Harvesting the Corn Crop in Illinois

An Economic Study of Methods and Relative Costs

By P. E. Johnston and K. H. Myers

UNIVERSITY OF ILLINOIS
AGRICULTURAL EXPERIMENT STATION
BULLETIN 373

In cooperation with Division of Farm Management and Costs, Bureau of Agricultural Economics, U. S. Department of Agriculture

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Urbana, Illinois September, 1931

Publications in the Bulletin series report the results of investigations made or sponsored by the Experiment Station

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By P. E. Johnston and K. H. Myers[1]

INTRODUCTION

CORN is the most important crop grown in Illinois both in acreage and in value. It returns a greater income and produces a greater amount of feed per acre than any other field crop extensively grown in the state. Its relative importance in the rotation varies in different parts of the state, but it usually occupies from 25 to 50 percent of the crop land. It is uniformly grown as extensively as possible, considering the maintenance of soil fertility, the efficient use of available labor, and the farm requirements for legume roughage and other supplementary feeds. In Champaign and Piatt counties in 1929, 57.7 percent of all the man labor spent on crops was spent in growing and harvesting the corn crop.

Probably the largest single operation that must be performed on Illinois farms is the harvesting of the corn crop. With the rapid development of labor-saving machinery the question of the relative cost and advantages of various methods of harvesting has been raised on many farms. The presence of the European corn borer in the corn belt has also laid additional stress on methods of corn harvesting, for the control of this insect is intimately connected with the disposal of the cornstalks and corncobs. These developments make the following study of particular interest at this time.

Purpose of Study. Four methods of harvesting the corn crop are common in Illinois: (1) husking from the standing stalk either by hand or with a mechanical husker; (2) cutting for silage either with a stationary cutter or a field harvester; (3) cutting and shocking and husking by hand or by machine or feeding as whole fodder; (4) feeding off with hogs, cattle, or sheep. The purpose of this study was to ascertain the relative costs of the first three methods, especially in terms of quantities of labor, power, equipment, and materials, and the relative advantages of the different methods under different conditions.

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Corn the Basis of Illinois Farming Systems. Illinois is one of the leading states in the acreage, production, and value of corn. During the five years 1924-1928 the estimated area in corn in Illinois was 9,117,000 acres, which is equal to 45.2 percent of the estimated acreage of all crop land.[1] During the same period oats were grown on 22.3 percent of the crop land, wheat on 10.9 and hay on 16.4 percent.

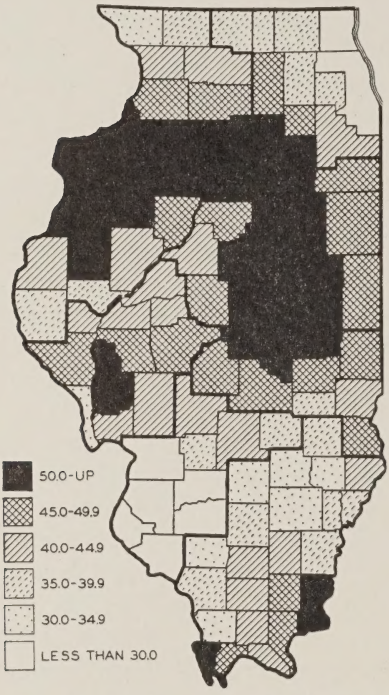

FIG. 1.—PERCENTAGE OF HARVESTED CROP LAND IN CORN IN 1929 (U. S. Census)

Soil and climatic conditions are most favorable for corn production thruout the central and north-central parts of the state. In the central part corn was grown on more than 50 percent of the harvested crop land in 1929 (Fig. 1). The acreage was less in both the southern and northern parts of the state. In only eight counties, however, was the acreage less than 30 percent of the total harvested crop land.

During the period 1924-1928 the gross value of the corn grown was equal to 51.9 percent of the farm value of all crops produced in Illinois (Table 1). Income from the sale of corn, however, made up only 19 percent of the cash farm income. Corn is primarily a feed crop in Illinois, 60 to 65 percent being marketed thru livestock or used for work stock. The sale of livestock and livestock products amounted to 57.6 percent of the total cash income during 1924-1928.

In the east-central part of the state nearly two-thirds of the corn crop is shipped out of the county where grown. In the western, a heavy corn-producing area, less than 20 percent is shipped out of the county and a great deal of this is fed in nearby areas. Whether marketed direct or thru livestock, however, corn is the crop upon which systems of farming in nearly all parts of Illinois are based.

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[1]U.S. Dept. Agr. Yearbook, 1931, p. 975.

TABLE 1.—GROSS FARM VALUE AND CASH INCOME FROM FARM PRODUCTION IN ILLINOIS
(Average, 1924-1928)[1]

Crops	Gross value		Cash income	
	Value	Percent	Value	Percent
	thousands		*thousands*	
Corn	$257 370	51.9	$102 235	45.8
Oats	59 615	12.0	27 601	12.4
Wheat	45 267	9.1	37 655	16.8
Barley	7 604	1.5	3 077	1.4
Hay	56 844	11.5	10 353	4.6
Other crops	69 209	14.0	42 499	19.0
All crops	495 909	100.0	223 420	100.0
All livestock	353 515	.....	303 047	.....

[1]Estimates of Bureau of Agricultural Economics, U. S. Department of Agriculture.

Methods of Harvesting. The method of harvesting the corn crop in an area, or on the individual farm, depends largely upon the type of livestock produced. In Illinois in 1929,[1] 90.7 percent of the corn crop was harvested for grain, most of it being husked from standing stalks; 2.8 percent was cut for silage; 3.3 percent was cut for fodder; and 3.2 percent was harvested by livestock. The extent to which these different methods are used, however, varies greatly in different sections of the state. In the Chicago dairy area 17 percent of the corn grown was cut for silage and 9 percent was cut for fodder. In the grain-surplus region of east-central Illinois 97 percent of the corn grown was husked from standing stalks. In west-central Illinois 7.3 percent of the crop was harvested by livestock.

Ear-corn silage has been used to a limited extent in Illinois, usually in seasons when considerable soft corn must be utilized to best advantage. With this method the ears are snapped in the field and cut into small pieces with the ensilage cutter. Tests at the Illinois Agricultural Experiment Station[2] have shown that late corn handled in this way may be just as valuable, on the dry-matter basis, to the cattle feeder as mature corn which is husked and cribbed.

Control of European Corn Borer. The European corn borer is known to have spread during the past ten years over nearly all of Ohio, Michigan, and a large part of Indiana. Specimens have been found within 15 miles of the eastern boundary of Illinois. In the event that farmers are forced to use control methods against the insect in order to prevent excessive reductions in corn yields, the particular methods they adopt will depend on the way they decide to harvest their corn.

[1]U. S. Census. [2]The utilization of soft corn in beef cattle feeding. Ill. Agr. Exp. Sta. Bul. 313. 1928.

Control measures recommended by the Bureau of Entomology, United States Department of Agriculture, consist of completely utilizing or destroying the entire corn plant by feeding to livestock, burning, or plowing under.[1]

Since low cutting of corn is an effective measure of control, little additional labor is necessary where corn is cut for silage or fodder. More labor will be required to dispose of the refuse where corn is husked from standing stalks.

Relative Importance of Harvesting Operation in the Production of Corn. The relatively large amounts of labor required per acre in growing corn and the large acreages grown on corn-belt farms make a great volume of work that must be performed in a comparatively short time when corn is husked from standing stalks. Much of this work is now done by transient labor.

The amount of labor required in harvesting the corn crop varies greatly with the method used. In the east-central Illinois study[2] an average of 5.23 hours of man labor an acre was used in husking corn by hand from standing stalks, as compared with a total of 13.5 hours used in growing and harvesting the crop. In southwestern Illinois[3] cutting and shocking required 12 hours of man labor an acre, as compared with 25.3 hours in growing and harvesting. Thus hand husking required about 40 percent of the total man labor used in producing the crop; while in cases where the corn was made into silage or cut and shocked for fodder, the labor required made up about 50 to 60 percent of the total.

The greater amount of labor used in making silage or cutting for fodder may be raised as an objection to these methods of harvesting. The greater amount of feed produced per acre, however, when profitably utilized more than offsets the increased cost. In some parts of the corn belt a further reason for cutting corn is to make possible the seeding of winter wheat on the corn ground. The European corn borer may also prove a factor in favor of this method.

HUSKING BY HAND FROM STANDING STALKS

Husking corn by hand from standing stalks is the most common method of harvesting in Illinois. It has always been the standard

[1]For details concerning the the European corn borer and control methods, see Illinois Circular 321, "Learning to Live With the European Corn Borer," and U. S. Dept. Agr. Farmers' Bulletin 1548, "The European Corn Borer, Its Present Status and Methods of Control."

[2]Champaign and Piatt counties, 1920-1928.

[3]Clinton county, 1926-1928.

method where only the grain was to be harvested. There are few farms on which at least part of the corn acreage is not husked from the standing stalks by hand or, in recent years, by the mechanical corn husker.

Time When Husking Is Done

Hand husking is started in the fall as soon as the corn is dry enough to crib, usually soon after the middle of October in central Illinois. During nine years, 1920-1928, on a group of representative farms in Champaign and Piatt counties, 13.3 percent of all labor in hand husking was done during October, 60.6 percent in November, 20.4 percent in December, and 5.7 percent in January or later (Table 2). This distribution varied from farm to farm and from

TABLE 2.—SEASONAL DISTRIBUTION OF MAN LABOR IN HUSKING CORN BY HAND: CHAMPAIGN AND PIATT COUNTIES, EAST-CENTRAL ILLINOIS

Year	Proportion of total man labor used in—			
	October	November	December	January or later
	perct.	*perct.*	*perct.*	*perct.*
1920	5.4	89.5	5.1	....
1921	40.9	52.4	6.7	....
1922	20.7	57.9	21.4	....
1923	9.6	73.9	15.2	1.3
1924	1.4	75.1	16.4	7.1
1925	13.3	58.5	27.6	.6
1926	1.3	45.0	44.0	9.7
1927	1.9	43.5	28.2	26.4
1928	28.0	68.4	3.6	....
Average 1920-1928	13.3	60.6	20.4	5.7

year to year. In 1920 nearly 90 percent was completed during November, while in 1927 only 43.5 percent was done during that month. In the latter year a late frost and heavy rainfall during November resulted in more than 26 percent of the acreage being left to be done after the first of the year. The amount completed by December 1 ranged from 45.4 percent to 96.4 percent, depending largely on weather conditions. The usual practice is to complete the husking by December 1 if possible.

Variations in Labor and Equipment With Area and Season

The amount of man labor, horse labor, and equipment used in husking corn varies a great deal in different areas (Table 3). Much of this regional variation is due to the yield, type, and quality of corn. In Clinton county, southwestern Illinois, where corn is not so important a crop as in the other areas and where the yield per acre is much lower, the amount of labor used per acre is high. A part of the variation is due to differences in kind of labor used and method followed.

In this area it is a common practice for two men to husk in each wagon, a practice which slows up perceptibly the rate of husking per man.

While corn husking comes at a season when no work is necessary on other crops, a large part of the labor used is necessarily hired (Table 4). In west-central Illinois in Knox and Warren counties, a

TABLE 3.—HOURS OF LABOR AND EQUIPMENT USED IN HUSKING CORN BY HAND IN VARIOUS PARTS OF ILLINOIS

	East-central Illinois[1]	West-central Illinois[2]	Southwestern Illinois[3]
Yield of corn per acre, bushels	48.80	51.80	28.60
Man labor per acre, hours	5.23	6.06	8.40
Horse labor per acre, hours	10.19	11.67	11.86
Wagon use per acre, hours	5.10	5.84	5.93
Total man labor used in growing and harvesting an acre of corn, hours	13.50	14.80	21.79

[1]Champaign and Piatt counties, 1920-1928; data on 11,945 acres. [2]Knox and Warren counties, 1923-1925; data on 4,022 acres. [3]Clinton county, 1926-1928; data on 1,086 acres.

TABLE 4.—KIND OF LABOR USED IN HUSKING CORN BY HAND IN ILLINOIS

Year	Champaign and Piatt counties, east-central Illinois		Knox and Warren counties, west-central Illinois	
	Proprietor	Hired	Proprietor	Hired
	perct.	*perct.*	*perct.*	*perct.*
1920	20.1	79.9	....	....
1921	39.8	60.2	....	....
1922	47.2	52.8	....	....
1923	21.3	78.7	56.4	43.6
1924	10.9	89.1	59.1	41.0
1925	22.3	77.7	34.2	65.8
1926	38.6	61.4	....	....
1927	42.8	57.2	....	....
1928	21.7	78.3	....	....
Average	30.0	70.0	47.9	52.1

livestock region, family labor made up 47.9 percent of the labor used in hand husking, while in east-central Illinois in Champaign and Piatt counties, a cash grain region, only 30 percent family labor was used.

On most farms enough extra labor is hired to complete all husking in early December if possible. The extra labor hired consists in part of local labor but a large part is transient, particularly in the east-central part of the state, where the acreage of corn is large. In areas where the care of livestock requires a considerable amount of time, shortening the husking day, more hand husking is done by labor hired on a time basis. When the pay is on the bushel basis, there is of course a greater incentive to husk as many bushels as possible in a given time. This fact explains in part the greater amount of man labor used in husking an acre of corn in west-central Illinois as compared with east-central (Table 3).

