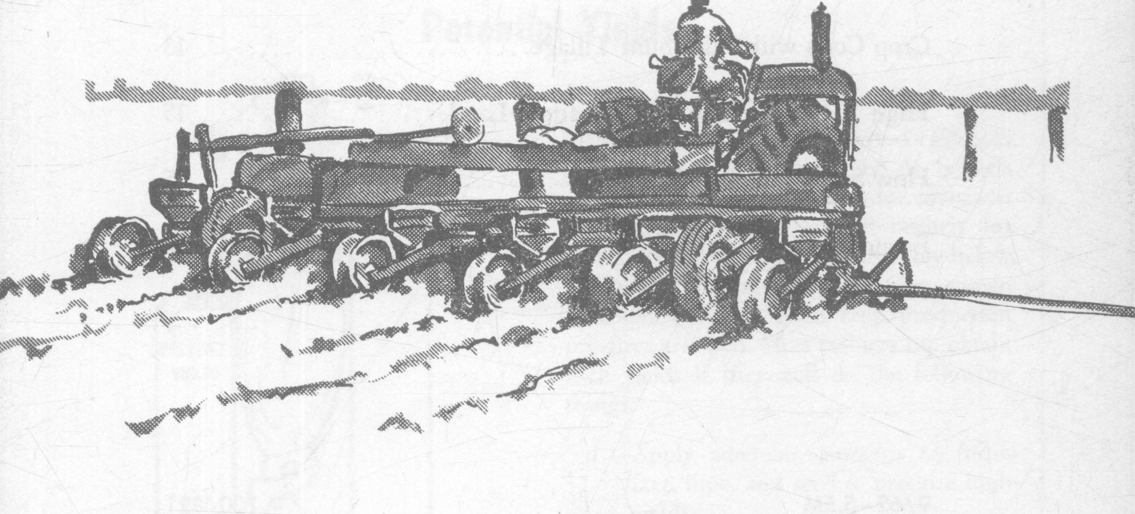
Bulletin 423

Crop Economics for OHIO



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CROP ECONOMICS FOR OHIO

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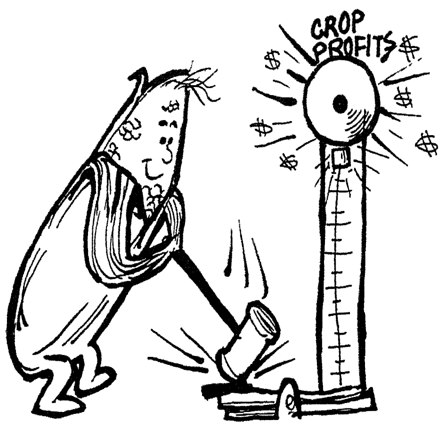
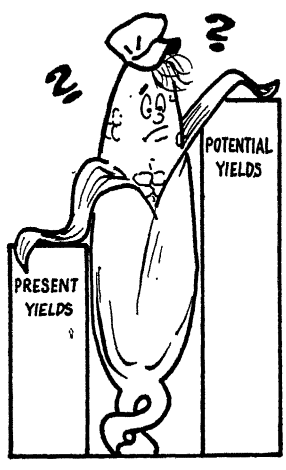
The economics of crop production is simply an analysis of the dollar costs and returns associated with raising and harvesting crops. Profits from crops vary considerably on Ohio farms because of differences in yields, size of farms, and efficiency of labor and machinery used.

A good crop farmer usually receives a higher hourly return for his productive labor than a livestock farmer. However, income from crops is limited because crops can be raised in Ohio for only about six months out of a year. To make a satisfactory income from crops alone, a farmer will have to operate a fairly large farm to obtain the necessary volume of business. He also will have to produce crops efficiently to obtain low costs per bushel or ton produced.



Potential Yields



ARE YOU GETTING POTENTIAL YIELDS ?

During the five-year period 1956-60, crop yields in Ohio averaged 61 bushels per acre for corn, 25 bushels for soybeans, 48 bushels for oats and 28 bushels for wheat. These yields are considerably below the potential levels of production shown in Table 1, when good crop production practices are used. Most farmers can obtain such yields if they will do the following things:

1.—Apply adequate amounts of fertilizer, lime, and seed to produce high yields.

[1] Extension Economist in Farm Management, The Ohio State University, and Associate Professor, Ohio Agricultural Experiment Station. The authors are staff members of the Department of Agricultural Economics and Rural Sociology.

2.—Plant high-yielding varieties of crops at the right time.

3.—Provide adequate drainage.

4.—Use erosion-control practices on sloping land that erodes easily.

5.—Control weeds, insects, and plant diseases.

Table 1—Potential Crop Yields for Ohio

(Based on using the best production practices known at the present time)

Crop	Dark Colored Soils	Light Colored Soils
	(bushels per acre)	(bushels per acre)
Corn	110	90
Soybeans	37	25
Wheat	35	33
Hay	4.5	3.5

Source: Department of Agronomy, The Ohio State University.

Crop Costs and Returns

A 1958 crop production study of 31 family-size farms in Preble, Miami, Madison, Fayette, and Pickaway counties showed that net returns from corn averaged $16.15 an acre; soybeans, $15.75; and wheat, $5.20. These average profits were left after making a land charge of $16.50 an acre and after charging all labor used at $1.50 an hour.

This same method of figuring showed that oats produced an average loss of $9.60 per acre. Alfalfa, clover, and timothy hays also showed losses of $2.50 per acre when only one cutting was made and the meadow was not pastured the rest of the season. However, two cuttings of hay gave a profit of $7 an acre. A detailed listing of the growing, harvesting, and storing expenses for the various crops is shown in Table 2. Costs of marketing are not included in the total expenses.

Yields per acre used in calculating gross receipts for the different crops were as follows: corn, 75 bushels; soybeans, 30 bushels; oats, 55 bushels; wheat, 30 bushels; one cutting of hay, 1.8 tons; and two cuttings of hay, 2.9 tons. These production figures are the averages of the yields the farmers said they normally produced.

All costs were based on 1958 production methods and prices. Labor charges were calculated at $1.50 an hour with the laborer providing his own house and food. The average amount of time reported by these farmers to grow and harvest an acre of each crop was: corn, 6.6 hours; soybeans, 4.9 hours; oats, 4.2 hours; wheat, 3.9 hours; and hay, 4.4 hours.

