVE FIRST-CUTTING HAY FROM WINDROW TO STORAGE BY VARIOUS METHODS

412 Farms in Three Areas of New York, 1945

Method	Total cost per ton			
	Eastern	Central	Western	Average
Loader:				
wagon	$2.70	$2.45	$2.67	$2.61
truck	2.04	2.17	2.54	2.25
truck & wagon	2.24	2.48	2.92	2.55
chopper	2.80	1.99	3.51	2.77
blower	--	--	2.82	2.82
Buckrake:				
auto	2.21	2.19	2.07	2.16
tractor	1.92	1.54	1.92	1.79
auto & blower	2.09	0.93	2.15	1.72
tractor & blower	1.06	--	1.60	1.33
chopper	1.79	--	2.50	2.13
Baler:				
hired	5.60	4.97	4.92	5.16
owned:				
1-man	3.40	4.49	2.54	3.48
3-man	2.53	2.79	3.13	2.82
4-man	2.95	--	3.94	3.45
stationary	--	5.33	4.49	4.91
Pitched on by hand	3.05	3.31	2.94	3.10
Field chopper	--	--	3.40	3.40

The costs among different farms within methods showed more variation than did average costs among methods. A highly efficient operator using nearly any method will have lower costs than will a less efficient operator using some other method.

Variations in the methods of loading in the field or of unloading at the barn may have some effect on the cost. For example, mechanical unloading devices probably will influence the rate of performance and therefore the cost of unloading baled hay. Trailing a wagon behind the baler may have some effect on costs. The authors recognize that information on these variations is desirable. It is expected that such points will be analyzed in a more thorough and complete report to be prepared later.

In general, buckrake costs were lower than the costs when other methods were used. It was more expensive to hire baling done than to do it with one's own equipment. On the other hand the average farmer who hired a baler, unless he could do additional baling, could not have bought and maintained a baler of his own as cheaply as he could hire the work done.

The cost when hay was pitched by hand was higher than the average for all methods. Yet it is quite possible that this may be the best method for those farmers who have little hay.

The cost when field choppers were used was relatively high. There were too few cases to supply definite information, but high equipment costs apparently more than offset fast performance and low labor costs.

Second Cutting

Many farmers did not make a second cutting of hay. Many of those who did cut only one or two fields. As a result many of the data on the second cutting lack significance, table 20.

In general, it cost more to move a ton of second cutting hay from the windrow to storage than it did to move hay from the first cutting. The low yield and the small acreage of the second cutting caused most of the difference.

Differences in costs of handling the first and second cutting did not affect the over-all cost per ton very much. The highest percentage of the total hay crop obtained in any area from the second cutting was 15 percent in Western New York. Therefore the first cutting costs approximated the average for both cuttings.

TABLE 20. TOTAL COST PER TON TO MOVE SECOND-CUTTING HAY FROM WINDROW TO STORAGE BY VARIOUS METHODS

412 Farms in Three Areas of New York, 1945

Method	Number of fields and total cost per ton						
	Eastern		Central		Western		Average
	No. of fields	Cost per ton	No. of fields	Cost per ton	No. of fields	Cost per ton	Cost per ton
Loader:							
wagon	12	$3.89	31	$2.71	50	$3.28	$3.29
truck	7	2.22	21	2.31	38	2.85	2.46
truck & wagon	3	1.53	1	1.33	2	3.80	2.22
chopper	2	3.50	--	--	4	4.10	3.80
blower	--	--	--	--	8	2.40	2.40
Buckrake:							
auto	1	3.00	19	2.38	27	2.66	2.68
tractor	1	6.00	4	1.85	15	2.80	3.55
auto & blower	1	1.50	--	--	31	2.35	1.93
chopper	--	--	--	--	3	4.42	4.42
Baler:							
hired	3	4.78	5	4.90	21	5.10	4.93
owned:							
1-man	30	4.42	5	3.30	42	2.65	3.46
3-man	9	3.27	16	3.12	63	3.46	3.28
4-man	3	3.66	--	--	53	4.14	3.90
stationary	--	--	1	5.00	3	5.22	5.11
Pitched on by hand	11	3.44	3	1.21	29	3.12	2.59
Field chopper	--	--	--	--	6	2.77	2.77

RAIN DAMAGE

Wet weather through much of the summer of 1945 was a severe handicap to hay harvesting. It caused heavy spoilage and a higher-than-normal damage not only by wetting hay in the swathe, windrow, or bale but also on many farms by delaying harvest past the time when best quality hay could be cut.