In each area some variation was shown in the average amounts of labor used in different years in hand husking an acre of corn. These variations were due to differences in acre-yield and to climatic conditions at husking time. In Champaign and Piatt counties there was a definite relation between the amount of labor used per acre, and acre-yield and amount of rainfall recorded in November (Table 5). In 1924, 4.79 hours of man labor were used per acre; in 1921, a year of

TABLE 5.—ANNUAL VARIATION IN AMOUNT OF LABOR USED PER ACRE IN HAND HUSKING, AND ITS RELATION TO RAINFALL: CHAMPAIGN AND PIATT COUNTIES, EAST-CENTRAL ILLINOIS, 1920-1928

	1920	1921	1922	1923	1924	1925	1926	1927	1928
Acres	828	1 257	1 207	1 321	1 348	1 670	1 600	1 501	1 213
Yield of corn per acre, bushels	49.9	49.0	48.3	49.6	42.9	51.3	53.9	44.1	49.5
Man labor per acre, hours	5.26	5.55	5.10	5.23	4.79	5.24	5.30	5.35	5.25
Bushels husked per hour	9.48	8.84	9.46	9.48	8.97	9.84	10.17	8.23	9.43
November rainfall,[1] inches	1.29	4.91	2.30	1.68	.83	2.81	2.46	6.77	1.88

[1]The average November rainfall at Urbana, Champaign county, according to U. S. Dept. Agr. Weather Bureau records, is 2.13 inches.

higher yield and heavier rainfall, 5.55 hours were used. In 1920 the November rainfall was 1.29 inches as compared with 4.91 inches in 1921. The yield per acre was about the same in both years. In the year of heavier rainfall only 8.84 bushels were husked per hour as compared with 9.48 bushels in 1920. The influence of the yield per acre is clearly shown in the year 1926 when with a November rainfall of 2.46 inches, 10.17 bushels were husked per hour. The high yield of 53.9 bushels per acre made the high rate of husking possible. Similar results were found in Knox and Warren counties.

Variations in Labor on Different Farms

The quantities of labor used on individual farms also showed wide variation. One farm in the eastern area used an average of 3.7 hours of labor per acre during a six-year period, while another used an average of 6.56 hours during a three-year period. In Knox and Warren counties the labor used varied from 5.16 hours an acre on one farm during the three-year period to 8.44 hours on another. The amount of labor used per acre increases with the yield but at a slower rate. A yield of 70 bushels an acre enabled the average husker to pick nearly 3 bushels more an hour than where the yield was only 30 bushels (Table 6). This is an important item when hired labor, paid on the bushel basis, is used. Often there is difficulty in securing labor where the yield is lower than the average in the community.

TABLE 6.—RELATION BETWEEN YIELD OF CORN AND AMOUNT OF LABOR USED PER ACRE AND SPEED OF HUSKING: CHAMPAIGN AND PIATT COUNTIES, EAST-CENTRAL ILLINOIS, 1920-1928

Yield per acre	Number of fields	Area	Corn husked per hour	Man labor per acre
bu.		*acres*	*bu.*	*hrs.*
25.0–34.4	36	1 073.2	7.92	4.00
35.0–44.9	93	3 074.9	8.58	4.60
45.0–54.9	149	4 478.6	9.27	5.38
55.0–64.9	85	2 472.8	10.28	5.72
65.0–74.9	29	735.6	10.83	6.23

While variations, similar to those shown in the quantities of man labor used, occurred in the hours of horse labor and in equipment use, little importance need be attached to that fact, since during the husking season there is little demand for horses and equipment for other operations.

Cost of Hand Husking

During the past eight to ten years the rate paid for hand husking has varied from 3 cents a bushel to 6 cents in east-central Illinois. The rate paid during the same season varies from one area to another depending largely on the average yield of corn and on husking conditions. When much of the corn is down, there is a tendency for rates to be higher.

Assuming that 5½ cents a bushel is paid in cash for hand husking, the estimated total cost per bushel in east-central Illinois during 1920

TABLE 7.—COST OF HAND HUSKING IN TWO AREAS IN ILLINOIS[1]

	East-central Illinois, Champaign and Piatt counties 1920-1928	West-central Illinois, Knox and Warren counties 1923-1925
Total acres	11 945	4 022
Total bushels	583 076	208 472
Average yield per acre	48.8	51.8
Bushels husked per hour	9.3	8.5
Acre cost[2]		
Man labor		
Cash	$2.69	$2.85
Board and room	.65	.76
Horse labor	1.43	1.63
Wagon use	.10	.12
Elevator	.24	.26
Total	$5.11	$5.62
Bushel cost[2]		
Man labor		
Cash	$ .055	$ .055
Board and room	.013	.015
Horse labor	.029	.031
Wagon use	.002	.002
Elevator	.005	.005
Total	$ .104	$ .108

[1]Assuming all to be done by hired labor. [2]Man labor at 5½ cents a bushel plus $1 an 8-hour day for board and room, horse labor at 14 cents an hour, wagon use at 2 cents an hour, and elevator use at one-half cent per bushel.

to 1928 was 10.4 cents, and in west-central Illinois, from 1923 to 1925, 10.8 cents (Table 7). An average of 9.3 bushels was husked an hour in the eastern area compared with 8.5 bushels an hour in the western area. This difference in the rate of husking resulted in a slightly higher cost for horse labor and for board and room for hired labor.

MACHINE HUSKING

Development of Mechanical Husker

A machine designed for husking corn from the standing stalks was first made about eighty years ago. The first snapping-roller type of corn husker was made in 1874 and patented in 1884.[1] The development of the corn binder soon after this caused manufacturers to lose interest in the husker, and it was not until 1902 that attention was again turned to its further development. Several machines of the same general type as the present-day husker were soon put on the market. The great expansion in the use of the husker, however, came after 1920, the increased cost of farm labor causing a wider use of labor-saving machinery.

During the past ten to fifteen years the many improvements in type and construction have served to make the huskers more popular with farmers. The early machines were pulled by horses or by a tractor, but the power for operating the husking mechanism was taken from the bull wheel. With unfavorable ground conditions, husking was very unsatisfactory or impossible with these machines. The development of the power-take-off device, whereby the husking mechanism is powered by the tractor pulling the husker, has served to make such machines more successful.

The development of the "wagon hitch" has made it possible for the tractor to pull, in addition to the husker, the wagon into which the husked corn is elevated. This device has practically eliminated one man and team from the husking crew and has increased the speed at which the husker may be operated. Other changes in construction have served to make the machines more efficient.

The two-row husker was first used extensively by farmers in 1928 and has proved quite popular with the operators of large farms.

Manufacturers are giving considerable attention to improvement in corn-husking machinery, and several new machines are being put on the market. Under these competitive conditions, increased efficiency in operation and wider use of machines on Illinois farms may be expected.

[1]Corn-harvesting machinery. U. S. Dept. Agr. Farmers' Bul. 303. 1907.

Area Where Study Was Made

Records of costs and of materials required were obtained in connection with 87 husking machines in 1928 and 111 machines in 1929. Machines of four different types were included in this study:

	1928	1929	Total
One-row huskers			
Power-take-off	41	61	102
Bull-wheel	19	9	28
Motor-mounted	2	2	4
Two-row huskers	25	39	64

The farms on which the records were obtained are located in east-central Illinois, a majority of them within forty miles of Urbana. This area is the cash grain-farming section of Illinois, with corn the principal source of farm income, and is the region where the mechanical husker has the greatest advantage.

Size of Farms Using Mechanical Huskers

The 55 farms where one-row huskers were owned individually by each operator averaged 293 acres; the 29 farms owning two-row machines individually averaged 350 acres (Table 8).

TABLE 8.—ACREAGE IN CORN ON FARMS ON WHICH MECHANICAL CORN HUSKERS WERE USED: EAST-CENTRAL ILLINOIS, 1929[1]

	Farms using one-row huskers		Farms using two-row huskers		Farms using one-row bull-wheel huskers
	Husker owned individually	Husker owned jointly	Husker owned individually	Husker owned jointly	
Number of farms	55	8	29	16	9
Size of farms, acres	293	162	350	201	213
Total crop acreage	258	129	305	182	188
Acres in corn	142	64	166	95	92

[1]In Champaign, Piatt, McLean, DeWitt, Douglas, Moultrie, Ford, Iroquois, and Woodford counties.

Four one-row machines and 9[1] two-row machines were owned jointly by two men each. The average farm where the one-row huskers were owned jointly contained 162 acres; where the two-row machines were owned jointly, 201 acres. The 9 farms where bull-wheel machines were used averaged 213 acres.

There was little difference in the utilization of the land on the farms differing in type of machine used. Corn was grown on 49 to 55 percent of the acreage in crops in each group.

[1]This means that on 18 farms huskers were owned jointly. Table 8 shows only 16 because facts about organization of one farm were not obtained. Similar minor differences in figures occur at several points in this publication.

A relatively small percentage of the total farm income in east-central Illinois comes from the sale of livestock and livestock products, as compared with the rest of the state. This fact has a very direct bearing on the methods of corn harvesting and on methods of saving the corn left in the field by the mechanical husker.

Methods of Harvesting

On farms where mechanical huskers were used, 96.8 percent of all corn was husked from standing stalks, and 71.7 percent was husked by machines. Farms with two-row machines husked a greater part of the crop by machine than farms with one-row huskers (Table 9).

TABLE 9.—METHODS OF HARVESTING CORN ON FARMS WHERE MECHANICAL HUSKERS WERE USED: EAST-CENTRAL ILLINOIS, 1929

Method of harvesting	61 farms with one-row huskers	31 farms with two-row huskers	9 farms with one-row bull-wheel huskers
	acres	*acres*	*acres*
Husked by machine	95.6	137.0	54.2
Husked by hand	44.0	31.0	33.7
Cut for silage	.7	1.9	.7
Hogged or fed off	1.0	1.5	3.3
Cut and shocked	.5	.3	....
Total	141.8	171.7	91.9

On nearly all farms the fields were opened by hand, and on many farms hand huskers were used in addition to the machines. This was particularly true on the larger farms where the acreage in corn was greater than the husker could handle in a reasonable length of time. Some who planned to husk their entire acreage with the mechanical husker were forced by weather conditions to finish by hand.

Only five one-row huskers were used to husk any corn other than that grown on the farm where owned in 1929. Twelve two-row huskers were used for some custom work.

The amount of custom work done with the five one-row machines varied from 4 acres to 90 acres, with an average of 31.2 acres each. That done with the twelve two-row huskers varied from 15 to 170 acres with an average of 60 acres. Custom work increased the average area covered by the one-row machines to 98.2 acres, and by the two-row machines to 155.4 acres. The total area husked by the individually owned one-row machines varied from 32 to 275 acres, with 80 to 119 acres the most common number. The acreage covered by the two-row machines varied from 30 to 338, with 120 to 149 acres the most common number. (For distribution of farms on basis of acreage husked, see Table 19.)

TABLE 10.—ACRES OF CORN HUSKED BY EACH MACHINE AND RATE OF HUSKING: EAST-CENTRAL ILLINOIS, 1928 AND 1929

	One-row huskers		Two-row huskers	
	1928	1929	1928	1929
Number of machines	41	61	25	39
Average number of acres husked with each machine	116	98	164	155
Yield per acre, bushels	44.5	42.0	46.0	44.0
Acres husked per hour	.86	.81	1.27	1.24
Bushels husked per hour	38.4	33.7	59.2	54.3

The acreage husked by both one-row and two-row machines was less in 1929 than in 1928 (Table 10). The average yield per acre was also lower in 1929. Husking conditions were less favorable in 1929 than in the previous season and more time was used per acre. This, combined with lower yields in 1929, resulted in fewer bushels husked per hour. In either year, however, the variation from farm to farm in the rate of husking was large.

Labor and Power Used in Machine Husking

The two-row husker gains its greatest advantage over the one-row machine thru more economical use of labor, power, and materials.

FIG. 2.—TWO-ROW HUSKERS OPERATE WITH LESS MAN LABOR AND POWER COST PER ACRE THAN ONE-ROW MACHINES

In 1928 and 1929 the 102 one-row machines studied were each used, on the average, the same number of hours as the 64 two-row machines. The two-row machines, however, husked an average of 53 acres (2,628 bushels of corn) more than the one-row machines. With the one-row machines an acre of corn was husked in 1.2 hours; with the two-row machines, in .8 hour.

While more men, horses, and wagons were commonly used with the two-row machines, the necessity of traveling only half the distance that must be covered with a one-row machine, resulted in the use of less man labor, horse labor, and fuel per acre (Table 11).

TABLE 11.—LABOR AND MATERIALS USED IN HUSKING WITH MECHANICAL HUSKERS: EAST-CENTRAL ILLINOIS, 1928 AND 1929

	102 one-row huskers			64 two-row huskers			28 one-row bull-wheel machines		
	Per husker	Per acre	Per bushel	Per husker	Per acre	Per bushel	Per husker	Per acre	Per bushel
Volume of husking									
Acres	105.4	...	...	158.8	...	...	75.8	...	...
Bushels	4 522	43	...	7 150	45	...	3 112	41	...
Time									
Picker, hours	127	1.20	.028	127	.80	.018	102	1.34	.033
Tractor, hours	127	1.20	.028	131	.82	.018	98	1.29	.031
Wagon, hours	302	2.86	.067	314	1.97	.044	225	2.97	.072
Man labor, hours	286	2.72	.063	351	2.21	.049	239	3.15	.077
Horse labor, hours	345	3.28	.076	454	2.86	.064	312	4.11	.100
Materials									
Gasoline, gallons	82	.78	.018	142	.90	.020	62	.81	.020
Kerosene, gallons	164	1.55	.036	101	.64	.014	104	1.37	.033
Oil, gallons	11.2	.11	.002	12.5	.08	.002	11	.14	.003
Grease, pounds	11.5	.11	.003	6.6	.04	.001	6	.08	.002

The bull-wheel machines covered fewer acres per machine than the power-take-off machines and used larger amounts of man labor, power, and equipment. However, the limited extent to which these machines are used makes further study of their operation of little importance.