Tractor and machinery charges were figured on the basis of size and number of hours of use in a year. This method gave an average tractor charge of $1.23 an hour including fuel and oil used. The average number of tractor hours used per acre by the farmers was as follows: corn, 5.7; soybeans, 4; oats, 3.4; wheat, 3; and hay, 2.1 hours for one cutting.

Table 2—Average Yields, Receipts, Expenses, and Profits per Acre for Farm Crops Produced on a Group of Family-Size Farms Averaging 220 Acres, West Central Ohio, 1958

	Corn	Soybeans	Oats	Wheat	Hay 1 Cutting	Hay 2 Cuttings
Average Yields	75 Bu.	30 Bu.	55 Bu.	30 Bu.	1.8 Ton	2.9 Ton
Receipts[1]	$75.00	$60.00	$35.75	$52.50	$36.00	$58 00
Expenses						
Man Labor	9.95	7.35	6.25	5.80	6.65	11.55
Tractor	7.05	4.80	4.35	3.65	2.60	5.00
Machinery	7.65	7.85	7.40	7.70	7.95[2]	13.15[3]
Fertilizer	10.40	2.75	4.60	5.65	.00	.00
Manure	5.10	1.25	2.50	2.55	.00	.40
Lime	.30	.55	.45	.45	.30	.30
Seed	1.75	3.15	3.30	5.00	4.30	4.30
Spray	.15	.05	.00	.00	.20	.10
Land	16.50	16.50	16.50	16.50	16.50	16.50
Total	58.85	44.25	45.35	47.30	38.50	51.30
Profit	16.15	15.75	— 9.60	5.20	— 2.50	6.70

[1] Prices used to determine receipts were as follows: corn, $1 bushel; soybeans, $2; oats, $.65; wheat, $1.75; and hay, $20 a ton.

[2] Includes $1.20 for baling twine and wire.

[3] Includes $1.85 for baling twine and wire.

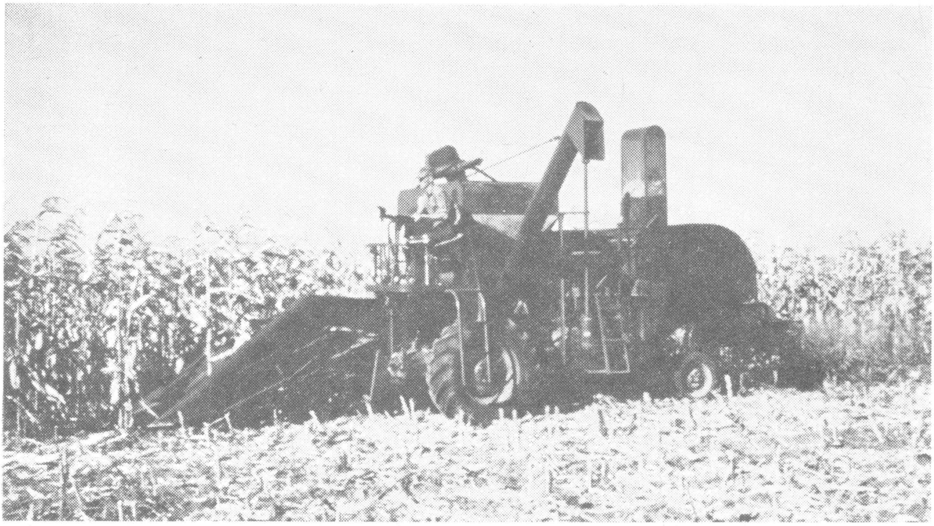
In calculating fertilizer and manure costs, no charge was made against the meadow crop. Computations showed that meadows made up of alfalfa or other legumes would add enough nitrogen to offset at least the value of the phosphorus and potash removed in the hay crop. Consequently, the value of all fertilizer and manure applied to the rotated land was prorated to the grain crops on the basis of the way these crops remove nitrogen, phosphorus, and potash from the soil. Fertilizer was charged at actual cost, and manure was valued at $2 a ton.

Cost of lime was prorated equally among the various crops grown on the rotated land. Price paid per ton averaged about $3.60.

Land charges were figured on a five percent return on a $285 cropland valuation without buildings, plus an annual tax charge of $2.25 an acre.

Income from straw sales was not included in the receipts because it is difficult to calculate due to an undependable market for straw. Income from the sale of straw seldom covers more than the cost of harvesting and the loss of mineral nutrients sold.

In determining which crops are to be grown, farmers should consider factors other than the relative profits per acre as they were calculated in this study. The livestock program, markets available, soil conservation, government programs, and other factors should be considered. Although meadows do not appear to be as profitable as corn and soybeans, a certain amount of meadow crop is desirable on some farms to maintain organic matter, improve soil tilth, and control erosion.



Efficient use of equipment reduces crop costs per acre. Larger farms on the average have lower machinery costs per crop acre than small farms.

How Size of Farm Affects Crop Costs

A 1958 crop production study of 124 farms in Preble, Miami, Madison, Fayette, and Pickaway counties showed that crop costs per acre declined as the size of farm increased. This reduction in costs per acre was particularly noticeable for farms having less than 400 crop acres. For example, the cost of producing an acre of corn declined about $6.50 when size of farm was increased from 100 to 400 crop acres.

But a further decline of only $2.50 an acre occurred when size of farm was increased from 400 to 700 crop acres. In other words, most of the reduction in costs per acre resulting from the use of larger tractors and field machinery were obtained when farms reached 400 crop acres. This was because the size of machines and intensity of use did not increase much on farms above this acreage.

Crop costs per acre were reduced by the following amounts when the rotated land was increased from 100 to 700 acres per farm: corn, about $9; soybeans, $8; wheat, $5.50, and one cutting of hay, $4.40. These reductions in cost were due to lower charges per acre for man labor, tractor power, and machinery use. More acres of land in the farming unit will not reduce expenditures per acre for seed, spray, lime, and mineral nutrients unless quantity purchases result in lower prices per unit purchased.

On an hourly basis, machinery costs rose as size of equipment increased. But on an acre basis, machinery charges were about the same regardless of machine size, when each piece of equipment was used the same number of hours. In other words, as the size of machine increased, savings in time amounted to enough to keep machinery charges approximately the same on an acre basis when the hours of use remained the same.

