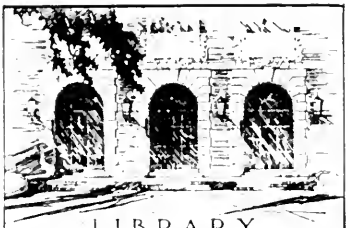

FARM PRACTICES

AND THEIR EFFECTS ON

FARM EARNINGS

BY

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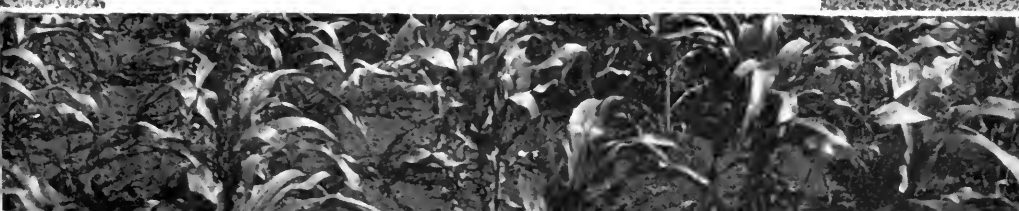

ACKNOWLEDGMENT

IN THE collection of data entering into a publication of the character of this bulletin, the authors must necessarily depend upon the close cooperation of a large number of farmers and staff members. Upon the intelligent and conscientious record-keeping of the many farmers in the Farm Bureau Farm Management Service thruout the ten years of the study, and the painstaking collection of data by the fieldman who supervised the accounting, the trustworthiness of this bulletin is finally dependent. J. B. Andrews, W. A. Herrington, and J. B. Cunningham, present members of the Illinois Experiment Station and Extension Service staffs, and F. A. Fisher, formerly of the Experiment Station staff, were the fieldmen who thus assisted in the collection of data, and to whom the authors express their grateful appreciation.

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Farm Practices and Their Effects On Farm Earnings

By M. L. Mosher and H. C. M. Case[1]

INTRODUCTION

DIFFERENCES of as much as a thousand to three thousand dollars a year in the net incomes of comparable farms in the same community in Illinois are not unusual. One farmer is successful, while another, having a farm the same size with the same type of soil, has a difficult time to make ends meet. Obviously such differences are due largely to differences in the organization of the farms and in the practices used in their operation. For in farming as in other lines of industry some operators are more prompt and more skillful in interpreting new technics or in making improvements in old practices, and in fitting these improvements into a well-organized business.

It was for the purpose of discovering the relative importance of the different methods and practices which farmers are following that this study, involving approximately 1,000 farms in north-central Illinois, was made. Such an evaluation should enable farmers who are striving to improve their businesses to choose with more confidence and discrimination those practices and types of farm organization which have proved to be profitable.

The study consists first of a comparison of specific practices used in crop and livestock production, and second of an analysis of the factors responsible for differences in farm earnings and the interrelations of these factors in the general organization and operation of a farm. All the data presented are based on carefully kept farm accounts. In the evaluation of some of the specific practices as many as 5,000 fields on approximately 1,000 farms were involved. The study of general organization and management practices and of the factors responsible for the differences in net income, on the other hand, was based primarily on the records kept on a selected group of fifty-seven farms thruout a ten-year period from 1925 to 1934.

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BASIS FOR THE STUDY: FARM BUREAU FARM MANAGEMENT SERVICE

The operators of all the farms used as the basis for this study were members of what is known as the Illinois Farm Bureau Farm Management Service. This service, conducted as a cooperative undertaking by the Illinois Agricultural Experiment Station and certain of the farm bureaus, was first organized among 235 farmers in Livingston, McLean, Tazewell, and Woodford counties in 1925. Four years later it was extended to include more than 400 farmers in these counties. Expansion was also made into other counties, until in 1931 more than 800 farmers in twelve counties in north-central Illinois were enrolled in this service. About 60 percent of the cost of the service has been paid by the farmers themselves.

The purposes of this organization were twofold: to assist the individual cooperators in improving the business organization of their farms; and, from the standpoint of the Experiment Station, to collect data which would be of value to farmers thruout the state. The services rendered to the individual cooperators were the following:

1. Assistance in keeping accurate records of farm finances and production and of the practices followed in the organization and operation of the farm.
2. Assembling, analyzing, and interpreting the records of all the cooperators in such manner as to enable each farmer to compare his accomplishments with those of others in the same community working under like conditions.
3. Assisting each cooperator to interpret his own records in the light of the records of the entire group, so that he might improve his own practices.
4. Assistance for each cooperator (if such assistance seemed advisable from the records obtained) in working out a better plan of organization for his entire farm in order to provide a larger gross income or more economical operation.
5. Conducting farm-management tours and farm-management meetings, in order that all members might see and discuss the examples of good organization found among the cooperating farms.

For accomplishing the first, third, and fourth of these objectives fieldmen[1] were employed. Each fieldman worked exclusively with about 200 farmers, visiting each farm four or more times a year and

[1]All the fieldmen were graduates of agricultural colleges, had had practical experience in farming, and were well trained in farm management.

meeting each operator at some centrally located point in the area at the end of the year for the purpose of closing the farm account books.

The farm accounts themselves were of course the basic feature of the entire service and of the present study. These accounts, kept by each farmer with the assistance of the fieldman, were complete financial records of the farm business. They included opening and closing inventories, all farm receipts and expenses, the production and value of all crops, livestock, and livestock products, the distribution of feed to each class of livestock, and the value of farm produce used in the home.

In addition, thruout the year a record was kept of the specific practices used in the production of crops and livestock. In all, for each cooperator each year, data were recorded on approximately 200 questions regarding the practices used. By recording these data thruout the year, information on every phase of the farm business that materially affected farm production, income, or expenses, was obtained. These data on specific practices have been used as the basis for the first sections of the present bulletin. The financial records of the farms, on the other hand, serve as the basis for the second portion of the study—that having to do with general organization and management practices and relative earnings among the different farms.