Man Labor. In husking with the one-row machines 2.72 hours of man labor were used per acre, while 2.21 hours were used with the two-row machines (Table 11). Family labor made up 69 percent of the labor used with the one-row machines and 71 percent of that used with the two-row machines (data not shown).

Within each group there were wide variations in the amounts of man labor used per acre. With two of the one-row huskers less than 1.5 hours were used, while with three, more than 4.5 hours were used. With 62 one-row machines 2 to 3 hours were used per acre. With 5 of the two-row machines less than 1.5 hours were used; with none were as many as 4 hours required. With 28 of the two-row machines, 1.50 to 1.99 hours of labor were used per acre. (For distribution of farms according to the hours of labor used, see Table 20.)

These variations in the amounts of man labor used are due largely to factors over which the individual farmer has some control, the more important of which are the organization of the crew and the amount of time required to husk an acre.

Husking Crews. The most common crew for husking corn with either the one- or the two-row machines consisted of 2 men, one operating the tractor and husker and one hauling and cribbing the corn. With the exception of three farmers who used an extra tractor to pull the wagon while loading, all used but one man to operate the husker. There was more variation in the number of men hauling and cribbing.

FIG. 3.—MECHANICAL HUSKERS BREAK DOWN STALKS, BUT FIELDS ARE FINISHED EARLIER, THUS PERMITTING MORE PASTURAGE BEFORE WINTER WEATHER

On a few farms where wagon hitches were not used, an extra man was required in hauling. A few farmers in operating two-row machines kept one man at the dump to help unload. Unless the distance to the crib was unusually long, however, one man hauling with 2 teams and using 4 wagons could haul and crib the corn as fast as a two-row husker could husk. Fourteen of the operators using one-row machines either had no one to haul and crib the corn or had a man or other family labor only part of the time. They stopped the husker when unloading or used enough wagons to run it for half a day.

On 78 farms where one-row huskers were used, 1 man hauled and cribbed the corn; on 10 farms 2 or more men were used for this operation. Where two-row machines were used, 1 man was required to haul on 41 farms; while 2 or more men were used on 23 farms. As the number of men used in hauling and cribbing the corn increased, the amount of man labor used per acre also increased, as indicated in Table 12.

Rate of Husking. While the time required to husk an acre of corn depends to some extent on the condition of the corn and the yield, the organization of the crew and the ability of the operator to keep the machine going steadily are of much more importance. The

relation of the rate of husking to the quantity of man labor used per acre is shown in Table 13. The relation between quantity of man labor used and cost of husking an acre will be shown later.

Power and Equipment. The hours of tractor use were the same as the hours of picker use except on a few farms where an extra tractor was used to pull the wagon while husking (1.2 hours an acre with the one-row machines and .82 hour with the two-row huskers, Table 11). Horse labor averaged 3.28 hours an acre with the one-row ma-

TABLE 12.—RELATION BETWEEN NUMBERS OF MEN HAULING AND CRIBBING CORN AND TOTAL AMOUNT OF MAN LABOR USED: EAST-CENTRAL ILLINOIS, 1928 AND 1929

Number of men hauling and cribbing	One-row machines		Two-row machines	
	Number	Man hours per acre	Number	Man hours per acre
Less than 1 man	14	2.00	..	....
One man	78	2.64	41	2.37
More than 1 man	10	3.78	23	2.70

TABLE 13.—RELATION BETWEEN RATE OF HUSKING AND QUANTITY OF MAN LABOR USED PER ACRE: EAST-CENTRAL ILLINOIS, 1928 AND 1929

Hours required to husk an acre	One-row machines		Two-row machines	
	Number	Man hours per acre	Number	Man hours per acre
Less than .75	..	....	18	1.85
.75–.99	8	2.16	42	2.36
1.00–1.24	53	2.49	4	2.62
1.25–1.49	32	3.04	..	....
1.50–1.74	4	3.49	..	....
1.75 and more	5	4.36	..	....

chines, 2.86 with the two-row machines. Two and three teams were used more commonly with the two-row machines than with the one-row, but the greater rate at which the husking was done with the two-row machines meant that the teams stood around less in husking and hauling.

Two-plow tractors were used to pull 73 of the one-row huskers, while three-plow tractors were used on 29 machines (Table 14). On the other hand, 26 of the tractors pulling the two-row machines were of the smaller size and 38 of the larger.

The amounts of fuel and oil used per acre were less with the two-row machines than with the one-row; they were also less with the two-plow tractors than with the three-plow (Table 14). While it was generally believed that the small tractors furnished sufficient power to operate the one-row machines, some operators found that they did not

TABLE 14.—QUANTITIES OF FUEL AND OIL USED IN HUSKING AN ACRE OF CORN: EAST-CENTRAL ILLINOIS, 1928 AND 1929

	One-row husker		Two-row husker	
	73 two-plow tractors	29 three-plow tractors	26 two-plow tractors	38 three-plow tractors
	gals.	*gals.*	*gals.*	*gals.*
Gasoline	.76	.84	.73	1.02
Kerosene	1.44	1.86	.63	.64
Total fuel	2.20	2.70	1.36	1.66
Oil	.11	.10	.08	.08

furnish enough power for the two-row huskers under adverse field conditions.

Cost of Machine Husking

The cost of husking an acre of corn with a mechanical husker varied from farm to farm and from year to year with weather conditions and with the relative efficiency of equipment and crew.

The total estimated cost[1] of husking corn with the one- and two-row machines was as follows:

	Per acre		*Per bushel*	
	1928	1929	1928	1929
Two-row huskers	$2.91	$3.00	6.2c	6.8c
One-row huskers	3.42	3.60	7.7	8.6

It will be observed that while the cost per acre was only 3 to 5 per cent greater in 1929, the lower yield of corn made a greater proportional difference in the cost per bushel.

[1]Man labor was charged at 33 cents an hour. This figure represents the weighted average of the labor hired by the month or by the day on the farms where records were obtained in 1929.

A charge of 14 cents an hour for horse labor was based on detailed cost-account records in Champaign and Piatt counties and in other areas. Tractor use was charged at 50 cents an hour for two-plow tractors and 90 cents an hour for three-plow machines. The average rate paid for kerosene was 13.4 cents a gallon and for gasoline was 16.4 cents a gallon; these rates were applied to the data from all farms. Since the quality of oil used on the farms varied greatly, the rates paid by each operator were used. The use of wagons charged at 2 cents an hour was based on cost-account records in Illinois.

There is little material upon which to base charges for depreciation of the picker and for interest on the money investment it represents. In obtaining the husking data the farm operators were asked to state their opinions as to the probable life of the machines, both in total acres of corn and in years. The answers indicated that the expected life of the one-row machines was ten years, husking a total of 950 acres, and of the two-row huskers, eight years, husking 1,400 acres. The annual charge for depreciation was based on the initial cost of each machine, when new, i.e.,

$$\frac{\text{Cost of machine} \times \text{Acres husked}}{\text{Average life of machine (in acres)}} = \text{Annual depreciation charge}$$

(Note is completed on next page.)

The average cost of husking with the one-row power-take-off husker during the two years was $3.55 an acre, or 8.26 cents a bushel (Table 15). The cost of using two-row machines was $2.98 an acre,

TABLE 15.—SUMMARY OF COST OF HUSKING WITH MECHANICAL CORN HUSKERS: EAST-CENTRAL ILLINOIS, 1928 AND 1929

Items	Cost per acre			Cost per bushel		
	102 one-row huskers	64 two-row huskers	28 one-row bull-wheel huskers	102 one-row huskers	64 two-row huskers	28 one-row bull-wheel huskers
				cents	*cents*	*cents*
Man labor	$ .90	$ .73	$1.04	2.09	1.62	2.53
Horse labor	.46	.40	.58	1.07	.89	1.40
Tractor use	.73	.60	.76	1.70	1.34	1.86
Fuel and oil	.42	.29	.42	.99	.64	1.03
Husker costs	.72	.60	.89	1.66	1.33	2.17
Elevator costs	.26	.32	.23	.62	.70	.55
Wagon use	.06	.04	.06	.13	.09	.15
Total	$3.55	$2.98	$3.98	8.26	6.61	9.69

or 6.61 cents a bushel. Where the one-row bull-wheel-driven machines were used, the cost was $3.98 an acre, or 9.69 cents a bushel.

The yield of corn was higher on farms where two-row machines were used than where one-row machines were used (Table 10).

Man labor costs amount to about one-fourth the total cost of mechanical husking. The cost for power, including horse labor, tractor use, fuel, and oil, is equal to 40 to 45 percent of the total. The remainder is made up of the cost for husker, elevator, and wagons.

The charge for horse labor depends largely on the number of teams used in hauling and the rate of husking. On many farms more horses were used than necessary and they were not worked steadily. Since their use represented no additional outlay, little attempt was made on most farms to reduce this item to a minimum.

Interest on investment was charged at 6 percent of the average valuation of the machine during its life according to the following formula:

$$\frac{\text{Cost of machine} \times (\text{Average life in years} + 1)}{\text{Average life in years} \times 2} = \text{Average valuation}$$

The shelter charge was based on estimates of operators and represents average costs. On one-row machines $3.50 was charged for the year, and on two-row machines $4.20 was the shelter charge.

The cost of the elevator for unloading corn was estimated at half a cent a bushel, based on data from the Champaign-Piatt counties cost-account records for 1920-1928.

All power, other than horses, used at the elevator was charged at half a cent a bushel.

The tractor charge depends on size of tractors and rate of husking. The husking rate was only slightly greater where three-plow tractors were used than where two-plow tractors were employed, on either one- or two-row huskers. The cost per hour, however, was estimated to be 80 percent greater. From 20 to 25 percent more fuel was used in the larger tractors.

The husker costs amounted to 20 percent of the cost with either size of machine. The total annual cost of each one-row husker amounted to $75.37, that of the two-row huskers to $95.26 (Table 16).

TABLE 16.—ESTIMATED ANNUAL HUSKER COSTS: EAST-CENTRAL ILLINOIS, 1928 AND 1929

	One-row machines	Two-row machines
Repairs	$ 9.64	$ 1.08
Depreciation	47.65	69.34
Interest	14.58	20.64
Shelter	3.50	4.20
Total	$75.37	$95.26

This charge is made up of repairs, depreciation, interest, and shelter. The great difference in repairs on the two types of machines—$9.64 on the one-row machines and $1.08 on the two-row machines—may be explained by the fact that all the two-row machines were in the first or second year of use, while many of the one-row machines had been used longer, nearly 40 percent of the one-row machines having been purchased previous to 1928. Also, the manufacturers of the two-row machines furnished many parts and made repairs with no expense to the operator. The annual interest charge was about 40 percent larger with the two-row machines, their original cost having averaged $625, as against $425 for the one-row machines. While the annual costs on the two-row huskers averaged larger than on the one-row, the greater number of acres husked by the two-row machines (Table 17) made the cost per acre and per bushel lower.

Variations in Cost of Machine Husking

A wide range was found on individual farms in the cost of husking with the mechanical husker. This was especially true with one-row huskers (Table 17). Some analysis of the data, showing the principal causes for these variations, should be valuable to the individual operator in studying his costs.

The yield of corn per acre is one of the most important factors causing variations in the cost of husking a bushel of corn with the

mechanical husker. The yield, however, has little effect on quantities of labor and materials used or on amount of time required to husk an acre. We find, therefore, little relation between yield and cost per

TABLE 17.—VARIATION IN ESTIMATED HUSKING COST PER BUSHEL OF CORN: EAST-CENTRAL ILLINOIS, 1928 AND 1929

Cents per bushel	One-row machines		Two-row machines	
	Acres husked	Number of farms	Acres husked	Number of farms
4.0– 4.9	....	..	645	4
5.0– 5.9	372	3	2 003	13
6.0– 6.9	1 795	14	3 605	22
7.0– 7.9	3 366	30	2 411	14
8.0– 8.9	2 381	23	1 498	9
9.0– 9.9	613	7	.....	..
10.0–10.9	1 195	12	.....	..
11.0–11.9	571	6	.....	..
12.0–12.9	270	4	.....	..
Total	.....	99[1]	.....	62[1]

[1]Three one-row and 2 two-row machines had costs higher than shown above. In each case, however, the number of acres harvested and the yields per acre were abnormally low.

acre (Table 18). A difference of 3.1 cents a bushel is shown in the cost of husking with one-row machines between farms where the yields were 27.5 to 32.4 bushels an acre and those where yields were 47.5 to 52.4 bushels. With the same increase in yield a reduction of 2.1 cents is shown in the case of the two-row machines. In the case of low yields 26 bushels were husked each hour with the one-row machines, while 36 bushels were husked an hour where the higher yields were obtained. The rate of husking with the two-row huskers was increased from 52 to 72 bushels an hour with the increase in yields.

The cost of husking is obviously influenced by the acreage husked during the season (Table 19). In the case of the one-row machines the relation between the area husked and cost per bushel is easily seen. The average cost with machines husking 160 to 199 acres was 1.9 cents a bushel less than on machines husking 40 to 79 acres during the season. The average yield of corn was equal in these two groups. The time required to husk an acre and the cost per acre were lowered as more acres were gone over. The higher yield in the group husking from 120 to 159 acres caused the higher cost per acre. In the case of the two-row machines the relation is not so clearly shown, being obscured by high average yields in the two groups husking the smallest acreages. Here again, however, the time required per acre and the cost per acre show a distinct trend downward as greater acreages are covered by each machine.