Reductions in machinery costs per acre on large farms can be attributed mainly to the efficient use of equipment during more hours each year. On the 160-acre farms, corn pickers were used on the average less than 50 hours a year on about one-fourth of the farms; combines were used less than 50 hours annually on half of the farms. But on the 640-acre farms, corn pickers were used over 100 hours a year on about 85 percent of the farms; and combines were used more than 100 hours annually on more than half of the farms. These figures include custom work done on other farms.

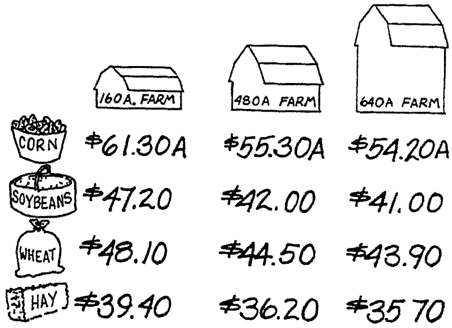
More hours of tractor use were the main reason why this cost item was lower on large farms than on small ones. On the 160-acre farms, about three-fourths of the farmers used their tractors 350 hours or less each year. But on the 640-acre farms, about half of the farmers used their tractors 500 or more hours a year.

Labor costs per acre for corn, soybeans, and wheat declined somewhat as size of farm increased because larger equipment reduced the amount of time required to perform a specific job. But for hay, labor charges did not decline much when more acres were added to the farming unit because the same size mower and rake and about the same size baler were used regardless of farm size.

Increasing the hours of productive use of equipment will lower tractor and machinery costs per acre.

Chart 1

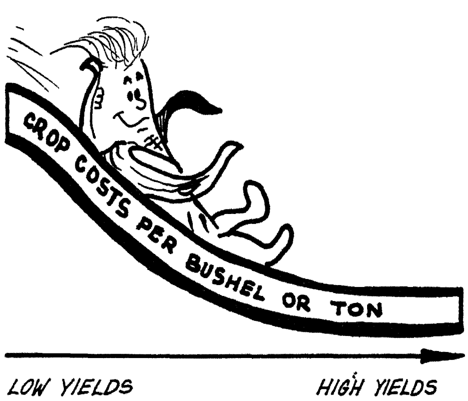
Crop Costs per Acre Go Down as Size[1] of Farm Goes Up



[1] 80 percent of the farm sizes given here are cropland.

Source: These figures were taken from an Ohio Agricultural Experiment Station study of 124 farms in west central Ohio in 1956.

Crop Yields Affect Crop Costs

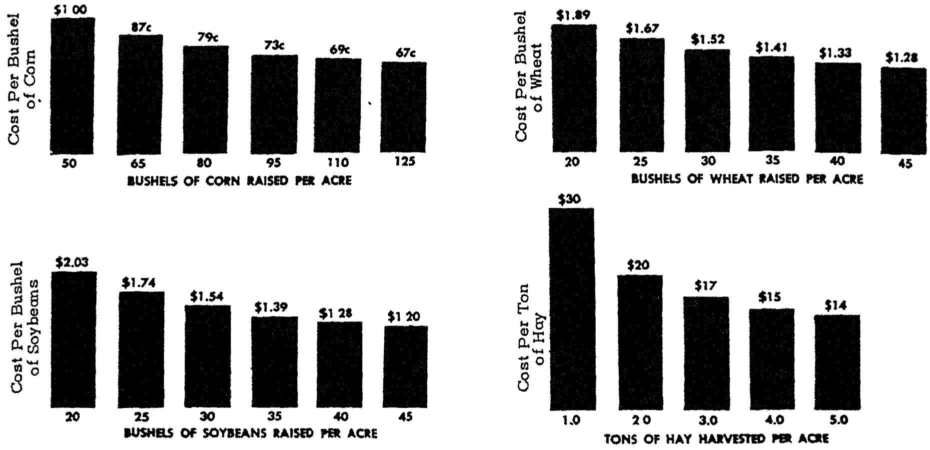


One of the best ways to reduce the cost of producing a bushel of grain or a ton of hay is to produce high yields per acre. Ninety bushels of corn per acre can be produced on a 220-acre farm in west central Ohio for about 75 cents a bushel, but 50 bushels per acre will cost about a dollar. Thirty-five bushels of wheat per acre can be produced for about $1.40 a bushel, but 20 bushels per acre will cost about $1.90. Four tons of hay per acre can be produced for about $15 a ton, while a yield of only one ton per acre will cost about $30.

These figures show that high yields can reduce the cost of producing a bushel of

Chart 2

Increased Yields Reduce Crop Costs per Bushel on Ton



Source: O.A.E.S. study of west central Ohio farms, 1958.

grain by about 25 percent and the cost of producing a ton of hay 50 percent. These reductions in costs per unit of output are considerably greater than the reductions usually made by adding more acres of land to the farming unit. This same west central Ohio study showed that total crop costs per acre could be reduced only 11 percent by increasing size of farm from 160 to 640 acres.

Cost of producing a ton of hay and a bushel of corn, soybeans, and wheat, when different yields are obtained, are shown in the bar diagram. (Chart 2) In making these calculations, costs of man labor, tractor power, and machinery use were based on a 1958 labor and machinery study of 124 farms in west central Ohio.

High crop yields can be produced cheaper per bushel or ton than low ones because most crop expenses do not increase in the same proportion as yields. The main exceptions are expenditures for fertilizer and lime. On an acre basis, costs of plowing, discing, planting, and cultivating are about the same regardless of the size of yield obtained.

The most efficient crop farmer may not have the lowest costs per acre because of larger expenditures for fertilizer, lime, seed, and higher costs of harvesting larger yields. But he should make considerably more profit per acre than less efficient crop farmers because of higher yields and lower production costs per bushel or ton produced.

Profits from Efficient Crop Production Programs

Calculations in Tables 3 to 6 show that a crop farmer who produces high yields has higher crop costs per acre than those getting lower yields because of larger expenditures for fertilizer, lime, seed, spray material, drainage installations, and harvesting. However, profits per acre are considerably greater when the most efficient crop production practices are used because the receipts usually increase much faster than the increase in expenses incurred when producing high yields.