PART I: SPECIFIC CROP AND LIVESTOCK PRACTICES

High yields of corn, oats, and other crops and profitable production of livestock depend on a large number of distinct practices in growing the crop or in producing, feeding, and marketing the livestock. To a casual observer the practices used by all corn growers might, for example, seem to be very much alike. There are, however, many variations which taken together have a marked effect on yields. Even among a group of farmers all of whom have been successful in producing a given crop or a certain kind of livestock, there are usually wide differences in practices (pages 592 to 604). Farmers themselves are in general well aware that these differences exist; and those who are most desirous of improving their own methods are always eager to learn just how someone else who has been unusually successful has gone about it. And if the more successful farmer has used somewhat different practices, the other very naturally considers whether he too should adopt those practices.

When the adoption of any specific practice is being considered, the cost of putting it into operation must be weighed against the probable returns from the use of it. It is not an easy matter, however, for an individual farmer to determine just what may be expected from a given practice under actual farming conditions. When one farmer consistently grows more corn per acre than another, it is difficult to say exactly how much of the difference is due to any one practice, unless the one practice being measured is the only one in which the methods of the two differ—which is usually not the case.

In order to determine the value of each specific practice, therefore, the comparisons in this section of the bulletin were made. Such an evaluation might be made in either of two ways: (1) by a series of experiments in which all practices other than the one being studied were the same; or (2) by comparing the results obtained on a large number of farms where the practice being studied was used, with those obtained on a large number of other farms where it was not used. The theory behind the second of these methods is that if the numbers of farms in the two groups are large enough, the other good and bad practices used will probably be distributed evenly enough between the two groups to give a satisfactory evaluation of the one practice according to which the farms were grouped. In the present study the second of these methods was followed.

In this section of the bulletin, therefore, emphasis will be placed on

the specific practices used by the most successful farmers of the area studied—practices that have actually proved valuable in making the farm business more profitable.

The values found for the different farm practices in this analysis are similar to those obtained for the same practices in controlled experiments by this Station. But because of variations in the *extent* to which certain practices were carried out on the farms included in the study, the values obtained sometimes differ in degree from those obtained in controlled experiments. For example, not all the farmers

FIG. 1.—HIGH YIELDS OF GOOD-QUALITY CORN ARE BASIC ON BOTH GRAIN AND LIVESTOCK FARMS

Corn produced on the farms in this study during the ten years 1925-1934 was worth about $3,000 a year per farm, when valued at the average price of corn during the period. When fed to productive livestock on the most profitable one-third of the farms, the average corn crop would account for about $4,300 gross income. High yields of sound corn thus contribute more to satisfactory incomes on corn-belt farms than any other single factor.

who applied manure applied the same amounts per acre, nor did all use the same care in handling the soil to prevent serious leaching or erosion. Accordingly the average results from applying manure were probably somewhat lower than they would have been had the practice been followed uniformly and in full.

Thus the results from any specific practice analyzed here do not

necessarily indicate the maximum that might be expected from that practice under the most favorable conditions. Nevertheless, the evaluations do indicate what may be expected from a given practice under actual farming conditions.

In the study of the practices involved in corn and oat production, records for one or more years on approximately 1,000 farms of north-central Illinois, kept during the eight-year period 1925-1932, were included. Livestock-production practices involved a total of approximately 800 farms, also in north-central Illinois. All these farms were in the Illinois Farm Bureau Farm Management Service.

CORN PRODUCTION

The acre-yield of corn on grain farms where corn occupies from a third to a half of the tillable land is probably the most important item affecting the net farm income. And on livestock farms, also, acre-yields are highly important, tho they may be overshadowed somewhat by livestock efficiency (page 553).

In order to discover the effect on yield of each practice used in producing corn, the practices followed on each of several thousand fields of dark prairie soil in north-central Illinois were studied during the eight years from 1925 to 1932 inclusive. In general, the practices that affect soil fertility showed more influence on the acre-yield of corn than did the practices having to do with cultivation and seed, except possibly the selection of the strain or variety of seed.

Fertility Practices Affecting Corn Yields

Corn yields on fields receiving the best soil treatment were influenced somewhat by the use of better and more carefully selected seed and more profitable cultivation practices than were used on the fields that received inferior soil treatments. Consequently the difference in yields on the two groups of fields cannot be explained entirely by the difference in soil treatments. Nevertheless, because it is a common practice of farmers to put heavier applications of manure on thinner land and also to give less productive land the preference in the use of clover and rock phosphate, the differences in yields attributed to different soil-treatment practices (Table 1) probably represent very closely the net effects of those treatments.

Manure. Yields of corn were higher by approximately 3 bushels an acre on 990 fields in this study where manure treatments were used, than on 811 fields where no manure was applied. "Manure treatment"

means that a field had been covered with more or less barnyard or straw stack-bottom manure at some time during the four years preceding the growing of corn. Many applications were rather light, the average probably amounting to only about 6 loads of barnyard manure an acre.

Raw rock phosphate. On 322 fields where raw rock phosphate had been used, the phosphate apparently raised the level of corn yields by about 4 bushels an acre (Table 1). "Phosphate treatment," as used

TABLE 1.—KIND OF SOIL TREATMENT AS RELATED TO CORN YIELDS

(Averages of twelve comparisons[a] on dark prairie soils of north-central Illinois, 1925-1932)

Soil treatment	Number of fields	Acre-yield of corn
		bu.
None[b]	811	45.3
Manure only[c]	238	48.3
Clover only[d]	833	50.3
Manure and clover	625	53.4
Clover and phosphate[e]	195	54.6
Manure, clover, and phosphate	127	56.9

[a]Each comparison involved one year's data from a large number of farms in one of the three four-county areas.