The more efficient use of huskers on the larger acreages is due to

TABLE 18.—PERFORMANCE OF ONE-ROW AND TWO-ROW CORN HUSKERS GROUPED ON BASIS OF YIELD OF CORN PER ACRE: EAST-CENTRAL ILLINOIS, 1928 AND 1929

Yield per acre	Acres per husker	Number of huskers	Quantity of corn husked		Labor and equipment per acre					Materials per acre				Cost	
			Per husker	Per acre	Husker use	Man labor	Horse labor	Tractor use	Wagon use	Gasoline	Kerosene	Oil	Grease	Per acre	Per bushel
							One-row huskers								
bu.			*bu.*	*bu.*	*hrs.*	*hrs.*	*hrs.*	*hrs.*	*hrs.*	*gals.*	*gals.*	*gals.*	*lbs.*		
27.5–32.4	86.9	5	2 590.6	29.8	1.15	2.25	3.13	1.18	2.68	.95	.85	.09	.09	$3.13	$.105
32.5–37.4	88.5	9	3 037.1	34.3	1.17	2.63	2.74	1.17	2.73	.76	1.37	.11	.11	3.33	.097
37.5–42.4	114.2	27	4 615.3	40.4	1.17	2.60	3.23	1.18	2.78	.90	1.33	.10	.11	3.40	.084
42.5–47.4	110.5	34	4 960.9	44.9	1.24	2.81	3.40	1.25	3.00	.68	1.77	.10	.11	3.67	.082
47.5–52.4	107.2	19	5 273.9	49.2	1.20	2.84	3.58	1.20	2.87	.61	1.78	.13	.10	3.65	.074
							Two-row huskers								
37.5–42.4	180.0	18	7 040.7	39.6	.76	2.18	2.61	.76	1.84	.58	.94	.08	.06	$2.81	$.071
42.5–47.4	169.0	19	7 571.7	44.8	.84	2.37	3.22	.88	2.26	1.06	.46	.08	.03	3.09	.069
47.5–52.4	173.0	9	8 529.1	49.3	.77	2.07	2.87	.77	1.89	.69	.66	.07	.04	2.84	.058
52.5–57.4	113.5	11	6 209.6	54.7	.86	2.40	3.13	.86	1.88	1.48	.19	.09	.02	3.36	.061
57.5–62.4	134.2	3	7 824.0	58.3	.81	1.79	1.74	.81	1.95	1.20	.56	.07	.03	2.91	.050

TABLE 19.—PERFORMANCE OF ONE-ROW AND TWO-ROW CORN HUSKERS GROUPED ON BASIS OF TOTAL ACRES HUSKED: EAST-CENTRAL ILLINOIS, 1928 AND 1929

Area husked	Acres per husker	Number of huskers	Quantity of corn husked		Labor and equipment per acre					Materials per acre				Cost	
			Per husker	Per acre	Husker use	Man labor	Horse labor	Tractor use	Wagon use	Gasoline	Kerosene	Oil	Grease	Per acre	Per bushel
One-row huskers															
acres			*bu.*	*bu.*	*hrs.*	*hrs.*	*hrs.*	*hrs.*	*hrs.*	*gals.*	*gals.*	*gals.*	*lbs.*		
40– 79	64.1	28	2 716.9	42.4	1.29	2.69	3.23	1.33	2.85	1.05	1.63	.11	.14	3.94	.093
80–119	99.3	39	4 122.6	41.5	1.21	2.71	2.99	1.21	2.69	.91	1.44	.10	.13	3.51	.085
120–159	134.7	21	6 166.9	45.8	1.18	2.88	3.80	1.18	3.14	.71	1.43	.12	.09	3.61	.079
160–199	186.7	10	7 921.5	42.4	1.13	2.49	3.27	1.13	2.74	.45	1.76	.10	.08	3.13	.074
Two-row huskers															
80–119	97.2	14	4 666.4	48.0	.86	2.09	2.63	.86	1.87	.85	.83	.11	.07	3.11	.065
120–159	140.6	17	6 657.5	47.4	.83	2.15	2.69	.87	2.08	1.41	.32	.07	.04	3.10	.065
160–199	176.1	16	7 666.3	43.5	.80	2.28	3.13	.80	1.86	.81	.66	.08	.04	2.96	.068
200–239	207.6	6	9 138.3	44.0	.76	2.15	2.33	.76	1.93	.46	.92	.06	.02	2.68	.061
240–279	262.4	6	11 799.5	45.0	.78	2.45	3.20	.86	2.19	.82	.59	.07	.02	3.06	.068

better organized crews, better adjustment of machines, and the incentive to cover the acreage before bad weather prevents the use of the husker. Depreciation of the husker, since figured on the acre basis, could have no effect here; but interest on investment and shelter charges would be less per acre as a larger acreage was husked.

FIG. 4.—ONE MAN WITH TWO TEAMS AND THREE WAGONS CAN MOVE CORN FROM THE HUSKER TO THE CRIB EFFICIENTLY

The cost of husking per acre is probably as closely related to the amount of man labor used as to any other factor (Table 20). Not all the increase in cost shown by these figures, however, is due to the larger amount of labor used, since along with the larger labor bill come more hours of tractor use, more horse labor, more wagon use, and more fuel.

Typical Organization of Efficient Units

There was large variation in use of labor and equipment, as well as in acreage husked, with the different-sized huskers. Table 21 shows how labor and equipment were used on two farms, on one of which a one-row machine was used efficiently and on the other a two-row machine.

The two-row machine was used on the larger farm and husked 172 acres as compared with 135 acres husked by the one-row machine. A three-plow tractor was used to pull the two-row machine and a wagon, while a two-plow tractor was used with the one-row machine. Two men were used with each machine, yet the greater speed of husking with the two-row husker resulted in less man labor per acre. The rate of husking was almost twice as fast with the two-row as with the one-row machine. An extra team was used with the two-row machine but no extra wagons. Many operators of two-row machines use

TABLE 20.—RELATION BETWEEN AMOUNT OF MAN LABOR USED IN HUSKING CORN AND COST OF HUSKING: EAST-CENTRAL ILLINOIS, 1928 AND 1929

Man labor per acre	One-row huskers					Two-row huskers				
	Number	Acres	Yield per acre	Cost per acre	Cost per bushel	Number	Acres	Yield per acre	Cost per acre	Cost per bushel
hrs.			*bu.*		*cents*			*bu.*		*cents*
1.00–1.49	2	170	43.7	$3.31	7.6	5	838	41.9	$2.47	5.9
1.50–1.99	11	847	40.7	3.18	7.8	28	4 178	45.9	2.80	6.1
2.00–2.49	28	3 584	41.5	3.11	7.5	14	2 396	44.0	3.01	6.8
2.50–2.99	34	3 352	44.3	3.50	7.9	8	1 541	44.6	3.16	7.1
3.00–3.49	12	1 320	42.8	4.03	9.4	5	643	47.5	3.66	7.7
3.50–3.99	7	812	47.4	4.29	9.1	3	567	46.1	3.62	7.8
4.00–4.49	5	502	39.8	4.14	10.4	..	....	....	....	....
4.50–up	3	161	43.1	5.99	13.2	..	....	....	....	....

three wagons, often to good advantage. In each case horse power was used to elevate the corn at the crib. The wagon team was used on the dump. Where the two-row machine was used, the second team was kept at the dump continuously.

TABLE 21.—USE OF LABOR AND EQUIPMENT ON TWO FARMS WHERE ONE-ROW AND TWO-ROW HUSKERS WERE USED EFFICIENTLY: EAST-CENTRAL ILLINOIS

	One-row husker	Two-row husker
Acres in farm	240	360
Acres of corn husked with machine	135	172
Acres husked by hand to open fields	8	8
Bushels husked with machine	6 270	6 732
Bushels husked per acre	46.4	39.1
Hours husker was used	152	111
Man hours per acre	2.50	1.38
Husker hours per acre	1.12	.64
Size of tractor	2-plow	3-plow
Number of men		
Operating husker	1	1
Hauling corn	1	1
Teams	1	2
Wagons	2	2
Cost per acre	$3.12	$2.39
Cost per bushel	.067	.061

The cost per acre was less with the two-row machine, but since the yield of corn per acre was so much less, there was only .6 of a cent difference in the bushel cost.

Corn Left in Field by Mechanical Husker

The possibility of losing an appreciable amount of corn has been an important factor in limiting the use of the mechanical husker. This consideration has been most important in the grain-farming areas, where many fields are not fenced and the amount of livestock is too small to clean up any large acreage. Some landowners have refused to permit tenants to use the husker since a part of the corn left in the field would be the landowners' loss. Many have used the huskers and picked up the lost corn by hand. Others do not believe the amount left is worth picking up and have made no effort to save it.

The amount of corn left in the field depends largely on the condition of the corn, the weather, and the adjustments of the husker. Leaning or down corn results in more ears being left in the field. Less corn is lost when the husks and stalks contain a considerable amount of moisture and do not break easily; cloudy, damp days are therefore better for husking than bright, dry weather. After the stalks have been

frozen and are dry and brittle, the loss is much heavier than before. The adjustments of the machine must be changed to meet weather conditions if excessive shelling or crushing by the snapping rolls is to be avoided. On some machines the shelled-corn saver under the husking rolls has greatly reduced the loss at this point.

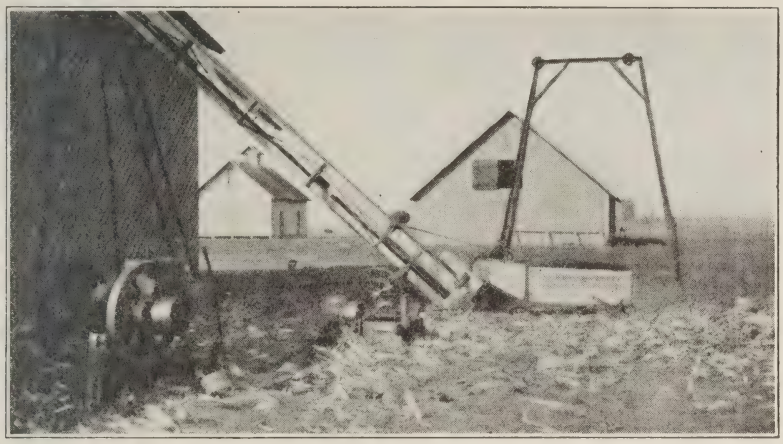

FIG. 5.—EITHER ENGINES OR HORSES MAY BE USED TO OPERATE THE DUMP

Estimates made by operators indicate that an average of 1.06 bushels of ear corn and .29 bushel of shelled corn an acre were lost by the one-row huskers, and an average of 1.66 bushels of ear corn and .48 bushel of shelled corn an acre were lost by the two-row machines.[1] The amount of corn left in the different fields was estimated to vary from ¼ bushel an acre to more than 6¼ bushels. In 70 percent of the fields where one-row machines were used, less than 1.25 bushels of ear corn were estimated to have been lost; in 7.5 percent of the fields, 2.25 or more bushels. Where two-row machines were used, the loss of ear corn was less than 1.25 bushels in 45 percent of the fields and more than 2.25 bushels in 24 percent of the fields. There is also some loss, of course, in hand picking, depending upon the condition of the corn and the skill of the husker. No data were obtained on this point.

[1]Studies made by the Department of Farm Mechanics, University of Illinois, indicate a higher loss. In 1929 the corn left in the fields by nine machines was picked up and weighed. The amount of ear corn left varied from .75 bushel to 7.87 bushels an acre. The shelled corn loss varied from .62 to 5.42 bushels an acre. Ill. Agr. Exp. Sta. 43d Ann. Rpt., p. 214. 1929-30.

Methods of Saving Corn Left in Field

Twenty-two percent of the area husked by one-row machines was gone over and the ear corn picked up by hand (Table 22). Fifty-five percent of the area was pastured by livestock, and no attempt was made to save the corn on the remaining 23 percent of the acreage. On the acreage where two-row machines were used, 42 percent was

TABLE 22.—ESTIMATED AMOUNTS OF CORN LEFT IN FIELD BY MECHANICAL HUSKERS AND AMOUNTS SAVED: EAST-CENTRAL ILLINOIS, 1929

	One-row huskers			Two-row huskers		
	Acres husked	Bushels husked	Bushels per acre	Acres husked	Bushels husked	Bushels per acre
Corn husked	5 989	249 710	42	6 062	266 372	44
Ear corn saved						
Picked up by hand	1 325	1 306	.99	2 570	5 033	2.00
Pastured by livestock	3 272	3 584	1.10	2 609	4 012	1.54
Ear corn not saved	1 392	1 441	1.04	883	1 034	1.17
Total ear corn left by huskers	5 989	6 331	1.06	6 062	10 079	1.66
Shelled corn left	5 989	1 726	.29	6 062	2 920	.48
Total corn left	5 989	8 057	1.35	6 062	12 999	2.14

TABLE 23.—COST OF PICKING UP BY HAND THE CORN LEFT IN FIELDS BY MECHANICAL HUSKERS: EAST-CENTRAL ILLINOIS, 1929

	One-row huskers		Two-row huskers	
	Total	Per acre	Total	Per acre
Number of fields	121	...	137	....
Acres picked	1 325	...	2 570	....
Bushels saved	1 306	.99	5 033	2.00
Man labor, hours	483.5	.36	1 863.5	.72
Horse labor, hours	839	.63	1 997	.78
Wagon use, hours	420	.32	998	.39
Cost of saving corn[1]	$291.81	$ .22	$939.37	$ .37

[1]For basis for computing costs, see footnote, page 370.

picked over by hand, 43 percent was pastured, and no effort was made to save the corn on 15 percent.

Where the corn was picked up by hand, an average of .99 bushel was saved on each acre where one-row machines had been used and 2 bushels where two-row machines had been used. That the time used in picking up this amount of corn was well spent is shown in Table 23. One man with a team and wagon picked up an average of 2.75 bushels of corn an hour. In many cases this was done after the machine husking was completed and when little other productive work could be done. Applying the rates previously described for man labor,

horse labor, and wagon use, the average cost per bushel where 1 bushel was saved per acre was 22 cents, and where 2 bushels were saved, 37 cents.