The damage was heavy throughout the State, but it was heaviest in the Western area where farmers reported 39 percent of their first-cutting hay was damaged. The percentage damaged gradually declined as one travelled eastward until in Washington County it was down to 30 percent, table 21.

The rain damage on the second cutting was much less than on the first. Although there were too few cases under most methods to establish meaningful percentages of damage for the second cutting, the over-all damage was only about 14 percent on this cutting, table 22. A majority of the farmers interviewed in all areas reported some damage to their first-cutting hay. On the other hand a majority of those who made a second cutting escaped damage to this part of the crop.

Part of the reason for the differences between cuttings was due to more favorable weather at the time of the second cutting. The lighter yield in the second cutting may also have required less time to cure in the field.

Such a small percentage of the total crop was obtained on the second cutting, except in Western New York where 15 percent of the crop was second-cutting hay, that the comparatively light damage to the later cutting had little influence on the percentage of the entire crop that was damaged. This percentage ranged from 29 percent in Eastern New York to 35 percent in both the Central and Western areas. Most of the differences in the percentages of damage shown when the methods are compared probably are not significant.

In each area, but especially in Eastern New York, the highest percentage of rain damage was reported on the farms with small hay enterprises, table 23.

Similar studies for the 1944 season on farms in Livingston and Cortland counties showed that 32 percent of the first-cutting hay was damaged in Livingston and 16 percent in Cortland County. The summer of 1944 was more favorable to haymaking than was the summer of 1945, but these figures, although on a smaller group of farms, indicate that rain damage is a problem even in favorable years.

No effort was made in the present study to evaluate these losses in monetary terms. It is evident, however, that rain damage is an important factor to consider in making hay, and that any opportunity to reduce this hazard should be carefully explored.

TABLE 21. PERCENTAGE OF FIRST-CUTTING HAY HARVESTED BY VARIOUS METHODS THAT WAS DAMAGED BY RAIN

412 Farms in Three Areas of New York, 1945

Method Used	Eastern		Central		Western		State
	No. of farms	Percentage damaged	No. of farms	Percentage damaged	No. of farms	Percentage damaged	Percentage damaged
Loader-wagon	19	23	38	34	63	37	31
Loader-truck	11	16	16	27	37	33	25
Loader-chopper	3	22	1	78	12	38	46
Loader-blower	--	--	--	--	9	31	31
Auto buckrake	5	45	30	41	31	41	42
Tractor buckrake	2	29	7	38	12	40	36
Buckrake-chopper	2	45	--	--	13	60	52
Buckrake-blower	3	17	1	33	26	47	32
Hired baler	11	29	12	22	47	37	29
One-man baler	12	37	9	35	25	42	38
Three-man baler	9	36	15	46	29	39	40
Four-man baler	2	36	--	--	33	40	38
Stationary baler	--	--	5	11	6	31	22
Field chopper	--	--	--	--	7	30	30
Loaded by hand	9	40	5	0	29	30	23
All methods	64 1/	30	97 1/	36	251 1/	39	35

1/ Because more than one method was employed on some farms, the number of farms does not total to the number of farms studied in the area.

TABLE 22. PERCENTAGES OF SECOND-CUTTING HAY[1] HARVESTED BY VARIOUS METHODS THAT WAS DAMAGED BY RAIN

412 Farms in Three Areas of New York, 1945

Method Used	Eastern		Central		Western		State
	No. of farms	Percentage damaged	No. of farms	Percentage damaged	No. of farms	Percentage damaged	Percentage damaged
Loader-wagon	9	0	20	13	39	15	9
Loader-truck	4	0	8	12	27	15	9
Loader-chopper	1	0	--	--	2	0	0
Loader-blower	--	--	--	--	3	0	0
Auto buckrake	2	0	12	9	16	0	3
Tractor buckrake	1	100	2	20	5	17	46
Buckrake-chopper	--	--	--	--	4	0	0
Buckrake-blower	1	100	--	--	18	13	56
Hired baler	2	17	3	39	18	26	27
One-man baler	10	7	3	0	19	20	9
Three-man baler	6	28	9	18	23	8	18
Four-man baler	--	--	--	--	20	15	15
Stationary baler	--	--	1	0	2	0	0
Field chopper	--	--	--	--	5	0	0
Loaded by hand	6	21	2	50	20	2	24
All Methods	40[2]	16	54[2]	14	194[2]	12	14