[b]No manure was applied during the preceding four years; nor any clover, alfalfa, or soybeans for either hay, seed, or pasture. No phosphate had ever been used. Some limestone may have been applied to some fields.

[c]More or less manure had been applied during the preceding four years. Applications varied from 2 or 3 tons of strawstack manure per acre to 12 to 15 tons of feed-lot manure. Most applications were about 5 to 7 tons per acre. No clover during preceding four years; no phosphate at any time.

[d]For one or more years during the preceding four, these fields had been left in clover—red, alsike, mammoth, or sweet clover, or alfalfa, either alone or in mixture. On many fields the stands had been rather poor, but good enough to leave. No manure during preceding four years; no phosphate at any time.

[e]Rock phosphate had been applied over the entire field at some preceding time. Most applications had been from 1,000 to 2,000 pounds per acre.

in this study, means that the entire field had been covered with raw rock phosphate at the rate of at least 1,000 pounds an acre sometime during previous years.

Soil-building legumes. The use of clover in the rotation (red clover, alsike clover, mammoth clover, sweet clover, or alfalfa) apparently raised the level of corn yields by approximately 5 bushels an acre, as an average of 833 fields during the eight years from 1925 to 1932 (Table 1).

From the standpoint of increasing the yields of corn, *sweet clover* and *alfalfa* appeared to be the best of the various soil-building legumes. Corn following alfalfa that was used for hay or pasture produced on fifty fields an average of 56 bushels an acre a year, while corn following small grain without clover averaged only 47 bushels an acre a

year (Table 2). Corn on 321 fields which had been in sweet clover the preceding year, either alone or in a mixture with other clovers and timothy, and used for pasture, produced an average of 57.7 bushels an acre a year. And following small grain in which sweet clover had been

TABLE 2.—KIND OF CROP GROWN THE PRECEDING YEAR AS RELATED TO CORN YIELDS

(Averages of twelve comparisons on dark prairie soils of north-central Illinois, 1925-1932)

Kind of crop the preceding year	Average of eight comparisons[a]		Average of twelve comparisons[a]	
	Number of fields	Acre-yield of corn	Number of fields	Acre-yield of corn
		bu.		*bu.*
Corn	1 678	50.2	2 395	50.3
Small grain[b]	....	....	1 659	48.4
Small grain without clover	561	47.0	....	....
Small grain with red, alsike, or mammoth clover	132	47.5	....	....
Small grain with sweet clover	364	52.0	....	....
Red clover[c]	....	....	484	54.2
Red clover for hay	156	52.4	....	....
Red clover for pasture	131	54.0	....	....
Sweet clover for pasture	321	57.7	511	58.0
Alfalfa	50	56.0	105	57.9
Soybeans	94	45.7	119	46.6
Timothy	70	53.5	101	55.3

[a] During the first four years of these studies the record of small-grain fields without clovers seeded were not kept separate from the records of fields with clovers seeded. Neither was there any distinction made between clover fields pastured and those cut for hay or for seed.
[b] Corn following small grain with and without clover.
[c] Corn following red clover used for either hay, pasture, or seed.

seeded and where the sweet clover had been plowed under late in the fall or early the following spring, corn produced 5 bushels an acre more than on land which had grown small grain without clover. The yield of corn following sweet clover seeded in the small grain was in fact almost as high as the yield following red clover cut for hay. Corn following corn produced a higher yield than corn following small grain without clover, tho where corn is grown two or more years in succession, the first corn crop is usually preceded by a legume crop and often the land has been covered with manure.

The low yield of corn following soybeans (Table 2) indicates that soybeans cannot be considered a soil-building crop when the crop is removed from the land.

Classification of fields according to fertility treatments. In order to eliminate so far as possible the effects of different soil treat-

ments on yield while studying the influence of other practices—those used in caring for or selecting the seed, in seedbed preparation, and in cultivation—, the fields were classified into three groups according to the care given to the soil. A field was considered to be well treated if adequate amounts of soil-building legumes had been included in the rotation and if adequate applications of manure and rock phosphate had been made. Fairly well treated soils had received some clover, manure, and phosphate treatment but not enough to place them in the

TABLE 3.—QUALITY OF SOIL TREATMENT AS RELATED TO CORN YIELDS
(Averages of twelve comparisons on dark prairie soils of north-central Illinois, 1925-1932)

Care of soil[a]	Number of fields	Acre-yield of corn
		bu.
Well treated	1 574	53.2
Fairly well treated	3 053	49.4
Poorly treated	1 801	44.6
All three grades of soil treatment	6 428	49.0

[a] *Well-treated soils* were those that had received any two of the three treatments listed in Table 1, or that had received one of the treatments in full and each of the other two in part. *Fairly well treated soils* had received one treatment but not enough of the other two to qualify as well-treated soils. *Poorly treated soils* were those that had received little or no treatment of any of the three types listed.

high-yielding class. Poorly treated soils had received little or no treatment with clover, manure, or phosphate. The well-treated soils produced an average yield of 53.2 bushels of corn an acre during the eight years of the study, whereas the fairly well treated soils averaged 49.4 bushels, and the poorly treated soils averaged only 44.6 bushels (Table 3).

Cultivation Practices Affecting Corn Yields

Early or late working of fall-plowed ground. Average yields of corn on 1,028 fields in seven comparisons[1] where fall-plowed ground was worked early in the spring were 1.7 bushels higher than the average for 402 fields where fall-plowed ground was not worked until shortly before the corn was planted (Table 4). In only one comparison did the late-worked ground give a higher average yield than the ground worked early, and in that case the number of late-worked fields was hardly sufficient to give a dependable average.

Working fall-plowed ground as early in the spring as the soil is in condition to be worked was a common practice among the farmers who

[1] Each comparison involved one year's data from a large number of farms in one of the three four-county areas.