SILO FILLING

The first silo used in the United States is reported to have been built about 1875. This method of preserving the feeding value of the corn plant originated in Germany about 1870 and had been used there and in France with some success. The fodder at first was stored in pits or merely piled up and covered with dirt to exclude the air. Pits with solid walls, however, were soon found to preserve the fodder much longer. Later long, narrow silos were built of lumber or masonry above the ground and feeding was from one end instead of from the top. The fodder in these early silos was cut by hand or stored without cutting. During the process of filling, it was well tramped, and weights were often added after the filling was completed in order to secure more thoro settling. Square, vertical silos were used later, and these in turn were replaced by the modern round silo. This method of harvesting corn gained rapidly in popularity, particularly in the dairy regions, as the feeding value of silage became generally known. In 1929[1] nearly 10 percent of all farmers in Illinois reported cutting corn for silage.

Practices and Equipment Used in Making Silage

The common method of filling silos is to haul the whole corn to the silo, where it is cut into silage and elevated by means of a stationary cutter. The chief objections to the use of silage have been the great amount of strenuous labor involved and the expense. Improvements in practices and in equipment have done much to eliminate these objections. The binder has made cutting possible with less labor and, when equipped with the bundle elevator, does away with the heavy lifting of the corn onto the wagons. The blower-type cutter has replaced the elevator type, increasing the possible rate of cutting. The tractor is now used to a large extent in place of the steam engine. In the past it has been a common practice to keep 2 to 4 men in the silo to tramp the silage as it was put in. Experiments[2] have shown this to be unnecessary, untramped silage making as good feed as well-tramped silage.

The field silage harvester is a machine by which the standing corn is cut, chopped into silage lengths, and elevated into a box wagon

[1]U. S. Census, 1930.
[2]U. S. Dept. Agr. Yearbook, 1928, p. 541.

drawn alongside the machine. It is then hauled to the silo and elevated by means of a blower.

The early models were horse-drawn, with a gasoline motor mounted on the frame to furnish power for the cutter. The later models, however, are drawn and operated by a tractor equipped with the power-take-off device. The first of these machines used in Illinois

FIG. 6.—HANDLING BUNDLE CORN IS STRENUOUS PHYSICAL EXERCISE

were purchased in 1918. Some difficulty was experienced with these early machines when they were used on heavy corn. The machines on the market at the present time, however, are proving quite satisfactory.

Records on the cost and physical requirements of filling silos with stationary cutters were secured on 87 farms in 1929. Similar data were available on 198 farms in 1921 and on 144 farms in 1922. Detailed cost-account records from three areas over longer periods of time were also available (Table 27). Data on filling silos with the field silage harvesters were secured on 37 farms in 1928, and on 81 farms in 1929 (Table 28). Nearly all the farms on which field silage harvesters were used are located in the northern part of the state. About half the farms on which records of stationary cutters were obtained are located in the northern part of Illinois—the remainder, in the west-central area.

Size of Farms Cutting Corn for Silage

There was little difference in the size of the farms on which the different types of cutters were used (Table 24). The average size of farm and the acreage of corn cut for silage, however, were smaller

on farms where custom machines were used than where silo-filling equipment was owned.

There was little difference in kind or numbers of livestock found on the two groups of farms.

On farms where field harvesters were owned, the operators owned 71 percent of the land they operated; where the machines were owned cooperatively, the operators owned 64 percent of their land; and where custom rigs were used, 58 percent of the land was owned by the

TABLE 24.—ACREAGE IN CORN ON FARMS WHERE SILO-FILLING RECORDS WERE OBTAINED, NORTHERN AND WESTERN ILLINOIS, 1929

	Stationary cutters		Field silage harvesters		
	Owned machines	Custom machines	Owned machines	Part-owned machines	Custom machines
Number of farms[1]	45	35	24	35	9
Size of farm in acres	281.5	201.8	277.1	265.0	170.7
Percentage of land owned	44	50	71	64	58
Total acres in crops	205.8	153.2	217.1	188.6	114.8
Total acres in corn	95.8	75.1	112.1	95.0	47.1
Acres cut for silage	18.5	14.1	17.6	17.9	8.7
Acres cut for fodder	4.3	3.9	6.8	5.7	3.5
Acres hogged off	1.4	1.6	.8	.6	2.4
Acres husked in field	71.6	55.5	86.9	70.8	32.5

[1]Acreage data not available for 7 farms using stationary cutters and for 13 farms using field silage harvesters.

operator. In the case of the stationary cutters 44 percent of the land was owned where machines were owned and 50 percent was owned where custom rigs were hired. The high investment required for silo-filling equipment, particularly for the field harvester, discourages many tenants from buying, especially when their tenure is uncertain.

Kinds of Power and Equipment Used

The kind of equipment used in filling silos, the kind and size of power units used, and the size and organization of the crews varied widely on the farms studied.

In the studies made in 1928 and 1929 (northern and western Illinois), records were secured on 48 farms where the power-take-off type of field silage harvester was used and on 70 farms where motor-mounted machines were used (Table 25). On ten of these farms, tractors were used to pull the motor-mounted machines. The silage was hauled to the silo in box wagons in most cases, usually 3 or 4 being used. There was little difference in the type of blower used at the silo. On most farms the regular field-harvester blowers were used altho a few had ordinary silage cutters with the knives removed.

A much greater variation was found in the equipment on farms

where stationary cutters were used. On 47 of the farms studied in 1929, the corn was cut with binders, on 26 it was cut entirely by hand, and on 14 both binders and hand cutters were used (Table 29). Little hand cutting is done in the northern part of the state, where the acreage cut for silage is relatively high. On none of the farms on which records were secured in 1929 in this northern area was any hand

TABLE 25.—NUMBER OF FARMS IN NORTHERN AND WESTERN ILLINOIS USING DIFFERENT KINDS OF POWER FOR FILLING SILOS, 1928 AND 1929

	Power-take-off machines		Motor-mounted machines					
	2-plow tractor	3-plow tractor	2-plow tractor	3-plow tractor	Number of horses			
					3	4	5	6
Cutter	19	29	4	6	49	5	4	2
Blower	36	12	38	32	..	..	..	..

TABLE 26.—NUMBERS OF FARMS USING DIFFERENT-SIZED MACHINES IN FILLING SILOS

Size of cutter	Number of farms					
	Northern Illinois, 1921		Henry county, 1922		Northern and western Illinois, 1929	
	Private rigs	Custom rigs	Private rigs	Custom rigs	Private rigs	Custom rigs
12 to 14 inches	18	24	10	8	9	4
15 to 17 inches	27	41	42	30	18	24
18 to 20 inches	13	30	18	18	8	9
Above 20 inches	6	39	1	5	..	..
Size unknown	..	..	10	2	12	3
Total	64	134	81	63	47	40

cutting done other than to open the fields. Records on 198 farms in 1921 in the same area showed the same general use of binders. Records on 144 farms in Henry county in 1922, however, indicated that corn was cut by hand on about one-fourth of the farms and on others a part was cut by hand. The records on farms in the western part of the state in 1929 also indicated hand cutting to be quite common.

Bundle elevators were used on 15 of the farms included in the 1929 study, or on about one-third of those using binders. All these farms are located in the northern part of the state. Eight operators used three binders each when equipped with elevators, six used two each, and only one used a single binder in cutting. The use of the elevator makes the labor connected with loading much less arduous. It therefore often solves the problem of obtaining labor, altho it does not reduce the number of laborers required nor the hours of labor.

The number of wagons used in hauling the corn to the silo varied on these farms from 2 to 10, 5 or 6 being most common where the cutters were owned, and 7 or 8 where custom rigs were hired.

The cutters used on the farms included in the 1929 study varied in size from 12 to 20 inches (Table 26). Sixteen-inch machines were most common, making up nearly 40 percent of all used. The trend during the past ten years has been toward the medium-sized cutters, whether bought for private use or for custom work. Fewer of the

FIG. 7.—BOYS OFTEN HAUL CORN FROM FIELD SILAGE CUTTER TO SILO

larger-sized modern machines were used in 1929 than in 1921. On 18 percent of the farms studied in 1921 the machines were 25 or 26 inches in size. In Henry county in 1922 the data showed no extremely large machines, but fewer small machines were used than in 1929. The trend toward farmer-owned cutters and farm tractors has resulted in the greater use of the medium-sized and small machines.

Three-plow tractors were most commonly used in pulling the field silage harvester, while two-plow tractors were more often used at the silo in driving the blower, as indicated below. When horses were used to pull the motor-mounted machines, three were generally needed altho several farms used four, five, or six horses.

Three-plow tractors were used in driving the stationary cutters on 56 farms in 1929, two-plow tractors were used on 24 farms, and steam engines were used on 7 farms, or 12½ percent. The trend away from steam engines is shown by the fact that in 1921 they were used on 34 percent of the farms on which records were secured.

Amounts of Labor and Power Used

The amounts of labor, power, and other materials used in filling silos vary from one area to another, from year to year, and from farm

to farm in the same area. Regional variations are due largely to the methods and equipment used. Annual variations are caused by factors over which the operator has little control, such, for example, as yield of silage per acre. Changes in methods and equipment may also cause annual differences. Many of the variations from farm to farm are caused by factors which may be controlled to a large extent.

Silo-filling is an important farm operation in northern Illinois; in the western area it is of less importance. Greater effort is made in these areas to use labor and equipment as efficiently as possible than is made in areas such as Champaign and Piatt counties, where comparatively little silage is used (Table 27).

TABLE 27.—LABOR AND POWER USED IN FILLING SILOS WITH STATIONARY CUTTERS IN FIVE AREAS IN ILLINOIS

	Northern and western Illinois, 1929	Northern Illinois, 1921	Henry county, 1922	Champaign and Piatt counties, 1920-1928	Hancock county, 1917-1922	Clinton county, 1926-1928
Number of farms	87	198	144	17	19	47
Acres of corn cut per farm	16.1	18.4	11.0	8.3	14.6	10.3
Tons of silage made per farm[1]	121	161	105	54	120	54
Yield of silage per acre, tons	7.5	8.8	9.6	6.5	8.2	5.2
Average size of crew	12.0	10.3	14.2	14.5	16.0	15.9
Tons cut per hour of man labor	.57	.73	.66	.34	.47	.41
Labor and power used per acre						
Man labor, hours	13.2	12.1	14.5	19.1	17.6	12.7
Horse labor, hours	16.0	17.8	18.0	13.8	20.4	16.5
Tractor use, hours	1.11	1.15	1.08	1.32	1.10	.87
Labor and power used per ton						
Man labor, hours	1.76	1.38	1.51	2.97	2.15	2.42
Horse labor, hours	2.14	2.03	1.88	2.15	2.49	3.19
Tractor use, hours	.15	.13	.11	.20	.13	.17

[1]Tons of silage were calculated from diameter and height of silos.

Less man labor and horse labor but more tractor hours were used in filling with the field silage harvesters (Table 28) than with the stationary cutters. The size of crew used with the field harvesters was only a little over half what it was with the stationary cutters, and the rate of cutting was only about three-fourths as great. With the lower rate of cutting, and since two tractors were used on many of the field-harvester outfits, the hours of tractor use were more than double those where stationary cutters were used.

Less man labor and power were used per acre in 1929 with the field harvester than in 1928. The amount used per ton, however, was greater; this apparently was due to the lower acre-yield in 1929.

The amount of silage made per farm in 1929 was about the same on farms where field harvesters were used as where stationary cutters were used.

TABLE 28.—LABOR AND POWER USED IN FILLING SILOS WITH FIELD SILAGE HARVESTERS: MOSTLY NORTHERN ILLINOIS FARMS

	1928	1929	All farms
Number of farms	37	81	118
Acres of corn cut per farm	13.9	16.4	15.7
Tons of silage made per farm	143	124	130
Yield of silage per acre, tons	10.3	7.6	8.3
Average size of crew	6.7	6.9	6.8
Tons cut per cutting hour	6.0	5.3	5.5
Labor and power used per acre			
Man labor, hours	11.48	9.94	10.37
Horse labor, hours	12.56	11.33	11.68
Tractor use, hours	2.66	2.21	2.33
Labor and power used per ton			
Man labor, hours	1.12	1.31	1.25
Horse labor, hours	1.22	1.50	1.40
Tractor use, hours	.26	.29	.28

Variations in Amounts of Labor and Power

As between farms where the machines were owned and those where custom rigs were hired, there was no appreciable difference in the amount of labor used in making a ton of silage. This was true both of the stationary cutters and of the field harvesters. Larger crews were used with the custom rigs, but with the higher rate of cutting, the total hours of labor used per ton were about the same. Less horse labor and tractor use resulted, however, from the higher rate of cutting.

Greater variations were found in the use of labor and power on farms where different methods or types of equipment were used. In the case of the stationary cutters more labor was used when the corn was cut by hand than when cut with a binder (Table 29). Not only was more labor required in cutting the corn, but more was used in hauling the loose corn and in feeding the cutter. Fewer hours of horse labor were used where no binders were employed and, since the rate of cutting was nearly equal, the tractor hours used were about the same.

In the case of the field harvesters there was practically no difference in the amounts of labor and power used on farms where the power-take-off was used and where motor-mounted horse-drawn machines were used (Table 30). Where the power machines were used, one tractor was substituted for three horses in most cases. Where the motor-mounted machines were pulled by tractors, the amount of tractor use was twice as great, and more man labor was required since an extra man was necessary to drive the tractor.