The figures show that a 120-bushel-corn-yield level of farming produced receipts that are 85 percent higher than a 60-bushel corn yield. But total expenses are only 64 percent higher. Man labor, tractor power, and machinery charges are 45 percent higher; but fertilizer charges are more than three times higher; land charges are 40 percent higher to pay for additional drainage installations and additional taxes on the higher land value.

Receipts, expenses, and profits in tables 3 to 6 are calculated for four different yield levels produced by a rotation of corn, soybeans, wheat and one year of hay. These computations are made on a rotation basis to eliminate the extremely difficult, if not impossible, problem of accurately determining the carry-over effects of fertilizer to succeeding crops.

The profits from the different yield levels should be compared by adding the profit figures for the various crops in the rotation and dividing by four. This gives the average annual profits per acre for each yield level. Profits for individual crops cannot be determined by comparing the calculated profits with each other because no attempt was made to allocate the fertilizer charges to the various crops as was done in Table 2. Average annual profits per acre over all costs for the various yield levels are as follows: 60 bushels of corn per acres, $2.05; 80 bushels of corn per acre, $6.76; 100 bushels of corn per acre, $11.20; and 120 bushels of corn per acre, $12.37.

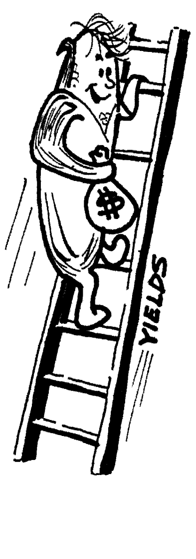


Table 3—Calculated Receipts, Expenses, and Profits from Farming Brookston Soil When a 60-Bushel-Per-Acre Corn Yield Is Obtained

	Rotation			
	Corn	Soybeans	Wheat	Hay
Yield per Acre	60	22	24	1.5
Receipts[1]	$60.00	$44.00	$42.00	$27.00
Expenses				
Man Labor[2]	10.35	8.05	5.00	5.50
Tractor Power	8.50	6.85	3.95	2.85
Machinery	7.00	6.55	5.40	4.05
Baling Twine	.00	.00	.00	1.00
Lime	.00	.00	.00	.00
Fertilizer	6.50	.00	9.75	.00
Seed	1.75	2.45	4.80	4.50
Land Charge	15.00	15.00	15.00	15.00
Total	49.10	38.90	43.90	32.90
Profit[3]	10.90	5.10	− 1.90	− 5.90

[1] Corn, $1 bu.; Soybeans, $2 bu.; Wheat, $1.75 bu.; Hay, $18 ton.
[2] Valued at $1.50 an hour.
[3] Average profit per acre from all crops: $2.05.

Table 4—Calculated Receipts, Expenses, and Profits from Farming Brookston Soil When an 80-Bushel-Per-Acre Corn Yield Is Obtained

	Rotation			
	Corn	Soybeans	Wheat	Hay
Yield per Acre	80	26	28	2.4
Receipts[1]	$80.00	$52.00	$49.00	$43.20
Expenses				
Man Labor[2]	11.30	8.20	5.30	9.50
Tractor Power	9.15	7.00	4.25	5.15
Machinery	7.65	6.75	5.70	7.20
Baling Twine	.00	.00	.00	1.55
Lime	.50	.50	.50	.50
Fertilizer	11.40	2.50	13.00	.00
Seed	2.10	2.65	4.90	4.75
Spray	.40	.00	.00	.75
Land Charge	16.00	16.00	16.00	16.00
Total	58.50	43.60	49.65	45.40
Profit[3]	21.50	8.40	—.65	—2.20

[1] Corn, $1 bu.; Soybeans, $2 bu.; Wheat, $1.75 bu.; Hay, $18 ton.
[2] Valued at $1.50 an hour.
[3] Average profit per acre from all crops: $6.76.

Table 5—Calculated Receipts, Expenses, and Profits from Farming Brookston Soil When a 100-Bushel-Per-Acre Corn Yield Is Obtained

	Rotation			
	Corn	Soybeans	Wheat	Hay
Yield per Acre	100	30	32	3.3
Receipts[1]	$100.00	$60.00	$56.00	$59.40
Expenses				
Man Labor[2]	12.25	8.35	5.70	12.25
Tractor Power	9.80	7.10	4.55	6.45
Machinery	8.35	6.95	6.00	9.25
Baling Twine	.00	.00	.00	2.15
Lime	1.00	1.00	1.00	1.00
Fertilizer	18.40	4.00	16.00	.00
Seed	2.35	2.85	5.10	5.05
Spray	.70	.00	.00	1.00
Land Charges	18.00	18.00	18.00	18.00
Total	70.85	48.25	56.35	55.15
Profit[3]	29.15	11.75	—.35	4.25

[1] Corn, $1 bu.; Soybeans, $2 bu.; Wheat, $1.75 bu.; Hay, $18 ton.
[2] Valued at $1.50 an hour.
[3] Average profit per acre from all crops: $11.20.

Fertilizer applications needed to produce the different crop yields are shown in Table 7. These recommendations, which were made by the Department of Agronomy at The Ohio State University, are based on the best research and field data available for Brookston soil. Although this soil type is limited mainly to west central Ohio, the preceding conclusions on the economics of good crop production should apply to most soils that have a potential corn yield of 100 bushels or more per acre.

Table 6—Calculated Receipts, Expenses, and Profits from Farming Brookston Soil When a 120-Bushel-Per-Acre Corn Yield Is Obtained

	Rotation			
	Corn	Soybeans	Wheat	Hay
Yield per Acre	120	33	35	4.0
Receipts[1]	$120.00	$66.00	$61.25	$72.00
Expenses				
Man Labor[2]	13.20	8.45	5.95	15.00
Tractor Power	10.45	7.20	4.80	8.10
Machinery	9.00	7.10	6.20	11.75
Baling Twine	.00	.00	.00	2.60
Lime	1.50	1.50	1.50	1.50
Fertilizer	29.85	4.00	18.20	.00
Seed	2.60	3.00	5.15	5.25
Spray	.90	.00	.00	1.00
Land Charge	21.00	21.00	21.00	21.00
Total	88.50	52.25	62 80	66.20
Profit[3]	31.50	13.75	— 1 55	5.80

[1] Corn, $1 bu.; Soybeans, $2 bu.; Wheat, $1.75 bu.; Hay, $18 ton.
[2] Valued at $1.50 an hour.
[3] Average profit per acre from all crops: $12.37.