TABLE 4.—TIME OF SPRING WORK ON FALL-PLOWED GROUND AS RELATED TO CORN YIELDS
(Dark prairie soils of north-central Illinois, 1929-1932)

Counties and year	Worked early in spring		Worked late in spring	
	Number of fields	Acre-yield of corn	Number of fields	Acre-yield of corn
		bu.		*bu.*
Livingston, McLean, Tazewell, Woodford				
1929	172	49.6	119	47.4
1930	168	37.4	100	37.1
1931	346	48.6	79	48.6
Henry, Knox, Peoria, Stark				
1930	43	47.7	21	45.5
1931	68	44.1	11	45.7
Grundy, LaSalle, Marshall, Putnam				
1931	137	49.4	48	45.0
1932	94	63.4	24	58.7
All seven comparisons	1 028	48.6	402	46.9

produced the highest average yields of corn over the ten-year period (pages 592 to 595).

Time of working spring-plowed ground. In four of seven comparisons the practice of working spring-plowed ground immediately after plowing, by having either a section of harrow or some other implement attached to the plow to pulverize the soil as it was turned

TABLE 5.—TIME OF WORKING SPRING-PLOWED CORNSTALK GROUND AFTER PLOWING, AS RELATED TO CORN YIELDS
(Dark prairie soils of north-central Illinois, 1930-1932)

Counties and year	Worked as plowed		Worked soon after plowing		Not worked soon after plowing	
	Number of fields	Acre-yield of corn	Number of fields	Acre-yield of corn	Number of fields	Acre-yield of corn
		bu.		*bu.*		*bu.*
Livingston, McLean, Tazewell, Woodford						
1930	85	36.1	56	37.2	63	35.4
1931	91	48.2	54	49.1	64	51.8
Henry, Knox, Peoria, Stark						
1930	64	42.5	43	42.4	27	41.8
1931	68	46.0	20	45.6	16	47.5
1932	65	69.6	19	64.7	7	66.9
Grundy, LaSalle, Marshall, Putnam						
1931	36	48.9	31	50.9	14	49.8
1932	46	67.9	58	64.5	13	54.3
All seven comparisons	455	51.3	281	50.6	204	49.6

over, proved to be slightly more profitable than following up with a harrow or other implements soon after plowing, and it proved definitely more profitable than letting the soil lie as turned over by the plow for several weeks before working it further. As an average of all seven comparisons, the immediate working of the spring-plowed ground held an advantage of .7 bushel of corn an acre over the working of the ground *soon* afterward, and 1.7 bushels an acre over delaying further working of the ground for several weeks (Table 5). This practice of working the spring-plowed ground immediately after plowing was followed also by those farmers who consistently obtained the highest yields of corn (page 594).

Harrowing after planting, before corn is up. In seven of eight comparisons, involving more than 3,000 fields in all, the fields that were harrowed after the corn was planted and before it came up gave higher yields than those not harrowed in this manner (Table 6). As an average of all eight comparisons, the harrowed fields yielded 1.6 bushels an acre a year more than the others.

Rolling after planting, before corn is up. Comparisons were made of the effects of different methods of working ground after corn was planted and before it came up. In seven of eight comparisons corn yields were lower where the ground was rolled and not harrowed than where it was harrowed without being rolled. When a roller was used, yields were higher where it was followed by a harrow than where it was not. Tho the fields where the roller only was used were, in several of the comparisons, too few to lend much significance to the data, the fact that the results all point in the same direction is of interest. Apparently if a roller is used to reduce clods and compact the soil, it is wise to follow the roller with a harrow so that the surface of the soil will not run together and cake after a rain.

Some of the most successful growers of corn (page 594) used the roller and harrow ahead of the planter when the ground was cloddy or loose, and used only the harrow and not the roller after planting.

Thoro working after planting, before corn is up. Fields with well-treated soil averaged 3.1 bushels more corn an acre when cultivated twice with harrow, weeder, or rotary hoe than the fields that received no cultivation after the corn was planted but before it came up (Table 7). On fairly well treated soil there was an advantage of 1.9 bushels an acre in favor of two cultivations over no cultivations before the corn was up. On poorly treated soil, however, there seemed

TABLE 6.—KIND OF WORK DONE ON GROUND AFTER PLANTING BUT BEFORE THE CORN CAME UP, AS RELATED TO CORN YIELDS
(Dark prairie soils of north-central Illinois, 1929-1932)

Counties and year	No work done		Harrow only		Roller only		Harrow and roller	
	Number of fields	Acre-yield of corn	Number of fields	Acre-yield of corn	Number of fields	Acre-yield of corn	Number of fields	Acre-yield of corn
		bu.		*bu.*		*bu.*		*bu.*
Livingston, McLean, Tazewell, Woodford								
1929	264	47.6	449	47.3	31	44.5	27	42.7
1930	204	37.0	423	37.6	66	35.9	69	37.3
1931	179	48.7	559	48.8	17	47.1	6	50.0
Average	(647)	44.4	(1 431)	44.6	(114)	42.5	(102)	43.3
Henry, Knox, Peoria, Stark								
1930	45	40.7	231	45.3	22	44.4	48	44.3
1931	53	45.4	210	45.9	1	46.0	20	44.7
1932	28	67.0	152	68.5	6	61.5	14	68.0
Average	(126)	51.0	(593)	53.2	(29)	50.6	(82)	52.3
Grundy, LaSalle, Marshall, Putnam								
1931	114	48.6	258	49.4	4	46.0	10	52.1
1932	136	60.0	234	65.4	5	55.8	10	69.8
Average	(250)	54.3	(492)	57.4	(9)	50.9	(20)	60.9
All eight comparisons	1 023	49.4	2 516	51.0	152	47.6	204	51.1