While amounts of labor and power varied with different equipment and with different practices, marked variations also occurred from

TABLE 29.—COMPARISON OF AMOUNTS OF LABOR AND POWER USED IN FILLING SILOS WITH STATIONARY CUTTERS WHERE CORN WAS CUT BY HAND AND WHERE CUT BY MACHINE[1]

	Northern and western Illinois, 1929		Henry county, 1922	
	Machine cut	Hand cut	Machine cut	Hand cut
Number of farms	47	26	100	29
Acres of corn cut per farm	18.8	11.7	12.0	7.9
Tons of silage made per farm	139	99	113	86
Yield of silage per acre, tons	7.4	8.4	9.4	11.0
Average size of crew	10.3	16.6	13.5	17.2
Tons cut per cutting hour	6.9	7.0	9.4	9.5
Labor and power used per acre				
Man labor, hours	11.0	20.1	13.5	19.8
Horse labor, hours	16.6	14.5	18.5	16.9
Tractor use, hours	1.07	1.21	1.00	1.15
Tons cut per hour of man labor	.67	.42	.70	.56
Labor and power used per ton				
Man labor, hours	1.49	2.38	1.43	1.80
Horse labor, hours	2.24	1.72	1.97	1.54
Tractor use, hours	.15	.14	.11	.10

[1]14 farms in northern and western Illinois and 15 in Henry county, where part of the corn was cut by hand and part with machine, were eliminated from the comparison.

farm to farm where the same type of equipment was employed and the same practices were followed (Table 31). These variations were due mainly to factors that could have been controlled to a large extent.

Effect of Silage Yield on Labor and Power Required. The yield of silage per acre had a distinct effect on the amount of labor and power used in filling, both with the stationary cutters and with field harvesters (Table 32). More labor and power per acre were used with the higher yields. The rate of cutting, however, increased with

TABLE 30.—COMPARISON OF LABOR AND POWER REQUIREMENTS OF POWER-TAKE-OFF, FIELD SILAGE HARVESTERS AND MOTOR-MOUNTED MACHINES, NORTHERN ILLINOIS, 1928 AND 1929

	Power-take-off machines	Motor-mounted machines	
		Horse drawn	Tractor drawn
Number of farms	48	60	10
Acres of corn cut per farm	19.4	13.7	9.5
Tons of silage made per farm	161	113	89
Yield of silage per acre, tons	8.3	8.2	9.4
Average size of crew	6.5	5.7	7.8
Tons cut per cutting hour	5.8	5.2	5.2
Labor and power per acre			
Man labor, hours	10.05	10.08	16.11
Horse labor, hours	9.09	14.45	13.09
Tractor use, hours	2.87	1.58	3.66
Labor and power per ton			
Man labor, hours	1.21	1.22	1.71
Horse labor, hours	1.10	1.76	1.39
Tractor use, hours	.35	.19	.39

TABLE 31.—DISTRIBUTION OF FARMS BASED ON VARIATION IN AMOUNT OF MAN LABOR USED PER TON OF SILAGE, 1928 AND 1929

Man labor per ton	Farms using stationary cutters, northern and western Illinois			Farms using field silage harvesters, mostly northern Illinois		
	Cut by hand	Cut with binder	Cut both by hand and with binder	Power-take-off machines	Motor-mounted, horse-drawn machines	Motor-mounted, tractor-drawn machines
hrs.						
.50– .99	..	1	..	16	11	1
1.00–1.49	1	25	1	20	30	2
1.50–1.99	5	14	7	9	15	5
2.00–2.49	11	4	4	1	4	..
2.50–2.99	5	3	..	2	..	1
3.00–3.49	4	1	1	..	..	1
Total number of farms	26	48	13	48	60	10

yields, resulting in the use of less labor and power per ton of silage. Even tho this be true, it is a common practice to put the poorest corn into the silo.

Size and Organization of Crew. One of the greatest advantages of a field silage harvester is that family and regular hired labor can be used to a greater extent with them than with stationary cutters.

TABLE 32.—VARIATION IN YIELD OF SILAGE AND ITS RELATION TO QUANTITIES OF LABOR AND POWER USED, NORTHERN AND WESTERN ILLINOIS, 1928 AND 1929

	Yield of silage per acre, tons				
	4.0–5.9	6.0–7.9	8.0–9.9	10.0–11.9	12.0–13.9
Field silage harvesters, 110 farms,[1] 1928 and 1929					
Number of farms	15	30	34	22	9
Acres cut per farm	13.8	21.0	15.7	12.7	10.4
Tons cut per hour	4.2	5.3	5.5	6.0	5.9
Labor and power per acre					
Man labor, hours	9.60	8.73	10.88	12.22	15.82
Horse labor, hours	11.13	10.09	11.66	13.99	17.67
Tractor use, hours	1.92	1.97	2.48	2.80	3.09
Labor and power per ton					
Man labor, hours	1.79	1.26	1.25	1.11	1.24
Horse labor, hours	2.08	1.45	1.34	1.28	1.39
Tractor use, hours	.36	.28	.29	.26	.24
Stationary cutters, 87 farms, 1929					
Number of farms	13	30	34	6	4
Acres cut per farm	22.1	19.0	13.8	9.3	5.5
Tons cut per hour	5.8	6.3	7.3	8.9	11.4
Labor and power per acre					
Man labor, hours	9.20	12.84	15.26	18.89	16.43
Horse labor, hours	14.10	14.99	17.76	18.57	20.11
Tractor use, hours	.85	1.12	1.23	1.22	1.16
Labor and power per ton					
Man labor, hours	1.87	1.80	1.73	1.74	1.25
Horse labor, hours	2.86	2.10	2.01	1.71	1.53
Tractor use, hours	.17	.16	.14	.11	.09

[1] 8 farms falling outside the class intervals shown are omitted from this table.

TABLE 33.—DISTRIBUTION OF FARMS USING FIELD SILAGE HARVESTERS, ACCORDING TO NUMBER OF MEN USED IN EACH OPERATION, 1928 AND 1929

Number of men	Farms using power-take-off machines				Farms using motor-mounted, horse-drawn machines				Farms using motor-mounted, tractor-drawn machines			
	Operating cutter	Hauling silage	Operating blower	Tramping	Operating cutter	Hauling silage	Operating blower	Tramping	Operating cutter	Hauling silage	Operating blower	Tramping
None	..	..	1	25	..	..	2	26	..	..	..	2
1	45	..	22	22	58	..	47	27	..	..	10	4
2	3	4	20	1	2	8	11	7	10	..	..	4
3	..	19	4	..	..	44	..	..	..	4	..	..
4	..	16	1	..	..	6	..	..	..	6	..	..
5	..	7	..	..	..	2	..	..	..	..	..	..
6	..	2	..	..	..	..	..	..	..	..	..	..

TABLE 34.—DISTRIBUTION OF FARMS USING STATIONARY CUTTERS, ACCORDING TO NUMBER OF MEN USED IN EACH OPERATION, 1929

Number of men	Number of farms using own machines							Number of farms using custom machines						
	Cutting[1]		Hauling	Driving or pitching	Operating cutter	Tramping	Misc.	Cutting[2]		Hauling	Driving or pitching	Operating cutter	Tramping	Misc.
	Hand	Binder						Hand	Binder					
0	22	18	..	32	..	5	42	25	8	..	19	..	3	35
1	..	13	..	2	25	24	5	..	3	..	5	7	9	5
2	3	9	1	2	15	10	..	1	12	..	3	27	19	..
3	4	..	3	2	5	6	..	3	9	1	7	4	7	..
4	6	..	7	5	2	1	..	..	1	1	..	2	2	..
5	1	..	13	2	..	1	..	..	..	6	5	..	..	..
6	1	..	8	1	..	..	..	4	..	8	..	..	..	..
7	1	..	4	..	..	..	..	..	..	10	..	..	..	..
8	2	..	7	1	..	..	..	..	..	11	1	..	..	..
9	..	..	3	..	..	..	..	..	..	3	..	..	..	..
10	..	..	1	..	..	..	..	..	..	..	..	..	..	..

[1]Both hand cutters and binders were used on 7 farms. [2]Both hand cutters and binders were used on 6 farms and one farm had a binder pulled with a tractor.

Not only is the total number of men necessary to operate the field cutter smaller, but labor can be utilized that cannot be used in the heavy work around the stationary cutter.

The number of men used in filling with the field harvesters varied from 3 to 11, with 6 the most common; while from 3 to 29 men, with 10 to 14 the most common, were used on the farms where stationary cutters were employed (Tables 35 and 36).

TABLE 35.—RELATION BETWEEN NUMBER OF MEN ON CREW AND AMOUNTS OF LABOR AND POWER USED IN FILLING SILOS WITH FIELD HARVESTERS, 102 FARMS, 1928 AND 1929[1]

Number of men in crew	5	6	7	8	9
Number of farms	22	44	19	7	10
Acres of corn cut per farm	20.1	16.1	12.2	17.2	13.6
Tons of silage made per farm	160	138	103	164	93
Average yield of silage per acre, tons	8.0	8.6	8.4	9.6	6.8
Tons cut per hour	5.6	5.5	5.5	6.0	5.8
Labor and power used per acre					
Man labor, hours	7.98	10.14	11.82	13.79	10.93
Horse labor, hours	11.14	11.32	14.79	11.99	9.93
Tractor use, hours	1.80	2.52	1.94	2.75	2.34
Labor and power used per ton					
Man labor, hours	1.00	1.18	1.41	1.44	1.60
Horse labor, hours	1.39	1.32	1.76	1.25	1.46
Tractor use, hours	.23	.29	.23	.29	.34

[1]16 farms falling outside the class intervals shown were not included in the tabulation.

Variations in the number of men used with the field harvesters were due largely to changes in the number hauling silage (Table 33). On nearly all farms except those where the motor-mounted machines were pulled by tractors, one man operated the cutter. On 67 percent of the farms using field harvesters, one man operated both the tractor and blower.

The silage was not tramped at all on 53 farms during the filling process; on 51 farms one man remained in the silo; and on only 12 farms were two men used in tramping.

When filling with the stationary cutters there were even greater variations in the number of men used in the different operations (Table 34).

The size of crew is determined mainly by the preferences of the operator. Many operators prefer to exchange help with only one or two neighbors or to use only their own labor force. Under this arrangement filling is done more slowly, but the hiring or exchanging of a great amount of labor is avoided. Other operators prefer to join a ring and operate a large machine, owned cooperatively, or to engage a custom machine. Under this arrangement rapid filling is necessary and large crews are used. Both types of crew organization have their

TABLE 36.—LABOR AND POWER USED IN MAKING SILAGE WITH STATIONARY CUTTERS ON 86 FARMS WITH DIFFERENT-SIZED CREWS, 1929[1]

	Less than 10 men in crew	10 to 14 men in crew	15 to 19 men in crew
Number of farms[2]	32	36	18
Acres cut per farm	20.9	14.8	10.6
Yield of silage per acre, tons	7.2	7.5	8.4
Tons cut per cutting hour	5.4	8.2	10.0
Labor and power used per acre except for corn cutting			
Man labor, hours	9.21	11.25	14.19
Horse labor, hours	12.20	11.99	12.76
Tractor use, hours	1.33	.94	.84
Labor and power used per ton except for corn cutting			
Man labor, hours	1.28	1.50	1.69
Horse labor, hours	1.69	1.60	1.52
Tractor use, hours	.18	.13	.10

[1]Does not include men cutting corn. [2]One farm falling outside the class intervals shown was not included in the tabulation.

place and may be equally efficient and economical. Differences in method of cutting the corn, in use of extra pitchers in the field, in rate of cutting, and in number of men used in tramping are the most important factors determining the size of crew needed for stationary cutters.

The effect of increasing the size of crew on most farms where either field harvesters or stationary cutters were used was to increase the rate of cutting, especially in the case of the stationary cutters, and to increase the amount of man labor used per acre and per ton of silage (Tables 35 and 36). On farms where large crews were well-organized, however, the labor efficiency compared favorably with that on farms where small crews were used.

With the field silage harvesters family and hired labor regularly employed on the farm made up 25 percent of the total labor used in filling silos with custom machines, as compared with 52.6 percent for owned machines. The contrast was equally striking for the stationary cutters; 14.4 percent of all the labor was family and regular hired

TABLE 37.—TYPE OF LABOR USED IN FILLING SILOS, 1929

Kind of labor	With field harvesters			With stationary cutters	
	Owned machines	Part-owned machines	Custom machines	Owned machines	Custom machines
	perct.	*perct.*	*perct.*	*perct.*	*perct.*
Family	26.5	21.7	18.3	16.2	9.0
Regular hired labor	26.1	15.7	6.7	12.0	5.4
Exchange	28.2	49.0	42.4	48.8	61.2
Extra hired	19.2	13.6	32.6	23.0	24.4

labor where custom machines were used, and 28.2 percent where owned machines were used (Table 37).

Size of Job and Efficient Use of Labor. A higher degree of efficiency in the use of man labor was obtained on farms where the job was large than on farms where only a few acres of corn were cut for silage. On 36 farms in 1928 and 1929 on which less than 10 acres of corn were cut with field silage harvesters, an average of 1.39 hours of man labor was used per ton, while on 15 farms where more than 25 acres were cut, an average of 1.1 hours was used.

Other Factors Affecting Labor and Power. Other factors than the foregoing have an effect on the amount of labor and power used in filling. The condition of the equipment and its adjustment to prevent loss of time thru breakdowns and to prevent undue consumption of fuel and oil are important. Having the crew so organized that one part does not delay the work of others is also an important factor. Sometimes there is a loss of time in setting the machine and in getting ready to operate. At these points the managing ability of the operator makes decided difference in the labor bill.

Fuel and Oil Used

With the field silage harvesters the amounts of fuel and oil used in filling the silos were greater than when the filling was done with the stationary cutters (Table 38).