Table 7—Yields per Acre and Fertilizer Used in Calculating Profits from Farming Brookston Soil

	Rotation			
	Corn	Soybeans	Wheat	Hay
Yield per Acre	**60 bu.**	**22 bu.**	**24 bu.**	**1.5 tons**
Fertilizer Used	200 lbs. 4-16-16	None	300 lbs 4-16-16	None
Yield per Acre	**80. bu.**	**26 bu.**	**28 bu.**	**2.4 tons**
Fertilizer Used	350 lbs. 4-16-16	125 lbs. 0-20-0	400 lbs. 4-16-16	None
Yield per Acre	**100 bu.**	**30 bu.**	**32 bu.**	**3.3 tons**
Fertilizer Used	45 lbs. Nitrogen 400 lbs. 4-16-16	200 lbs. 0-20-0	25 lbs. Nitrogen 400 lbs. 4-16-16	None
Yield per Acre	**120 bu.**	**33 bu.**	**35 bu.**	**4.0 tons**
Fertilizer Used	100 lbs. Nitrogen 550 lbs. 4-16-16	200 lbs. 0-20-0	30 lbs. Nitrogen 450 lbs. 4-16-16	None

Economics of Different Cropping Programs

Labor income figures in Table 8 show the relative profitability of three different rotations, four different levels of yields, and two ways of using the meadow crops. These figures show that one of the best ways to increase profits is to raise yields to the potential yield level for the soil type involved.

On land that is not subject to erosion and is adapted to several years of corn in the rotation, more acres of corn usually mean higher profits from crops. This is especially true when the meadow crop is not harvested and the entire growth is plowed under for soil improvement purposes, or when increased amounts of nitrogen are applied. A high percentage of meadow crops is usually difficult to justify on level land from an economic standpoint unless they are harvested and sold or are fed to efficient livestock.

For the most profitable crop production, the combination of crops grown should be examined periodically to determine whether more should be grown for cash or if more should be marketed

Table 8—Calculated Average Labor Income[1] per Acre from Farming Brookston Soil for Different Cropping Systems and Under Various Methods of Management

	Corn Yield Per Acre			
Rotation	60	80	100[2]	120[2]
Corn, Soybeans, Wheat, Hay	$ 9.25	$15.35	$20.85	$23.00
Corn, Corn, Wheat, Hay	11.90	18.40	23.90	26.55
Corn, Corn, Corn, Wheat, Hay	12.25	19.15	24.35	27.10
Corn, Soybeans, Wheat, Meadow (No Meadow Harvested)	5.35	9.35	12.15	12.55
Corn, Corn, Wheat, Meadow (No Meadow Harvested)	7.95	12.45	15.20	16.10
Corn, Corn, Corn, Wheat, Meadow (No Meadow Harvested)	9.10	14.40	17.40	18.70

[1] Average return to labor and profit per acre for the cropping system.
[2] For first year corn. Second and third year corn yields slightly lower than first year.

through livestock. Many farmers continue to follow the same rotations year after year because of custom and habit. New developments in varieties, reductions in fertilizer costs, and changes in markets often change considerably the most profitable combination of crops that should be grown on a particular soil type.

The following are generally considered high profit crops: corn, soybeans, sugar beets, vegetable crops, and alfalfa hay when sold for more than $20 a ton or fed to efficient livestock. Low profit crops usually include: oats, clover-timothy hay, rye and barley. The farm manager should strive for the most profitable crops that his resources will allow him to produce and market efficiently.

Profits from Corn and Hay Compared

Which is more profitable—corn or hay? The answer to this question depends a great deal upon (1) the yields of corn and hay and (2) the market prices of these crops when they are sold or fed to livestock.

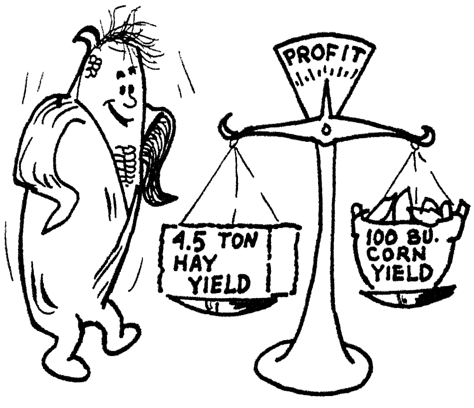
A study of crop costs in west central Ohio shows that about 4.5-ton hay yields are needed to give returns equal to 100 bushels of corn per acre. Labor and profit return from meadow crops will equal those from corn when high hay yields are obtained and the market value per ton averages no lower than $20. The labor and profit return per acre as shown in Table 9 is $40.80 for a 100-bushel corn yield and $40.30 for a 4.5-ton hay yield. These conclusions are based on the income and expense figures shown in Table 9.

Fertilizer and manure charges for corn were determined by calculating the commercial fertilizer cost of replacing the nitrogen, phosphorus, and potash removed from the soil by the different level of yields. No fertilizer or manure charge was made against the hay crop. Computations showed that hay crops consisting

Table 9—Receipts, Expenses, and Profits from Growing an Acre of Corn and Hay in West Central Ohio

	Corn			Hay		
	60 bu. Yield	80. bu. Yield	100 bu. Yield	1.5 ton Yield	3.0 ton Yield	4.5 ton Yield
Receipts[1]	$60.00	$80.00	$100.00	$30.00	$60.00	$90.00
Expenses						
Man Labor	10.35	11.30	12.25	5.45	10.90	16.35
Tractor	8.50	9.15	9.80	2.85	5.70	8.55
Machinery	7.00	7.65	8.35	5.05[2]	10.10[2]	15.15[2]
Fertilizer and Manure	11.50	15.50	19.00	.00	.00	.00
Lime	.00	.50	1.00	.50	1.00	1.50
Seed	1.75	2.05	2.35	4.50	5.00	5.50
Spray	.00	.40	.70	.00	1.00	1.00
Land	15.00	16.00	18.00	15.00	16.00	18.00
Total	54.10	62.55	71.45	33.35	49.70	66.05
Profit	5.90	17.45	28.55	— 3.35	10.30	23.95

[1] Prices used: corn $1 per bushel and hay $20 per ton.
[2] Includes charges for baling twine and wire.



largely of alfalfa or other legumes should add enough nitrogen to the soil to offset at least the value of the phosphorus and potash removed.