TABLE 7.—NUMBER OF CULTIVATIONS AFTER PLANTING BUT BEFORE CORN WAS UP, AS RELATED TO CORN YIELDS

(Average of eight comparisons on dark prairie soils of north-central Illinois, 1929-1932)

Care of soil	Number of cultivations*	Number of fields	Acre-yield of corn
			bu.
Well treated	None	218	50.7
	One	482	53.3
	Two	180	53.8
Fairly well treated	None	485	50.3
	One	1 239	50.8
	Two	334	52.2
Poorly treated	None	330	46.6
	One	676	47.0
	Two	159	46.6
All three grades of soil treatment	None	1 033	49.2
	One	2 397	50.3
	Two	673	50.9

*The tools used for such cultivations were harrows, rotary hoes, weeders, or rollers.

to be little or no advantage in working the land after it was planted and before the corn came up. Apparently the working of cloddy or poorly handled soil before corn comes up or as it is coming up may reduce the stand. As an average of the three grades of soil treatments, there was an advantage of 1.1 bushels an acre for one cultivation over no cultivation after planting but before corn was up, and of 1.7 bushels an acre for two cultivations over no cultivation.

Cultivating young corn before row cultivation begins. The cultivation of young corn with a harrow or weeder before row cultivation is begun apparently is not a worth-while practice. On 218 fields of corn where a harrow or weeder was used in this manner the average yield was lower by .8 bushel than on 2,483 fields where no such work was done (Table 8). Lower average yields following this early cultivation occurred in five of the eight comparisons recorded. In two of the three comparisons where using the harrow or weeder appeared beneficial, the number of fields studied was hardly sufficient to give dependable results. In five of eight comparisons where the rotary hoe was used once after the corn came up, the yields were higher than where no work was done; in three comparisons the yields were lower; and, as an average of all, they were about the same. Where the rotary hoe was used twice or more, average yields were approximately the same as where the harrow or weeder was used.

These data bear out the practice followed by many of the best growers of corn; namely, doing unusually thoro work in the preparation of the seedbed but limiting the work after corn is planted to the

TABLE 8.—KIND OF WORK DONE ON GROUND AFTER CORN WAS UP BUT BEFORE ROW CULTIVATION BEGAN, AS RELATED TO CORN YIELDS
(Dark prairie soils of north-central Illinois, 1929-1932)

Counties and year	No work done		Harrow or weeder		Rotary hoe once		Rotary hoe twice or more	
	Number of fields	Acre-yield of corn	Number of fields	Acre-yield of corn	Number of fields	Acre-yield of corn	Number of fields	Acre-yield of corn
Livingston, McLean, Tazewell, Woodford								
1929	445	47.2	51	44.2	171	48.9	69	46.0
1930	446	37.0	42	36.8	105	38.0	92	40.0
1931	520	48.9	55	47.0	157	49.0	49	47.9
Average	(1 411)	44.4	(148)	42.7	(433)	45.3	(210)	44.6
Henry, Knox, Peoria, Stark								
1930	183	43.2	17	41.2	37	41.9	28	43.6
1931	185	45.6	9	47.9	50	45.8	38	45.6
1932	153	68.3	3	69.3	23	70.0	18	64.2
Average	(521)	52.4	(29)	52.8	(110)	52.6	(84)	51.1
Grundy, LaSalle, Marshall, Putnam								
1931	260	49.1	25	44.4	87	48.2	25	48.8
1932	291	63.8	16	65.8	58	62.6	18	60.5
Average	(551)	56.4	(41)	55.1	(145)	55.4	(43)	54.6
All eight comparisons	2 483	50.4	218	49.6	688	50.6	337	49.6

minimum necessary to kill weeds and keep the surface of the soil in good condition (see page 594).

Shovel or blade cultivators. The old question which is better, the shovel cultivator or the blade cultivator, is answered by these comparisons (Table 9) to the satisfaction of many good corn growers. On well-treated land, where the soil was in good physical condition, the blades had a slight advantage over the six-shovel cultivator in twelve comparisons covering a period of eight years. Blades were used on 601 fields having well-treated soil, and shovels on 447 fields. On the

FIG. 2.—GOOD STANDS OF STRONG STALKS ARE NECESSARY TO HIGH YIELDS OF CORN

Planting healthy, viable seed of a high-yielding strain of corn in a well-prepared seedbed of fertile soil, and cultivating so as to kill weeds without damage to the corn plants, are important measures in producing good yields of sound corn.

other hand, the shovels had a slight advantage on 894 fields where the soil was fairly well treated, and a decided advantage on 457 fields where the soil was poorly treated.

Some of the best corn growers in north-central Illinois are turning to the broad spear-point type of shovel (page 594).

TABLE 9.—KIND OF ROW CULTIVATOR USED AS RELATED TO CORN YIELDS
(Averages of twelve comparisons on dark prairie soils of north-central Illinois, 1925-1932)

Care of soil	Kind of cultivator	Number of fields	Acre-yield of corn
			bu.
Well treated	Common, six shovels	447	54.9
	Blades	601	55.8
Fairly well treated	Common, six shovels	894	51.6
	Blades	1 126	50.9
Poorly treated	Common, six shovels	457	47.9
	Blades	690	46.1
All three grades of soil treatment	Common, six shovels	1 798	51.5
	Blades	2 417	50.9

Number of cultivations. When the fields were classified according to number of cultivations (including use of harrow, rotary hoe, or row cultivator) after the corn was up, the advantage, if any, was in favor of only three cultivations rather than four or five (Table 10). This was particularly true on the well-treated soils, and is in accord with the statement already made that the best corn growers prepare the seedbed very thoroly, and then after the corn is up do only as much cultivating as is necessary in order to kill weeds.