TABLE 38.—AMOUNTS OF FUEL AND OIL USED PER ACRE WITH STATIONARY CUTTERS AND FIELD SILAGE HARVESTERS, 1928 AND 1929[1]

Type of equipment	Number of records	Fuel			Oil
		Gasoline	Kerosene	Total	
		gals.	*gals.*	*gals.*	*gals.*
Stationary cutters					
Two-plow tractors	24	1.32	.96	2.28	.12
Three-plow tractors	48	1.29	1.55	2.84	.11
Field silage harvesters					
Power-take-off cutters					
Two-plow tractors	13	1.12	1.27	2.39	.11
Three-plow tractors	24	1.17	1.87	3.04	.11
Motor-mounted cutters					
Horse-drawn	49	1.79	.07	1.86	.19
Tractor-drawn	10	2.79	2.50	5.29	.39
Blowers					
Two-plow tractors	58	1.49	.78	2.27	.11
Three-plow tractors	38	1.81	1.05	2.86	.14

[1]The number of records includes only those on which accurate data on the fuel consumption were available.

The motor-mounted, horse-drawn machines required less fuel and oil than the power-take-off machines. More horse labor was used, however, with the motor-mounted machines, and the power was less

satisfactory. Thirteen power-take-off machines pulled by two-plow tractors used less fuel and oil than 24 machines pulled by three-plow tractors. The machines pulled by two-plow tractors cut as rapidly as did those pulled by three-plow tractors.

On 58 farms the blowers were driven by two-plow tractors, and again the two-plow tractors used less fuel and oil than the three-plow tractors that were used on 38 farms.

The 48 three-plow tractors employed in driving stationary cutters in 1929 used more fuel per hour of operation than the 24 two-plow tractors. The rate of cutting was practically the same with both machines, and with both the amount of fuel used per ton was less where the filling was done rapidly.

Twine Records on Forty-Five Farms

The amount of twine required in cutting an acre of corn with the binder depends largely on the yield of silage per acre. On 45 farms where binders were employed (1929), an average of 3.3 pounds of twine were used per acre. The variation in the use of twine due to variations in yield of silage per acre was as follows:

Yield per acre *tons*	Number of records	Total acres	Twine used per acre *lbs.*
4.0– 5.9	9	198	2.75
6.0– 7.9	16	390	3.26
8.0– 9.9	14	237	3.70
10.0–11.9	3	22	3.45
12.0–13.9	3	20	4.45

Cost of Filling Silos

The estimated cost of making silage on 49 farms where motor-mounted, horse-drawn, field silage harvesters were owned in 1928 and 1929 was $10.06 an acre, or $1.22 a ton, on corn yielding 8.2 tons of silage per acre (Table 39). Comparable costs on 47 farms in 1929 where stationary cutters were owned were $9.85 an acre, or $1.29 a ton, when the average yield was 7.6 tons an acre.

The average yield of silage was higher in 1928 than in 1929. The average cost of filling with the field harvester on 67 farms in 1929, where the yields averaged 7.5 tons, was $9.67 an acre, or $1.29 a ton. This is exactly the same rate a ton as with the stationary cutters in 1929.

Nearly all the farmer-owned stationary cutters were owned individually, but during the two-year period records were secured on 54 farms where the field harvesters were owned by two or more

farmers. The estimated cost on the farms where the machines were owned jointly was $1.20 a ton, compared with a cost of $1.27 a ton on 44 farms where the machines were owned individually.

The cost of filling with the power-take-off type of field harvester was the same as with the motor-mounted type pulled by horses, $1.22 a ton. On 10 farms, however, where the motor-mounted machines were pulled by tractors, the cost averaged $1.48 a ton.

TABLE 39.—COST OF MAKING SILAGE ON 145 ILLINOIS FARMS WHERE FILLING EQUIPMENT WAS OWNED[1]

Volume of cutting and items of cost	Field silage harvesters, 1928 and 1929			Stationary cutters, 1929
	Power-take-off machines	Motor-mounted machines		
		Horse-drawn	Tractor-drawn	
Number of farms	39	49	10	47
Total acres	839	706	95	822
Total tons of silage	6 880	5 816	893	6 286
Labor and power used per acre				
Man labor	$ 3.29	$ 3.32	$ 5.32	$4.43
Horse labor	1.25	2.02	1.83	2.24
Tractor use	2.11	1.16	2.29	1.08
Fuel and oil	.89	.97	1.41	.49
Field-harvester costs	1.84	1.92	2.41	....
Blower costs	.45	.49	.51	....
Stationary-cutter costs	....	....	....	.72
Binder costs	....	....	....	.44
Twine	....	....	....	.27
Other equipment	.10	.11	.13	.13
Buildings cost	.07	.07	.07	.05
Total cost	$10.00	$10.06	$13.97	$9.85
Labor and power used per ton				
Man labor	$ .40	$ .40	$ .56	$ .58
Horse labor	.15	.25	.19	.29
Tractor use	.26	.14	.24	.14
Fuel and oil	.11	.12	.15	.06
Field-harvester costs	.22	.23	.26	....
Blower costs	.06	.06	.06	....
Stationary-cutter costs	....	....	....	.09
Binder costs	....	....	....	.06
Twine	....	....	....	.04
Other equipment	.01	.01	.01	.02
Buildings cost	.01	.01	.01	.01
Total cost	$ 1.22	$ 1.22	$ 1.48	$1.29

[1]The rates charged for man labor, horse labor, tractor use, fuel, and wagon use were the same as used in estimating the cost of hand husking and machine husking (see footnote, pp. 371-72).

On the basis of estimates made by the operators as to the average life of the field silage harvesters, depreciation was figured on an expected life of twelve years, and the cutting of a total of 500 acres of corn. The average price paid for the machines when new was about $625. Since the records were secured on a farm basis rather than a machine basis, depreciation was charged at $1.25 an acre of corn. Interest was charged at 48¾ cents an acre, or 6 percent on an average valuation of $338.50 during the twelve years. This average valuation was calculated as follows:

$$\frac{\text{Initial cost of machine} \times \text{Average life} + 1}{\text{Average life} \times 2} = \text{Average value}$$

By the same method the average life of the blower was placed at twenty-four years, during which time it would put up 7,500 tons of silage. With an average initial cost of $225, depreciation was charged at 3 cents a ton and interest at 2¼ cents a ton.

The cost of housing the field harvester and blower was estimated by the operators at $3 a year, or 7¼ cents an acre of corn cut.

On the basis of a survey conducted in Henry county in 1922 and on the results of certain detailed cost data, an average life of fifteen years was estimated for the stationary cutters when 500 tons were cut each year. With an average initial cost of $375 a charge of 5 cents a ton was made for depreciation and 2.4 cents for interest.

Similarly the binder charge was based on an average life of 12.5 years, with the binder cutting 40 acres each year. The average initial cost of binders with bundle elevators was figured at $225, those without the elevators at $175. A charge of 35 cents an acre was made for those without elevators and 45 cents for those with elevators. Twine was charged at the price paid by the farmer.

Custom Charges. On 40 farms where stationary cutters were hired in 1929 to fill silos, the average cost to the silo owners was $1.37 a ton, while on 20 farms where field harvesters were hired, the cost in 1928 and 1929 was $1.35 a ton.[1] The yields where the field harvesters were hired averaged 8.6 tons an acre; where stationary cutters were hired, the average was only 7.3 tons. The amount paid for custom filling and the basis for determining the amount to be paid varied widely on these farms. Charges were made on the basis of the number of acres cut, the number of tons cut, the days or hours used, or a flat charge was made for the entire job.

A common method of charging for the use of stationary cutters was the hour basis, the amount depending on the number of men furnished. Payment was made most frequently on the ton basis in the case of the field silage harvesters. Because of the lower rate of cutting with the field harvester, it is doubtful whether it will ever be as commonly used as the stationary cutter for custom work.

Distribution of Costs. While total costs are practically the same whether filling silos with the field harvester or with the stationary cutter, the distribution of these costs is quite different. Man labor made up about 33 percent of the total estimated cost in the case of the field harvesters and 45 percent where the stationary cutters were used. Power, including horse labor, tractor use, and fuel was equal to about 42 percent in the case of the field harvesters and 39 percent with the stationary cutters. Other equipment necessary for filling, including housing costs, made up 25 percent and 16 percent respectively (Table 39).

Horse labor made up nearly 60 percent of the power costs where stationary cutters were used, 30 percent where the power-take-off type of field harvester was used, and 49 percent where the motor-mounted, horse-drawn machines were used.

Equipment costs were higher where the field harvesters were used (Table 40). The higher initial cost of equipment when the field harvester was used and the higher rate of depreciation account for this difference. Repairs were higher where stationary cutters and binders were used, except in the case of the motor-mounted machines pulled by tractors.

Variations in Cost. The cost of filling varied widely from farm to farm with both field harvesters and stationary cutters. On 88 farms

[1]In determining the cost where custom machines were used, the amount paid by the farmer was used plus the cost of other labor and materials calculated on the same basis as where the machines were owned.

TABLE 40.—AVERAGE ANNUAL COST OF EQUIPMENT USED IN FILLING SILOS

	Field harvesters			Field harvester blowers	Stationary cutters	Binders
	Power-take-off machines	Motor-mounted machines				
		Horse-drawn	Tractor-drawn			
Number of machines	39	49	10	98	47	43
Use per machine:						
Acres	21.5	14.4	9.5	16.7	17.5	19.3
Tons	177	119	89	139	134	144
Average annual cost per machine:						
Repairs	$ 3.36	$ 2.62	$ 6.36	$ .58	$ 2.61	$ 1.59
Depreciation	26.90	18.02	11.81	4.07	6.69	7.22
Interest	10.48	7.02	4.61	3.13	3.19	2.78
Total	40.74	27.66	22.78	7.78	12.49	11.59

using their own field harvesters, the cost varied from 68 cents to $2.68 a ton. On 16 of these farms the estimated cost was less than $1 a ton; on 19 farms it was more than $1.50 a ton, and on 4 farms it was above $2 a ton.

Where stationary cutters were used, the cost varied from 79 cents to $2.32 a ton. On only 4 farms was the cost estimated to be below $1, on only 9 farms was it more than $1.50, and on only one farm was it above $2.

The influence of amount of man labor used per ton of silage, on the cost per ton on these 88 farms, is shown in Table 41.

In the case of the field harvester the rate of cutting is determined by the speed of the harvester; additional men for hauling or for other operations can have no effect. Few of the stationary cutters, however, are run at their full capacity, and as more men are added for hauling, more silage is cut per hour. The most desirable number of men to use and the equipment to use depend on conditions on the individual farm (Table 42). Where field harvesters are used, a crew of 5 men, 1

TABLE 41.—RELATION BETWEEN AMOUNT OF MAN LABOR USED PER TON AND COST PER TON

Hours of man labor used per ton	Field harvester			Stationary cutter		
	Number of farms	Total corn cut	Average cost per ton	Number of farms	Total corn cut	Average cost per ton
		acres			*acres*	
.50– .99	23	408	$ .94	1	30	$1.01
1.00–1.49	42	788	1.24	14	293	1.11
1.50–1.99	17	264	1.53	11	239	1.40
2.00–2.49	4	39	1.91	14	149	1.35
2.50 or more	2	46	2.54	7	111	1.56

operating the cutter, 1 the blower, and 3 hauling, is sufficient unless the distance which the silage must be hauled is great. With the slow rate of cutting, no one is needed to tramp.

The two farms shown in Table 42, on which stationary cutters were used, illustrate two different sets of conditions. The interchangeability of labor and equipment is clearly shown. On the farm where

TABLE 42.—TYPICAL USE OF LABOR AND EQUIPMENT ON THREE FARMS WHERE STATIONARY CUTTERS AND FIELD SILAGE HARVESTERS WERE USED EFFICIENTLY, 1929

Organization of cutting crews	Field silage harvester	Stationary cutter	
		Small crew	Large crew
Acres in farm	420	420	279
Acres of corn cut for silage	28	65	16
Tons of silage cut	235	512	150
Hours cutter was used in filling silo	35	125	11.5
Size of cutter, inches	...	16	16
Size of tractor			
Cutter	3-plow	3-plow	3-plow
Blower	2-plow	.....	.....
Number of men, total	5	5	18
Cutting corn	..	1	3
Driving in field	..	..	3
Hauling	3	3	7
Operating cutter	1	1	2
Operating blower	1	..	..
Tramping	..	..	3
Number of binders	..	1	3
Number of wagons	3	3	7
Number of teams	3	3	7
Tons cut per cutter hour	6.7	4.1	13.0
Man labor used			
Per acre	6.51	9.84	13.21
Per ton	.78	1.25	1.41
Total estimated cost			
Per acre	$8.01	$9.96	$10.99
Per ton	$ .95	$1.27	$ 1.17

the small crew was used, the machine was owned by the operator. Two men were hired regularly by the month. Because of the large amount of silage to be cut, difficulty had been experienced previously in securing sufficient exchange labor. Two extra men were therefore hired by the day. Using a binder equipped with an elevator and 3 men for hauling, the 5 men filled the silos in twelve and one-half days. On the other farm a custom outfit was hired. Four dollars an hour was paid for the machine and the two men operating it. On this farm the important consideration was the keeping of the hours of machine use down to a minimum. A large crew was therefore organized and the silage was cut more than three times as rapidly as on the other farm, three binders, all equipped with elevators, being used for the

cutting operation. With three men driving the teams while loading, little time was lost by either men or machines. Where filling is done rapidly, as on this farm, tramping is necessary unless the silo is to be refilled at a later date.

Thus more man labor was used in making the silage with the larger crew, but the cost per ton was slightly less.

