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THE COMBINE IN MINNESOTA

What is a Combine?

The combine is a machine that cuts, threshes, and cleans small grain in one operation. It was first used in Minnesota in 1927. Eleven machines were in use that year and 49 during the harvest season of 1928. Sixty percent of these machines cut a 10 or 12 foot swath and 40 per cent a 16 foot swath. The combines are usually drawn by a tractor and the cutting and threshing mechanism is operated by an auxiliary engine mounted on them. The grain is collected in a 30 to 60 bushel tank from which it is spouted into a wagon or truck.

The chief advantages of the combine harvester over the binder stationary thresher method of harvest as practiced in Minnesota is the saving of man labor, the speeding up of the harvesting operation, and the reduction in the total costs of harvest. The chief disadvantages are the difficulty of getting the grain sufficiently dry to keep in storage after threshing and the loss of straw. To offset this disadvantage of wet grain the windrower has come into general use in this state. The windrower cuts the grain and deposits it in a windrow on top of the stubble where it dries out. A pickup attachment on the combine in place of the sickle and reel makes it possible to pick up this and thresh it when dry enough to store safely. This use of the windrower makes it necessary to go over the ground twice.

In order to learn something of the cost and rate of performance of combine harvesters a study covering about 20 machines was made by the University of Minnesota during the harvest season of 1928. Complete detailed costs were obtained on five machines each of 10 and 16 foot widths and on three machines of 12 foot width. Windrowers were used with nine of the machines studied. A 12 foot windrower is used with a 10 foot combine and a 16 foot windrower with a 12 or 16 foot combine.

What is the Capacity of a Combine?

The average rate of combining was 2.6 acres per hour for the 10 foot machine, 3.1 acres for the 12 foot machine and 4.2 for the 16 foot machine. The average full working day was eight hours. On this basis the daily capacity of the three machines would be 21 acres, 25 acres and 33 acres respectively for the 10, 12 and 16 foot machines. The average rate of performance for the 12 foot windrower was $4\frac{1}{2}$ acres per hour and for the 16 foot machine 6 acres per hour.

What is the Cost of Combine Harvesting?

The costs of combine harvesting vary somewhat according to the skill of the operator, the acreage over which the overhead costs may be distributed and similar variables. In this study man labor has been charged at 40 cents per hour, gasoline

at 22 cents per gallon, oil at 75 cents per gallon, a three plow tractor at \$1.00 per hour and a four plow at \$1.20. Interest has been charged at 6 per cent and depreciation based on a seven year life. The average purchase price of these combines was \$1336 for the 10 foot machines, \$1849 for the 12 foot machines and \$2216 for the 16 foot machines. The average purchase price of the windrowers was \$250 and \$366 respectively for the 12 and 16 foot machines and \$85 and \$92 respectively for the pickup attachments. The cost per acre of harvesting and threshing grain with different sized combines is shown in Table 1. These data have been adjusted to the approximate relative capacities of the different sizes of machine. The cost of combining standing grain and also the cost of cutting

TABLE I. Average Cost per Acre of Combine Harvester Operation

Width of cut Acres combined	Without Windrower			With Windrower		
	10-ft. 500	12-ft. 600	16-ft. 800	10-ft. 500	12-ft. 600	16-ft. 800
Man labor	\$.47	\$.48	\$.43	\$.59	\$.61	\$.56
Horse and truck work	.17	.17	.17	.17	.17	.17
Tractor work	.44	.31	.27	.70	.52	.48
Machine charge	.75	.78	.77	.87	.92	.88
Total cost	1.83	1.74	1.64	2.33	2.22	2.09

the grain with a windrower and then picking it up and threshing it with a combine is given. The extra cost of this latter process is 45 to 50 cents per acre. The most important variable affecting acre costs is the acreage covered by a machine. The cost per acre of a 16 foot combine harvester threshing only 200 acres per year is \$2.75 per acre as compared with \$1.18 per acre when 1000 acres are cut by one machine.

What Are the Advantages and Disadvantages of the Combine as Compared with the Binder Thresher Method of Harvest?

A comparison between combine and binder-thresher costs in 1928 is shown in Table II.