Planting Practices Affecting Corn Yields

Thin planting often caused low yields. Farmers in this study were planting too few kernels to the hill rather than too many. On well-treated land 180 fields having an average of about 3 stalks to a

TABLE 10.—NUMBER OF CULTIVATIONS AFTER CORN WAS UP AS RELATED TO CORN YIELDS
(Averages of eight comparisons on dark prairie soils of north-central Illinois, 1929-1932)

Care of soil	Number of cultivations[a]	Number of fields	Acre-yield of corn
			bu.
Well treated	Three	462	53.8
	Four	247	52.3
	Five	77	52.7
Fairly well treated	Three	1 060	51.2
	Four	573	50.6
	Five	211	50.6
Poorly treated	Three	644	46.6
	Four	306	48.5
	Five	96	46.7
All three grades of soil treatment	Three	2 166	50.5
	Four	1 126	50.5
	Five	384	50.0

[a]The tools used were row cultivators, harrows, rotary hoes, weeders, and rollers.

hill after cultivation averaged approximately 9 bushels an acre more than 553 fields having an average of 2 stalks per hill (Table 11). Those having 3 stalks per hill averaged 4.3 bushels more than those having 2½ stalks per hill. While the differences for fields having fairly well treated soil and poorly treated soil were not so great, they were in the same direction.

Of all of the practices having to do with soil fertility, cultivation, seed, and seed treatment, apparently no single practice has more to do with getting a good yield of corn than planting plenty of seed and

TABLE 11.—NUMBER OF STALKS PER HILL AS RELATED TO CORN YIELDS
(Averages of eleven comparisons on dark prairie soils of north-central Illinois, 1925-1927 and 1929-1932)

Care of soil	Stalks per hill, after cultivation	Number of fields	Acre-yield of corn
			bu.
Well treated	1.75 to 2.24	553	50.6
	2.25 to 2.74	594	55.3
	2.75 to 3.24	180	59.6
Fairly well treated	1.75 to 2.24	1 280	48.7
	2.25 to 2.74	1 067	52.7
	2.75 to 3.24	240	54.7
Poorly treated	1.75 to 2.24	897	44.6
	2.25 to 2.74	532	47.3
	2.75 to 3.24	92	51.9
All three grades of soil treatment	1.75 to 2.24	2 730	47.9
	2.25 to 2.74	2 193	51.7
	2.75 to 3.24	512	55.4

using careful cultivation so that a good stand is maintained. In thirty-two of the thirty-three comparisons on well-treated, fairly well treated, and poorly treated soils, involving a total of 5,435 fields averaging about 25 acres each, those fields having an average of 3 stalks to a hill produced higher yields than those having an average of only 2 stalks to a hill.

Early planting had some advantage. In 1932 corn planted during the first ten days of May produced 3 bushels an acre more than that planted from May 10 to May 19, as an average of all three grades of soil treatment (Table 12). The yield on a few fields planted after May 20 was lower by an average of 1.2 bushels an acre. In 1929 a marked difference of 2.2 bushels an acre occurred in favor of planting during the first ten days of May rather than during the second ten days. In 1930 and 1931 the earlier planting apparently held no advantage.

As an average of the four years, and including 4,042 fields, the

TABLE 12.—TIME OF PLANTING AS RELATED TO CORN YIELDS
(Averages of all comparisons on dark prairie soils of north-central Illinois, 1929-1932)

Care of soil and time of planting	1929		1930		1931		1932		Average of four years	
	Number of fields	Acre-yield of corn	Number of fields	Acre-yield of corn	Number of fields	Acre-yield of corn	Number of fields	Acre-yield of corn	Number of fields	Acre-yield of corn
		bu.		*bu.*		*bu.*		*bu.*		*bu.*
Well-treated soil										
Before May 10	60	51.9	215	43.0	145	49.4	37	71.8	457	54.0
May 10 to 19	84	51.1	53	43.4	96	49.0	114	68.5	347	53.0
May 20 to 31	13	53.1	16	44.2	20	49.9	13	67.9	62	53.8
Fairly well treated soil										
Before May 10	141	51.2	431	40.6	423	48.6	69	68.8	1 064	52.3
May 10 to 19	169	46.9	151	38.1	312	49.2	195	65.5	827	49.9
May 20 to 31	51	47.8	20	39.9	56	49.9	17	61.4	144	49.7
Poorly treated soil										
Before May 10	85	44.0	180	34.8	285	45.6	38	61.7	588	46.5
May 10 to 19	106	42.5	55	34.4	154	46.5	141	59.1	456	45.6
May 20 to 31	42	39.6	8	36.8	35	46.3	12	60.4	97	45.8
All three grades of soil treatment										
Before May 10	286	49.0	826	39.5	853	47.9	144	67.4	2 109	50.9
May 10 to 19	359	46.8	259	38.6	562	48.2	450	64.4	1 630	49.5
May 20 to 31	106	46.8	44	40.3	111	48.7	42	63.2	303	49.8

corn planted during the first ten days of May produced slightly higher yields than that planted later in the month.

Seed Practices Affecting Corn Yields

Use of high-yielding well-adapted strains.[1] The planting of known high-yielding strains of seed adapted to local conditions is one of the most effective ways of increasing corn yields (Table 13). Recommended strains of seed on 3,644 fields yielded approximately 3 bushels an acre more than all other strains on 2,437 fields. Among the unrecommended strains were some local selections and unknown selections that were undoubtedly very good.

Good strains of corn are more or less local in adaptation. This is shown by the fact that in the area comprising Livingston, McLean, Tazewell, and Woodford counties where the Krug strain originated,[2] the Krug corn yielded 4.2 bushels an acre more than the unrecommended or unknown varieties ("all other kinds," Table 13), as an average of the three grades of soil treatment; whereas in Henry, Knox, Peoria, and Stark counties Krug corn produced only 1.6 bushels an acre more than the unrecommended or unknown strains. In this latter area the "other good strains" proved superior to the Krug corn. The good strains recommended for Grundy, LaSalle, Marshall, and Putnam counties included two recommended for early maturity as well as for high yield, but during 1931 and 1932, when these data were collected, the early strains did not yield so well as the later non-recommended strains.