CUTTING AND SHOCKING

Cutting and shocking is a relatively unimportant method of harvesting corn in Illinois, only 3.3 percent of the 1929 crop being harvested in this manner. There is a wide variation in the importance of this method of harvesting in the different areas of the state. Less than 1 percent of the corn grown in east-central Illinois was cut for fodder in 1929, while 9 percent of that grown in the Chicago dairy area was harvested by this method. In the St. Louis dairy area 9.5 percent was cut and shocked. While a small part of that cut is fed without being husked, most of it is husked by hand in the field or is shredded.

Records of this method of harvesting were obtained on twenty farms in Clinton county in 1927 and 1928 (Table 43). An average of

TABLE 43.—LABOR USED AND ESTIMATED COST OF HARVESTING CORN BY CUTTING AND SHOCKING, HUSKING, AND CRIBBING, CLINTON COUNTY, ILLINOIS, 1927 AND 1928

Number of farms	20
Acres cut	135
Bushels of corn harvested	3 872
Tons of stover cut	181
Labor used per acre	
Man labor, hours	16.6
Horse labor, hours	16.9
Estimated cost per acre[1]	
Man labor	$3.61
Horse labor	1.71
Machinery and twine	.29
Total	$5.61

[1]Man labor was charged at 21.7 cents an hour; horse labor, at 10.1 cents.

16.6 hours of man labor and 16.9 hours of horse labor were used in cutting, shocking, husking, and cribbing an acre of corn. The total estimated cost of harvesting was $5.61 an acre. Binders were used in cutting the corn.

On six farms in Knox and Warren counties, 1923-1925, an average of 6.94 hours of man labor was used in cutting and shocking an acre of corn by hand. On seventeen farms in Champaign and Piatt coun-

ties, 1920-1926, an average of 7.7 hours of man labor was used per acre in cutting and shocking by hand.[1]

FEEDING OFF CORN

No special data were gathered with reference to feeding off corn. The practice of hogging-off corn is most important in the livestock areas in the west-central and northwest parts of Illinois. In these two areas in 1929, 7.3 percent and 6.2 percent of the corn was harvested

FIG. 8.—A CHEAP METHOD OF HARVESTING CORN ON LIMITED ACREAGES

in this way; in the southern part of the state, 1.2 percent was so harvested. Only 3.2 percent of the corn in the state as a whole was harvested in this way in 1929.

[1]More complete data on this method of harvesting corn are available from studies made in Ohio, where the method is used to a much larger extent. In Greene county, Ohio, an average of 7.86 hours of man labor is reported for cutting and shocking an acre of corn by hand. Where binders were used, cutting required 2.01 hours of man labor and 4.47 hours of horse labor and shocking, 3.28 hours of man labor. An average of 15.76 hours of man labor and 5.57 hours of horse labor was also used in husking and cribbing the corn from the shock where the average yield was 46.6 bushels an acre. (Ohio Agr. Exp. Sta. Bul. 396, 1926).

Shredding corn from the shock requires less total labor than hand husking. In Greene county, Ohio, an average of 12.1 hours of man labor and 13.7 hours of horse labor was used in shredding and cribbing an acre of corn yielding 41.1 bushels.

Records on 214 farms in 1927 (unpublished data), obtained by the U. S. Department of Agriculture and the Agricultural Experiment Stations in Ohio, Michigan, Indiana, and Illinois, showed that 9.6 hours of man labor were used in shredding and cribbing an acre of corn yielding 36 bushels. Where the yield was 18 bushels an acre, 7.4 hours of labor were used; while with corn yielding 56 bushels, 12.3 hours were used.

When corn is harvested by hogs or by other livestock, the labor necessary for harvesting by other means is saved, as is also the labor that would be required in feeding if the corn were cribbed. Furthermore the hauling of manure is eliminated.

Against these savings must be balanced certain disadvantages. When corn is harvested by stock, some temporary fencing is usually necessary and, in many cases, special provision must be made for water. Also, some loss of feed usually results. During dry seasons this loss probably is no more than when the corn is husked by machine or by hand in the field. In years when the ground is muddy, the loss may be quite high.

On farms where some corn is normally harvested direct by farm animals, the stock are turned in as soon as the corn is sufficiently mature to make good feed, usually two to four weeks before it is dry enough to husk and crib. The amount pastured depends on the number of livestock available and on weather conditions.

SUMMARY AND CONCLUSIONS

Corn is the most important crop grown in Illinois whether considered from the standpoint of a feed crop or of a cash crop. Its gross value is equal to about 50 percent of the farm value of all crops produced in the state. The income from the sale of corn makes up about 20 percent of the cash farm income.

About 89 percent of the corn crop in Illinois is husked from standing stalks and about 4 percent is harvested by each of the following methods: cut for silage, cut for fodder, harvested by livestock.

On individual farms the following are the chief factors that determine the most advantageous method of harvesting: (1) kind and amount of livestock raised; (2) availability of other roughages, particularly legume hay; (3) equipment for harvesting available on the farm; (4) the relation of the cost of different methods to the income that can be realized from feeding or from other usages. The control of the European corn borer may become another important factor in determining methods of harvesting corn in Illinois. Under corn-borer conditions the cost of control will be less where corn is cut than where it is husked from standing stalks. When new machinery for harvesting must be purchased, its relation to corn-borer control methods should be considered.

The choice between harvesting by husking in the field and harvesting by cutting is determined on individual farms by the need for nonleguminous roughage. The farmer who harvests his crop by husking

from the standing stalk has the choice of harvesting by hand or with mechanical huskers. The farmer who uses silage in his feeding operations has the choice of using the field silage harvester or the stationary cutter. The farmer who cuts and shocks his corn may cut by hand or may use a binder; he may also husk the corn from the shock by hand or may choose to use the husker-shredder.

Husking Corn From Standing Stalks

The total estimated cost of husking corn with the one-row husker in 1928 and 1929 was $3.55 an acre when all cash costs plus the value of labor, equipment, and power furnished by the farm were considered. The average cost was $2.98 an acre with two-row machines. With yields of 50 bushels to the acre, the cost was 7.1 and 6.0 cents per bushel, respectively, with one-row and two-row machines. The cost of hand husking (at 5½ cents a bushel, plus a dollar a day for room and board) was about 10½ cents a bushel, or $5.25 an acre.

Family labor made up about 70 percent of the labor used in husking with machines but only about 30 percent of the labor used in hand husking in the same area. As a practical matter, decision whether to husk by machine or by hand and whether to use one-row or two-row machines is based on the additional cost of the items that must be purchased for the different methods of harvesting. Eliminating the charges for items already available on the farm, such as family labor, horse labor, wagon use, and elevator use, the cost of harvesting was about 4.6 cents a bushel where one-row machines were used and 3.7 cents a bushel where two-row machines were used. These figures cover the cost of hired labor, repairs, fuel, oil, and interest and depreciation on the additional equipment that was necessary.

The one-row machines husked on the average a little over 100 acres a season. Ten of these machines, however, covered over 160 acres each. Altho the average of all two-row machines was 150 acres, twelve two-row machines husked over 200 acres each a season. Bushel costs were lower on the machines that covered the larger acreages.

In husking by machine there was little or no variation in acre-cost with differences in yield per acre, but the bushel-cost was much lower where the yields were higher. With one-row machines the cost per bushel where the yields averaged 50 bushels an acre was one cent less than where it averaged 40 bushels an acre; with two-row machines the difference was 1.3 cents.

The amount of man labor used per acre varied from farm to farm. Two one-row huskers and five two-row huskers used less than 1½

hours of man labor per acre. There were 15 one-row huskers and three two-row huskers that used over 3½ hours of man labor per acre. The cost of husking increased directly with increases in the amount of man labor used. The opportunity for individual farmers to lower their costs of husking is indicated by the fact that there were three farmers using one-row machines and 17 farmers using two-row machines who husked their corn at a cost of less than 5 cents a bushel. On the other hand, 52 operators using one-row machines and nine operators using two-row machines had costs higher than 8 cents a bushel. With the one-row machines the cost of husking ranged from less than 5 cents to more than 12 cents a bushel, and with the two-row machines from less than 5 cents to more than 8 cents a bushel.

The two-row machines left about twice as much corn in the field as did the one-row machines. On fields where the corn was picked up by hand, a bushel an acre was saved behind the one-row huskers as compared with 2 bushels where the two-row huskers were used.

The advantages of using mechanical huskers may be summarized as follows: (1) the cost per bushel is less than hand husking; (2) the husking operation takes less time and may be completed earlier in the season than is possible when husking by hand with the same number of men; (3) less dependence is placed on hired labor; (4) the work of husking with the machine is much easier than hand husking.

The points in favor of hand husking are: (1) it may often be done by the labor regularly employed on the farm, thus saving cash expense; (2) no capital is invested in equipment; (3) less corn is likely to be left in the field; and (4) stalks are not broken down so badly.

Silo Filling

There was little difference in the total cost of making silage with stationary cutters and with field harvesters when all labor, power, and equipment were evaluated. On 88 farms where power take-off and horse-drawn motor-mounted machines were used, the average cost of filling was $1.22 a ton; on 10 farms using tractor-drawn motor-mounted machines, $1.48 a ton; on 47 farms where stationary cutters were owned and used, $1.29 a ton; on 40 farms where stationary cutters were hired, $1.37 a ton; on 20 farms where custom field harvesters were used, $1.35 a ton.

The difference in the cost of harvesting varied little between stationary cutters and field harvesters when only the cash items are considered. On most farms family labor was used to a greater extent in filling with the field harvesters, but the overhead and operating costs on the filling equipment were also greater.

An average of 1.25 hours of man labor was used in cutting a ton of silage with the field harvester and 1.76 hours when filling with the stationary cutter. The number of men on the crew varied greatly with the individual machines. The most common number operating the field harvester was five or six. When owned stationary cutters were used, the crew commonly consisted of 10 to 12 men, while 15 to 18 men were often used when a custom machine was hired.

The method of cutting the corn in the field was also important in determining both size of crew and total quantity of man labor used in filling. On 47 farms on which the corn was cut with binders, the average crew consisted of about 10 men and 1.49 hours of man labor was used to a ton. On 26 farms where the corn was cut entirely by hand, an average crew of 16 men was used.

Significant variations were found in the amount of man labor used per ton of silage. Considering both stationary cutters and field silage harvesters, there were 28 farms where less than one hour of man labor was used per ton of silage. With the stationary cutters there were 14 farms and with the field silage harvesters 4 farms where more than 2½ hours of man labor was used per ton of silage.

The cost of filling silos varied directly with the amount of man labor used per ton. Where the amounts of man labor varied from 1 to 1½ hours per ton of silage, the cost was $1.24 per ton for field harvesters and $1.11 per ton for stationary cutters. Where the man labor used per ton of silage varied from 2 to 2½ hours, the cost was $1.91 per ton for field harvesters and $1.35 per ton for stationary cutters.

On the average, the small-sized crews were organized more efficiently than the larger crews, the total man power used per acre and per ton increasing as the size of the crew increased.

The principal advantages of the field silage harvesters are: (1) the smaller amount of man labor required in filling as compared with the stationary cutters; (2) the smaller crews necessary; (3) the easier work connected with the filling operation. The advantages of the stationary cutter are: (1) the greater possible cutting capacity, and (2) the smaller amount of special equipment necessary.

Other Methods of Harvesting

The importance of cutting and shocking as a method of harvesting corn in different areas in the state varies greatly. In east-central Illinois less than 1 percent of the corn is cut for fodder, while in the Chicago dairy area 9 percent and in the St. Louis dairy area 9.5 per-

cent is harvested by cutting and shocking. Records from 20 farms in Clinton county, Illinois, for 1927 and 1928, indicate an average of 16.6 hours of man labor used per acre in cutting, shocking, husking and cribbing corn. The total estimated cost of harvesting by this method was $5.61 an acre.

In the west-central and northwest parts of the state, 7.3 percent and 6.2 percent of the corn was fed off in 1929, according to the United States Census. This is more than twice the percentage for the state as a whole. Where corn is harvested by livestock, there is a triple saving of labor; that is, the labor that would be necessary to harvest by other means, the labor required in feeding if the corn were cribbed, and the labor that would be required to haul and spread the manure produced by the stock. The disadvantage of harvesting corn by feeding it off lies in the fact that additional expense is necessary to provide temporary fencing, and very often water must be hauled to the livestock. There is also a certain amount of loss of grain, particularly if the weather conditions are unfavorable.

TABLE 44.—AMOUNTS OF LABOR USED AND ESTIMATED COST OF HARVESTING AN ACRE OF CORN BY DIFFERENT METHODS IN ILLINOIS, 1928 AND 1929

Method of harvesting	Number of acres	Average yield	Labor used		Estimated cost			
			Man	Horse	Labor	Power	Equipment and materials	Total
		bu.	*hrs.*	*hrs.*				
Hand husking[1]	11 945	48.8	5.23	10.19	$3.34	$1.43	$ .34	$5.11
Machine husking								
One-row husker	10 747	42.9	2.72	3.28	.90	1.61	1.04	3.55
Two-row husker	10 162	45.0	2.21	2.86	.73	1.29	.96	2.98
Cutting for silage								
With field harvester	1 545	49.2	10.06	11.45	3.31	4.20	2.55	10.06
With stationary cutter	822	44.3	13.44	16.02	4.43	3.82	1.60	9.85
Cutting and shocking[2]	135	28.7	16.60	16.90	3.61	1.71	.29	5.61

[1]Champaign and Piatt counties, 1920 to 1928. [2]In Greene county, Ohio, where more corn is cut for fodder, an average of 21.1 hours of man labor and 10.1 hours of horse labor were used in cutting with a binder, shocking, husking, and cribbing an acre of corn yielding 46.6 bushels; the total cost was $9.13 an acre. Ohio Agr. Exp. Sta. Bul. 396.