1/ Includes a very few fields on which a third cutting was made.

2/ Because more than one method was employed on some farms, the number of farms does not total to the number of the farms on which a second cutting was made.

TABLE 23. PERCENTAGE OF HAY HARVESTED IN BOTH CUTTINGS THAT WAS DAMAGED BY RAIN BY SIZE-OF-HAY-ENTERPRISE GROUP

412 Farms in Three Areas of New York, 1945

Size of hay enterprise	Eastern		Central		Western		All Areas
	No. of farms	Percentage damaged	No. of farms	Percentage damaged	No. of farms	Percentage damaged	Percentage damaged
Small 1/	16	45	28	38	90	39	41
Medium 2/	29	26	34	35	94	37	33
Large 3/	19	27	35	34	67	32	31
All	64	29	97	35	251	35	33

1/ Less than 70 tons. 2/ 70-120 tons. 3/ Over 120 tons.

OPERATORS' EVALUATION OF THEIR METHODS

Each farmer was asked during the interview the advantages and disadvantages of his method in comparison with other methods of harvesting hay. The replies of those farmers who used the common methods are summarized in table 24. This table differs from other tables in this report in that all replies are totalled and the averages are not simple averages of the figures by areas. It was thought that an advantage or a disadvantage of using a machine would be less influenced by geographic location and by local custom than would other factors such as size or composition of the haying crew. An area-by-area comparison of the data supported this belief, for there was marked similarity in the farmers' appraisal of the chief advantages and disadvantages of the various methods in all areas.

The low investment required with loaders and wagons was selected by farmers in each area as the outstanding advantage of this method. The chief differences between users of wagons and trucks with loaders were in the belief of truck users that their method saved labor and was better adapted to long hauls. The disadvantage cited by the greatest number of users of both methods was excessive labor requirements. Between one-fourth and one-third of each group were planning to change methods. About one-fifth in each group expected to secure a pick-up baler, usually a one-man machine.

TABLE 24. OPERATORS' STATEMENTS OF ADVANTAGES AND DISADVANTAGES OF THEIR METHODS OF HARVESTING HAY AND THEIR INTENDED CHANGES IN METHOD 1/

412 Farms in Three Areas of New York, 1945

Advantage, disadvantage, and change planned	Percentage of farmers using each method who mention specified advantage, disadvantage, or change planned in method								
	Loader and wagon, 73 using	Loader and truck, 53 using	Auto buckrake, 54 using	Tractor buckrake, 20 using	Buckrake and blower, 25 using	One-man baler, 45 using	Three-man baler, 48 using	Four-man baler, 31 using	Pitch on by hand, 28 using
Advantage:									
"Saves labor"	19	34	81	70	52	62	52	42	7
"Use family labor"	15	11	30	25	20	22	10	19	21
"Lighter work"	5	6	40	45	32	56	40	29	0
"Lower investment"	31	26	43	35	12	2	4	3	36
"Low cash expense"	4	6	7	15	16	9	4	3	0
"Suited to farm topography"	5	11	15	5	0	2	2	0	4
"Suited to hauling distance"	7	30	17	15	16	9	10	32	7
"Feeding"	12	8	13	0	8	44	50	45	0
Disadvantage:									
"Wastes labor"	28	17	4	5	0	0	6	6	21
"Heavy work"	7	2	0	0	0	0	2	3	14
"Distance to storage"	3	0	0	0	4	0	0	0	0
"High investment"	0	0	0	0	0	2	0	0	0
"High cash expense"	1	0	0	0	0	2	0	0	0
"Topography"	0	0	0	0	4	2	2	0	0
"Feeding"	3	0	0	0	0	0	0	0	0
Plan a change to:									
Loader	--	--	4	0	0	0	2	0	21
Buckrake	1	8	--	--	0	0	0	0	0
Pickup baler	20	19	13	10	12	0	15	45	14
Field chopper	1	4	0	0	4	0	4	0	4
Blower	4	0	6	10	--	0	0	0	0
Stationary chopper	0	0	2	0	0	0	0	0	0
Total planning change	26	31	25	20	16	0	21	45	39

1/ Only methods used by 20 or more of the farmers interviewed are included.