Land charges include taxes and a five percent return on the present valuation of the cropland without buildings and fences. Since good soils are usually needed to produce high yields, land values and charges were increased as crop yields increased.

Would meadow crops be more profitable than shown in Table 9, if they were fed to livestock? Efficient livestock increases farm income in most cases, even if all feed is purchased. However, if livestock feed is valued at market prices, regardless of whether it is produced on the farm or can be purchased for the same value as charged to the livestock, profits from corn and hay will still be the same as shown in Table 9.

Crop Costs with Minimum Tillage

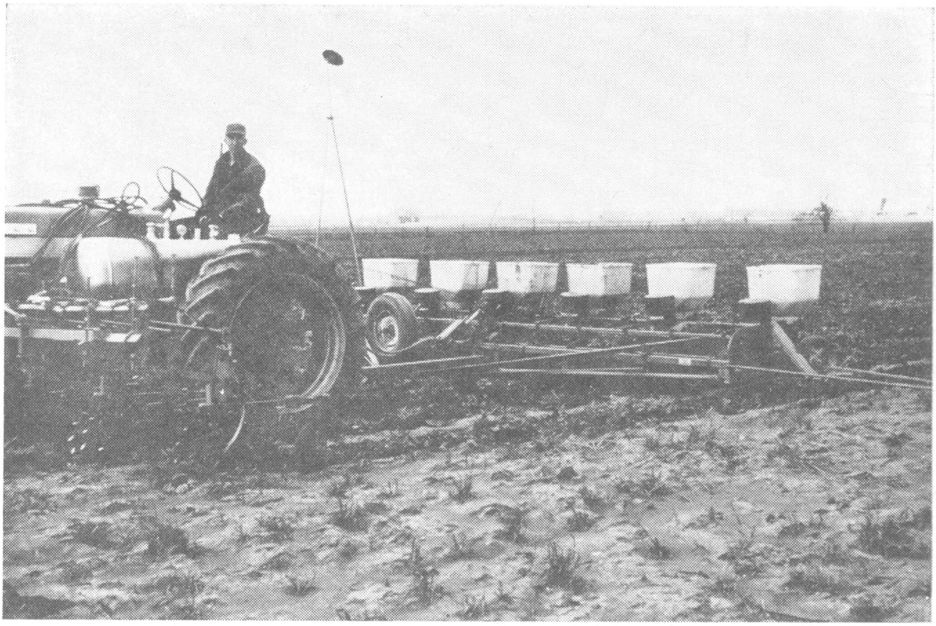
Calculations in Table 10 show that a farmer can reduce the cost of producing an acre of corn by about $2 to $3 by adopting a minimum tillage program instead of following the conventional method of preparing the seedbed and planting.

A general rule to follow is to prepare the soil only enough to insure accurate planting and germination of a desirable stand of corn. If corn yields can be maintained or increased by making fewer trips over a field, costs per acre can be reduced and profits increased. This will amount to roughly $1.50 an acre for each field operation that can be eliminated, assuming yields remain the same. Ohio farmers who are now overworking their soils can profitably benefit by taking a critical look at their present soil preparation practices and eliminating unprofitable operations. Overworking soils or working when they are wet destroys the soil structure and reduces profits. Pulling a fitting tool behind the plow or plowing followed by once over with a disc and a spike tooth harrow in tandem are examples of minimizing conventional tillage operations.

Table 10—Comparison of Costs of Raising an Acre of Corn up to Harvest When Minimum and Conventional Systems of Tillage are Used

	Tillage System	
Cost	Conventional No. of Operations	Minimum No. of Operations
Plowing	$ 4.00	$ 4.00
Discing	2.00[1]	.00
Harrowing	1.00	.00
Planting	1.45	1.75
Cultivating[2]	4.00	4.00
Spraying	1.50	1.50
Total	$13.95	$11.25

[1] Two times at $1.00.
[2] One rotary hoeing and two cultivations.



Minimum tillage—preparing a seedbed, planting corn, applying row fertilizer and anhydrous ammonia in one operation.

A good job of plowing and once over with fitting tools in tandem give a satisfactory seedbed on most Ohio soils.

High Yields Require Well Drained Land

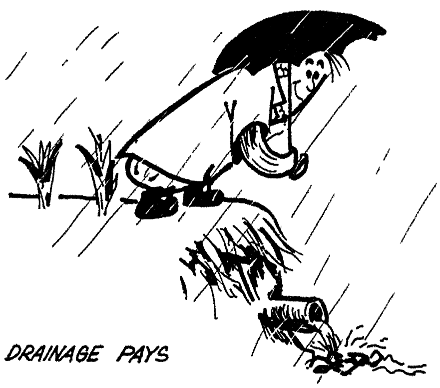
Profits from different applications of fertilizer on corn are shown in Table 11 for poorly and well drained Paulding soil that is located in the lake bed area of northwestern Ohio These calculations were made by subtracting 60 percent of the cost of the fertilizer applied to corn from the market value of the additional yield obtained.

Other costs were not considered because they did not change significantly when more fertilizer was used. The price used for calculating net income above all additional fertilizer costs was $1 a bushel for corn. Charges for fertilizer were figured on the basis of a 3 12-12 analysis, with a cost of 2 5 cents a pound.

Net income figures per acre show that good drainage is necessary to make moderate applications of fertilizer profitable

Table 11—Net Income per Acre Above Additional Cost of Using Increasing Amounts of Fertilizer on Paulding Soil—1954-56
(Based on Charging 60% of the Fertilizer Cost Against the Corn Crop)

		Net Income Above Additional Cost	
Crop	Fertilizer Used	Below Avg Drainage	Above Avg Drainage
	1st 150 lbs	$ 1 75	$4 75
Corn	Next 150 lbs	— 1 25	4 75
	Next 150 lbs	—	3 75



on Paulding soil These results are applicable to most of Ohio's poorly drained soils. On the poorly drained land, the first 150 pounds applied to corn gave only a small increase in net income. The second 150 pounds did not produce enough additional corn to pay for itself. Profits from a third increment of 150 pounds of fertilizer on corn could not be determined for poorly drained land because this application was beyond the limits of the data obtained in this study. On the best drained land, fertilizer increased corn yields enough to pay for a 450-pound application. Profits from larger applications could not be determined from the data available. Approximate costs of a complete tile system range from $100 to $150 an acre. Costs of surface drainage installations usually vary from $10 to $20 an acre. If the fields need it, drainage pays.