Early selection of seed from stalk. The common practice of good farmers of selecting seed corn from the stalk early in the fall was shown by these studies to be a profitable practice (Table 14), particularly when the corn was grown on well-treated soil. As an average

[1] At the time this portion of the study dealing with corn practices was completed, in 1932, hybrid corn was just beginning to come into general use, and consequently was not included in the comparisons made here. Since that time hybrids have been developed extensively, and many of them have proved to be higher yielding than the best open-pollinated strains. The effect has been to give even more prominence to the practice of using high-yielding corn. The relative value of the other practices discussed has not, in general, been affected by the advent of hybrid corn.

[2] In Table 13 Krug corn was listed separately because approximately half of the fields included in the entire study covering eight years were planted with that variety. Krug corn was discovered in a corn-yield test conducted in Woodford county during the years 1919-1922. It has had wide distribution thruout the corn belt where climatic and soil conditions are similar to those in Woodford county.

TABLE 13.—PLANTING OF KNOWN HIGH-YIELDING STRAINS OR OTHER STRAINS, AS RELATED TO CORN YIELDS
(Averages of twelve comparisons on dark prairie soils of north-central Illinois, 1925-1932)

Care of soil	Kind of seed	Livingston, McLean, Tazewell, Woodford counties 1925-1931		Henry, Knox, Peoria, Stark counties 1930-1932		Grundy, LaSalle, Marshall, Putnam counties 1931-1932		Average of 12 comparisons 1925-1932	
		Number of fields	Acre-yield of corn	Number of fields	Acre-yield of corn	Number of fields	Acre-yield of corn	Number of fields	Acre-yield of corn
			bu.		*bu.*		*bu.*		*bu.*
Well treated	Krug[a]	572	54.6	126	56.2	75	59.6	773	55.8
	Other good strains[b]	127	54.0	17	57.5	30	57.4	174	55.4
	All other kinds[c]	421	49.9	69	54.1	60	58.8	550	52.5
	Average of all kinds	1 120	52.6	212	55.5	165	58.8	1 497	54.4
Fairly well treated	Krug[a]	999	50.9	256	52.8	149	62.0	1 404	53.2
	Other good strains[b]	272	50.0	48	55.8	47	53.8	367	52.0
	All other kinds[c]	835	46.8	179	51.3	110	57.2	1 124	49.6
	Average of all kinds	2 106	49.0	483	52.6	306	57.8	2 895	51.4
Poorly treated	Krug[a]	534	45.4	94	49.1	118	55.6	746	48.0
	Other good strains[b]	123	45.6	18	49.5	39	50.2	180	47.5
	All other kinds[c]	630	41.7	41	47.9	92	50.6	763	44.7
	Average of all kinds	1 287	43.4	153	49.2	249	53.7	1 689	46.5
All three grades of soil treatment	Krug[a]	2 105	50.3	476	52.7	342	59.1	2 923	52.4
	Other good strains[b]	522	49.9	83	54.3	116	53.8	721	51.6
	All other kinds[c]	1 886	46.1	289	51.1	262	55.6	2 437	49.0
	Average of all kinds	4 513	48.3	848	52.4	720	56.7	6 081	50.7

[a]Krug corn was listed separately from other good strains because it was used on nearly half of the fields.
[b]"Other good strains" included Funk 176A, Sommer Yellow Dent, Lampe, McKeighan Yellow Dent, Will County Favorite, Western Plowman, and a few other local strains.
[c]"All other kinds" included some good strains not grown on enough fields to give dependable average yields.

TABLE 14.—METHOD OF SELECTING SEED AS RELATED TO CORN YIELDS
(Averages of eight comparisons on dark prairie soils of north-central Illinois, 1925-1932)

Care of soil	Method of selecting seed	Number of fields	Acre-yield of corn
			bu.
Well treated	From stalks, before husking	808	53.8
	At husking	128	52.3
Fairly well treated	From stalks, before husking	1 432	50.9
	At husking	285	49.8
Poorly treated	From stalks, before husking	958	45.2
	At husking	201	45.1
All three grades of soil treatment	From stalks, before husking	3 198	50.0
	At husking	614	49.1

of eight comparisons involving 3,812 fields during 1925-1932, the stalk-selected seed yielded 1.5 bushels an acre more than that selected at husking time on well-treated soil, 1.1 bushels more on fairly well treated soil, and only .1 bushel more on poorly treated soil.

Careful storage of seed. The careful drying and storage of seed corn proved to be more profitable than any other practice having to do with the seed except the use of high-yielding strains. Careful handling of seed (drying it with heat in the fall, and storing it where it would

TABLE 15.—METHOD OF STORING SEED AS RELATED TO CORN YIELDS
(Averages of eleven comparisons on dark prairie soils of north-central Illinois, 1925-1927 and 1929-1932)

Care of soil	Method of storing seed[a]	Number of fields	Acre-yield of corn
			bu.
Well treated	Dried with heat and kept from freezing	384	51.8
	Not dried with heat and not kept from freezing	530	48.9
Fairly well treated	Dried with heat and kept from freezing	554	48.1
	Not dried with heat and not kept from freezing	1 120	45.6
Poorly treated	Dried with heat and kept from freezing	367	42.6
	Not dried with heat and not kept from freezing	690	41.9
All three grades of soil treatment	Dried with heat and kept from freezing	1 305	47.5
	Not dried with heat and not kept from freezing	2 340	45.5

[a]Most seed described as "dried with heat and kept from freezing" was stored on racks in attics, dry basements, or in seed houses. Most seed described as "not dried with heat and not kept from freezing" was hung up in driveways of corncribs or barns and in machine sheds and left there over winter.

not freeze) resulted in yields averaging for all fields 2 bushels an acre more than the yields from seed not so handled (Table 15). On well-treated soil the difference was 2.9 bushels an acre, on fairly well treated soil 2.5 bushels, and on poorly treated soil .7 bushel in favor of the carefully handled seed.