TABLE II. Cost Per Acre of Harvesting and Threshing Grain

	Combine and Windrower			8-foot	7-foot
	10-ft.	12-ft.	16-ft.	binder & stationary thresher N.W.Minn.	binder & stationary thresher S.E.Minn.
Acres threshed	500	600	800	200	101
Man labor	\$.59	\$.61	\$.56	\$1.40	\$2.40
Man and truck work	.17	.17	.17	.60	1.02
Tractor work	.70	.52	.48	--	--
Machine charge	.87	.92	.88	.22	.25
Twine	--	--	--	.28	.36
Threshing charge	--	--	--	.95	1.50
Total cost	2.33	2.22	2.09	3.45	5.53

The most important saving effected by the combine over the binder thresher costs is in man labor. This is especially important since farm help is both scarce and high priced at harvest time. A crew of three men can operate a combine and haul the grain. On large farms this crew can be furnished from the regular labor supply of the farm. The use of the combine also relieves the farm housewife of the task of boarding a crew of harvest and threshing hands. The large acre capacity of the combine together with the fact that as soon as a field is cut and threshed it is ready for the plow makes possible earlier fall plowing and furnishes employment during weather not suitable for harvest operations. This method of harvesting leaves the straw evenly distributed over the field so that it can be plowed under and its humus and fertility value utilized.

On the other hand, the combine is an expensive piece of machinery. The small farmer can not afford one unless he can provide sufficient use for it by doing custom work as is commonly done with stationary threshers. Most Minnesota farms are live-stock farms and need the straw for feed or bedding. The straw may be left in windrows or bunches by the combine and picked up with a hay loader or buck rake. This involves considerable labor and the straw thus recovered has either been cut so ripe or exposed to the weather so long that it has little or no feeding value. Uneven ripening of grain and the presence of weeds increase the moisture content of combine threshed grain. Most of these conditions can be offset to a considerable extent by use of the windrower but this takes somewhat more time and expense and involves more mechanical loss. According to studies by the United States Department of Agriculture the combining of standing grain direct involves less loss than the binder thresher method of harvesting, but the delay of harvest until grain is dry enough to store involves the risk of wind and hail damage, crinkling and shattering. If this delay and risk is obviated by the use of the windrower this operation itself entails some additional loss over straight combining.

To What Kind of Farms is the Combine Adapted?

The combine is new in Minnesota. Most of the farmers who were operating machines in 1928 were inexperienced. The season was unfavorable for harvesting operations because of excessive rainfall. While the data presented give some idea of the elements of cost in combine harvester operation and of the relative cost of the combine and the binder thresher method of harvest, more experience will be needed before definite conclusions can be drawn as to the adaptation of the combine harvester to Minnesota conditions. At least it seems likely that the combine will be more generally used on large farms with a large percentage of the land in small grain and on which relatively less livestock are maintained. Such farms are most numerous in the west central and northwestern part of the state. Farms in southern Minnesota are usually smaller in size and more heavily stocked and the straw produced is needed for feeding and bedding. Until some economical method of straw recovery can be developed and the extension of combine use will likely be confined mainly to large grain growing farms with relatively little livestock.

George A. Pond

PRICE INDEX NUMBER FOR MAY 1929

The index number of Minnesota farm prices for the month of May 1929 was 112.4 as compared with 100, which represents the average of the prices prevailing in the three months of May 1924-25-26. The corresponding index for May 1928 was 113.7 and for May 1927, 109.0.

The price index of 112.4 for the past month is the net result of increases and decreases in the prices of farm products in May 1929 over the average of May 1924-25-26, as shown in the following list:

Principal Farm Products which Showed Price Increases and Decreases
in May 1929 when compared with Average Prices in
May 1924-25-26

<u>Increase in May 1929</u>		<u>Decrease in May 1929</u>
Corn	Lambs-sheep	Wheat
Oats	Chickens	Barley
Hogs	Eggs	Rye
Cattle	Butterfat	Flax
Calves	Milk	Potatoes
		Hay

The May 1929 prices of these products have also been compared with the prices of April 1929 for increases and decreases. The products are shown according to this comparison in the following table:

Principal Farm Products which Showed Price Increases and Decreases
in May 1929 when Compared with April 1929

<u>Increase in May 1929</u>	<u>Decrease in May 1929</u>		<u>No Change</u>
Cattle	Wheat	Potatoes	Calves
Chickens	Corn	Hogs	
Eggs	Oats	Lambs-sheep	
	Barley	Butterfat	
	Rye	Hay	
	Flax	Milk	

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