How Stand Affects Corn Yields

In the chain of crop production a weak link that is often easy to strengthen is the amount of seed planted. In the good corn producing areas of Ohio many farmers are not obtaining potential yields because they do not have enough plants per acre to utilize all of the available moisture and mineral nutrients

Figures in Table 12 show that adequate stands are necessary to obtain higher yields. This is more noticeable when heavy applications of fertilizer are used. When no fertilizer was used, an increase in plant population from 14,500 to 18,000 increased the yield 20 bushels per acre. When the recommended amount of fertilizer was used, this same increase in number of plants produced increases in yield of 34 bushels per acre.

Table 12—Yield of Corn per Acre from Different Plant Populations and Fertilizer Applications

	Amount of Fertilizer Used		
Plants per Acre	None	Recommended Amount	Increase in Avg. Yields
	Bu./Acre	Bu./Acre	Bu./Acre
14,500	74	78	+4
18,000	94	112	+28

Source: Summary of results from soil fertility demonstration plots, Dept. of Agronomy, O A.E.S., Agronomy Mimeograph Bulletin 155, 1959.

Economics of Machinery Use

Farmers on small farms can compete with operators of large farms on a per-unit cost basis, if they can use their harvesting equipment efficiently. On 300-acre farms, corn pickers and combines are responsible for about half of the machinery charges for producing corn, soybeans, and small grain. On smaller farms, harvesting equipment accounts for a much larger proportion of machinery costs.

Costs of using most pieces of machinery decline quite rapidly until use exceeds 100 hours a year. For example, when a corn picker is used only 40 hours a year, cost per acre is about $8 compared with $3.40 for 100 hours of use. A pull-type combine that is used only 40 hours a year costs about $8.40 an acre compared with $3.60 for 100 hours of use.

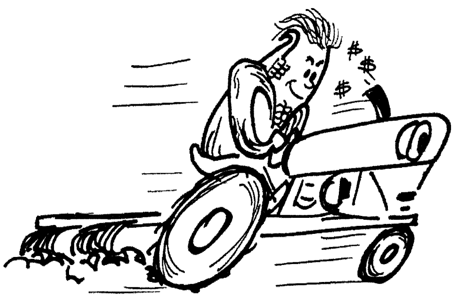
Harvesting costs can be kept to a minimum on small farms by hiring crops harvested, by doing some custom work for neighbors or using used machinery. If these alternatives are used on a 160-acre farm, cost of producing crops per acre will be about the same as on a 280-acre farm where all machinery is owned by the operator; and only slightly higher than the costs incurred on a 500-acre farm. These conclusions are based on the assumption that crops will be harvested at about the right time when custom work is used. Although there are conditions under which crop production costs may be kept low on small farms, operators of small units frequently have difficulty making a satisfactory income because volume of business is too low.

The approximate number of acres needed to economically justify owning some of the various harvesting machines is as follows:

- 6 to 7 ft. P.T.O. Combine, 90 to 120 acres
- 12 ft. Self-Propelled Combine, 200 to 300 acres
- Corn Picker—1 row, 50 to 70 acres
- Corn Picker—2 row, 80 to 110 acres
- Field Chopper, 50 to 70 acres
- Baler—1 cutting of hay or equivalent, 150 to 200 acres; 2 cuttings, 75 to 100 acres, etc.

These calculations are based on using each machine to the point where the annual cost of operation about equals the custom rate charged for the use of the machine. Since these computations do not take into consideration any yield losses that may occur by not harvesting the crop at the proper time or by improper adjustment or speed, some farmers may be able to justify the ownership of harvesting equipment on a somewhat smaller acreage.

A general rule for deciding whether ownership of harvesting machinery is economically desirable is whether or not the machine can be used 100 hours or more a year. If use is less than 100 hours annually, it may often be more profitable to hire work done than to own the machinery, if the crop can be harvested at the right time. Ownership is usually desirable from the cost standpoint when use exceeds 100 hours a year. Tractors should be used at least 500 hours a year, if somewhere near minimum charges per acre



WISE USE OF MACHINERY...... NECESSARY FOR PROFITABLE CROP FARMING.

are to be realized. Power and machinery charges make up about one-fourth of the cost of producing crops. However, these costs do not increase in the same proportion as yields.

Calculations in Table 13 show that tractor and machinery costs average about $15.53 per acre in west central Ohio when 60 bushels of corn are produced. But when 120 bushels per acre are raised the cost increases to only $19.45. On a per-bushel basis, these costs amount to 26 cents for a 60 bushel yield and 16 cents for a 120-bushel yield.

Table 13—Power and Machinery Costs per Acre and per Bushel for Different Yields of Corn Produced in West Central Ohio, 1958

	Bushels of Corn per Acre			
Cost	60	80	100	120
Tractor	$ 8.52	$ 9.16	$ 9.81	$10.45
Machinery	7.01	7.67	8.34	9.00
Total	15.53	16.83	18.15	19.45
Cost per Bu.	.26	.21	.18	.16

The average amount of fuel used *per hour* by various size tractors in Nebraska tractor tests are as follows:

- 2-3 plow tractors using gasoline, 2.6 gallons
- 3-4 plow tractors using gasoline, 3.9 gallons
- 3-4 plow tractors using diesel oil, 3.1 gallons
- 5 plow tractors using gasoline, 4.7 gallons
- 5 plow tractors using diesel oil, 3.6 gallons

Average tractor and machinery costs per crop acre for a group of Ohio farms in 1960 are shown in Table 14.