The outstanding advantage of the buckrake, either the auto or the tractor type, was in the opinion of the operators the saving in labor. At least 60 percent of the buckrake users in each area mentioned this point. Few disadvantages were mentioned, but about one-tenth of each group planned to change to pick-up balers, and about an equal number expected to make some other shift.

Operators using a blower with a buckrake stressed the saving in labor. Apparently eliminating the work of mowing hay away was in the minds of these farmers. About one-eighth of the men using a buckrake and blower planned to secure a pickup baler.

In every area farmers using pickup balers emphasized that these machines eased the work load and that they preferred to feed baled hay. The farmers who were using one-man balers seemed satisfied as few had specific disadvantages in mind and none were planning a change in method except to obtain additional equipment such as bale elevators. On the other hand about one-fifth of the farmers using three-man balers and almost one-half of those with four-man outfits were planning a change in method. A majority of these changes involved the acquisition of a one-man baler.

The advantage most frequently mentioned by farmers who pitched the hay onto the wagon by hand was the low investment in equipment. All disadvantages mentioned by these men involved labor requirements. Almost two-fifths of these operators expected to change methods, one-fifth to loaders and one-seventh to balers.

There were only six field chopper operators among the farmers interviewed and all were in Western New York. Three of these farmers said that a field chopper saved labor and four preferred to feed chopped hay. One man thought the investment required was too high. One operator of a field chopper expected to obtain a baler.

If these changes are effected, 65 of the 412 farmers will change to pickup balers, and 31 others will make some change in method. If this shift is representative of the general situation in New York, many more farmers will soon have balers; there may be fewer custom baling jobs remaining to be done, and the competition among owners of pickup balers for custom work is likely to become more intense.

CONCLUSIONS

The data obtained in this study show that in 1945 the total cost of moving a ton of hay from windrow to storage ranged from about $2.00 when buckrakes were used to about $5.00 when hay was custom baled. Features peculiar to the individual farm may offset any advantage or disadvantage arising from the comparative costs of the different areas.

Few important differences among areas were discovered. These were confined chiefly to differences in the size and composition of the labor force, in the cost of operating a few pieces of equipment, especially one-man balers, and in the charge for custom baling.

Damage resulting from rain was one of the most serious problems facing farmers in 1945 and it was important in 1944, even in areas where less than normal rainfall occurred. Little evidence was discovered as to the relative damage when different methods were used.

Because there is no one way to harvest hay that is best for all farms, perhaps the following conclusions based on analysis of the statistical data obtained in the study, the farmers' appraisal of their methods, and the impressions gained by the interviewers in their contacts with the farmers may be of assistance to farmers who are considering which method to use.

The loader and wagon method is adapted to moderate hauling distances and to considerable use of family labor. Greater speed on the longer hauls may be obtained if a truck is substituted for the wagon. The investment is low, but considerable hard work is required both in loading and in the mow. The cost of putting up hay by this method is likely to be less than if the baler is used, but there is often much work required to untangle the hay preparatory to feeding. A loader and truck or wagon is the most commonly used method and may be used under widely varying conditions.

If the barn is strongly built and if mow space is limited, the hay may be run through an ensilage cutter and the chopped hay blown into the barn. This method may require special carts or barn arrangements if feeding is to be efficient.

The buckrake is best adapted to those farms where most of the fields are relatively close to the barn and are accessible by means of wide, smooth lanes. If a car buckrake is to be used, it should be built on a truck or heavy automobile chassis in order to support a sufficiently large load for efficient operation. The lifting mechanism should be powerful and speedy in action, else too much