Table 14—Tractor and Machinery Costs per Acre for Selected Ohio Farms, 1960[1]

Typ of Farming	Avg. for High Income Farms	Avg. for Low Income Farms
General Farms	$19.87	$22.16
Cash Crop	17.17	20.36
Corn-Hog	16.89	24.58
Dairy	27.72	32.04

[1] Includes fuel and oil.
Source: 1960 Extension Farm Account Summaries, The Ohio State University.

Annual tractor and machinery charges for an individual farm can be determined by adding the various items listed below. Costs per crop acre can be calculated by dividing the total charges by the number of crop acres farmed. Calculate your annual costs here:

1 Fuel, oil, and grease	$
2 Repairs	
3 Farm share of automobile expenses	
4 Depreciation charges[1]	
5 Interest charge[2]	
6 Three-fourth of the cost of custom work hired	
Total Costs	$

Total Costs $

——————— = $ Annual Cost per Crop Acre

Crop Acres Farmed

[1] Use actual Depreciation Charge or 10% to 12% of beginning inventory

[2] About 5% of beginning inventory

Should a farmer buy larger tractors and machinery to save time or operate a larger farm? Many farmers say they cannot make the necessary calculations satisfactorily because they do not know how much time is required to do a particular job with different sizes of tractors and machinery.

The amount of man labor, tractor power, and machine time used per acre by farmers to perform the various jobs involved in producing crops are given in Table 15. These time requirements are stated in two ways: one is the amount of time used by the typical farmer with typical equipment; the other shows the range in the amount of time used for each job for the middle 50 percent of the farmers. One-fourth of the farmers did their work faster than the bottom figures show, while another fourth required more time than the top figures indicate.

The amount of work accomplished in a given period of time varied considerably because of differences in size of the machines used, rate of speed, age and condition of machinery which influenced the number of breakdowns, time required to move machinery to and from fields, weather, yields, size and shape of fields.

By using the time requirements from this study, it should be easy to calculate the approximate amount of man labor, tractor power, and machine time needed to produce an acre of corn, soybeans, small grain, and hay for different size equipment and tillage operations.

Crop production also requires some miscellaneous labor such as hauling fertilizer, getting equipment ready for use and making necessary repairs and adjustments of machinery. This amounts to about one-half hour per acre for corn and two-fifths of an hour per acre for soybeans, small grain, and meadows that are cut once.

Table 15—Time Used for Field Work in West Central Ohio

Job Done	Size of Tractor Used[1]	Man Hours Used per Acre[2]	
		Average	Range for Middle Half of Farms
Plow with 2-14" plows	2	1.25	1.12-1.45
Plow with 3-14" plows	3	.92	.75-1.00
Plow with 4-14" plows	4	.58	.50- .67
Disk with 7 or 8-foot disk	2,3	.39	.33- .47
Disk with 9-foot disk	3	.31	.27- .41
Disk with 10-foot disk	3,4	.28	.22- .32
Disk with 12-foot disk	4	.24	.21- .25
Drag with 10-foot drag	2	.39	.33- .50
Drag with 12-foot drag	2,3	.32	.26- .35
Plant corn and soybeans, 2-40" rows	2,3	.55	.44- .65
Plan corn and soybeans, 4-40" rows	2,3	.29	.25- .35
Rotary hoe corn and soybeans, 2 rows	2,3	.27	.23- .33
Rotary hoe corn and soybeans, 4 rows	2,3	.15	.13- .18
Cultivate corn and soybeans, 2 rows	2,3	.49	.40- .56
Cultivate corn and soybeans, 4 rows	2,3	.26	.22- .33
Spray corn with 6-row sprayer	2,3	.17	.15- .23
Pick corn with 1-row picker	2,3	1.65	1.36-2.00
Pick corn with 2-row picker	2,3	.90	.69-1.01
Store corn on farm	2,3	1.18[3]	.87-1.91
Sow small grain and soybeans, 12 × 7 drill	2,3	.54	.43- .75
Sow small grain and soybeans, 15 × 7 drill	2,3	.46	.35- .60
Sow small grain and soybeans, 17 × 7 drill	2,3	.37	.27- .43
Combine with 5-foot combine	2,3	1.05	.97-1.27
Combine with 6-foot combine	2,3	.90	.72-1.05
Combine with 7-foot combine	2,3	.75	.65- .95
Combine with 10-foot combine	SP[7]	.46	.38- .59
Combine with 12-foot combine	SP	.42	.36- .50
Store small grain and soybeans on farm	2,3	.80[4]	.50-1.10
Mow hay and straw with 7' mower	2,3	.50	.35- .55
Rake hay and straw with 7' rake	2,3	.45	.33- .50
Bale hay and straw	2,3	.50	.40- .70
Store hay on farm	2,3	1.90[5]	1.30-2.65
Store straw on farm	2,3	1.30[6]	.85-1.90
Seed meadow with broadcast tractor seeder	2,3	.16	.12- .20

[1] Stated in number of plows tractor is rated to pull.
[2] Unless otherwise stated, number of tractor and machine hours used per acre is same as number of man hours used.
[3] Tractor time .86 hours.
[4] Tractor time .65 hours.
[5] Tractor time. 55 hours.
[6] Tractor time .45 hours.
[7] Self-propelled.

CHECK YOUR CROP EFFICIENCY!!

Checklist for Measuring Your Crop Production Efficiency*

	YES	NO
1. Do you know the soil types on your farm and their yield potential?	☐	☐
2. Do you have your soil tested occasionally and do you follow the fertilizer and lime recommendations based on these tests?	☐	☐
3. Do you plant recommended varieties?	☐	☐
4. Do you plant enough seed per acre to use profitably the potential mineral nutrients available in your soil?	☐	☐
5. Do you grow the most profitable combination of crops on your farm?	☐	☐
6. Do you invest in drainage installations when they are needed?	☐	☐
7. Do you keep power and machinery costs low by investing in machines that will be used enough hours per year?	☐	☐
8. Are you planting and harvesting your crops on time?	☐	☐
9. Do you use up-to-date methods in controlling weeds, insects and diseases?	☐	☐
10. Do you use tillage practices that give a satisfactory seedbed without overworking the soil?	☐	☐
11. Do you use proper placement of fertilizer?	☐	☐
12. Do you follow soil conserving practices where needed?	☐	☐

* The NO answers can reduce crop income—take the steps necessary to eliminate the NO answers from your crop production efficiency checklist.