Most of the seed that was not dried with heat and not kept from freezing was hung up for the winter in the driveways of corncribs or barns or in machine sheds. Since approximately two-thirds of all of the fields were planted with this poorly handled seed, it is evident that many corn-belt farmers have an opportunity to increase their acre-yields of corn thru more careful drying and storing of the seed.

Ear testing for germination and disease. On 2,522 fields for which the seed had been carefully tested for germination and disease,

TABLE 16.—EAR-TESTING OF SEED FOR GERMINATION AND DISEASE AS RELATED TO CORN YIELDS

(Averages of nine comparisons on dark prairie soils of north-central Illinois, 1925-1932)

Care of soil	Method of testing seed[a]	Number of fields	Acre-yield of corn
			bu.
Well treated	Each ear tested	718	54.6
	General, or no test	464	52.9
Fairly well treated	Each ear tested	1 109	52.0
	General, or no test	1 050	49.8
Poorly treated	Each ear tested	695	46.2
	General, or no test	703	44.1
All three grades of soil treatment	Each ear tested	2 522	50.9
	General, or no test	2 217	48.9

[a] "Each ear tested" means that a few grains from each ear were tested in a germinator of some kind and only the ears showing good germination and apparent freedom from disease were used for seed. All methods of ear testing and all degrees of disease selection were included in this one class. "General or no test" means that only a few ears from the seed supply were tested, or that no test of any kind was made.

the yields of corn averaged approximately 2 bushels an acre more than on 2,217 fields planted with seed which had received only a general test or had not been tested at all (Table 16). Approximately the same differences in yield occurred on well-treated, on fairly well treated, and on poorly treated soils. Evidently a high proportion of corn-belt farmers who still use open-pollinated seed could profitably increase their yields of corn by adopting the practice of carefully testing each year's seed for germination and disease.

Treating seed for disease. Approximately 60 percent of the fields included in this study were planted with seed treated with one of the dust treatments for the control of corn diseases (Table 17).

TABLE 17.—TREATMENT OF SEED FOR DISEASES AS RELATED TO CORN YIELDS
(Averages of eight comparisons on dark prairie soils of north-central Illinois, 1929-1932)

Care of soil	Treatment of seed	Number of fields	Acre-yield of corn
			bu.
Well treated	Treated for disease	572	53.1
	Not treated	187	52.7
Fairly well treated	Treated for disease	1 217	51.2
	Not treated	549	50.1
Poorly treated	Treated for disease	729	47.1
	Not treated	290	45.9
All three grades of soil treatment	Treated for disease	2 518	50.5
	Not treated	1 026	49.6

In general the treatment for disease was a little more effective on the less productive land than on land that was in the best state of fertility. On the well-treated soil the corn grown from treated seed yielded .4 bushel an acre more than the corn grown from untreated seed; on fairly well treated soil it yielded 1.1 bushels an acre more; and on poorly treated soil it yielded 1.2 bushels an acre more.

This greater advantage of dust treatment on poorly treated soil may have resulted from the fact that less of the seed used on poorly treated soil had been ear-tested for germination and disease (Table 16).

Large-eared corn better on poorly treated soil. Strains of corn described by the growers as producing large seed ears yielded an average of 2.6 bushels an acre more on the poorly treated soil than strains of seed described as having medium-sized ears (Table 18). On the fairly well treated soil the large-eared strains had an advantage of only .8 bushel an acre. But on well-treated land, the strains having medium-

TABLE 18.—SIZE OF SEED EARS AS RELATED TO CORN YIELDS
(Averages of seven comparisons on dark prairie soils of north-central Illinois, 1929-1932)

Care of soil	Size of seed ears	Number of fields	Acre-yield of corn
			bu.
Well treated	Large	137	49.7
	Medium	538	50.9
Fairly well treated	Large	275	49.4
	Medium	1 321	48.6
Poorly treated	Large	117	46.7
	Medium	764	44.1
All three grades of soil treatment	Large	529	48.6
	Medium	2 623	47.9

sized ears yielded 1.2 bushels an acre more than the large-eared strains. On poorly treated soil only about one field in seven was planted with the large-eared type, while on well-treated soil about one field in four was planted with that type.

Smooth-eared corn best on well-treated soil. Corn having very little indentation of kernels yielded on well-treated soil about 2 bushels an acre more than corn having medium indentation. On fairly well

TABLE 19.—INDENTATION OF KERNEL OF SEED EARS AS RELATED TO CORN YIELDS (Averages of five comparisons on dark prairie soils of north-central Illinois, 1929-1932)

Care of soil	Indentation of kernel	Number of fields	Acre-yield of corn
			bu.
Well treated	Smooth	329	52.7
	Medium	204	50.7
Fairly well treated	Smooth	709	50.7
	Medium	552	49.0
Poorly treated	Smooth	485	45.3
	Medium	329	45.1
All three grades of soil treatment	Smooth	1 523	49.5
	Medium	1 085	48.3

treated soil the difference was 1.7 bushels and on poorly treated soil only .2 bushel an acre in favor of the smooth ears (Table 19).

Summary of Profitable Corn-Growing Practices

A summary of the gains in yield of corn brought about by following the superior practices discussed in this section is given in Table 20.

Total gains in yield resulting from including clover in the rotation, from applying manure once in the rotation, and from applications of rock phosphate amounted to 11.7 bushels an acre. The superior practices used in the preparation of the seedbed, in the time and rate of planting, and in the cultivation of the crop accounted for gains of 9.9 bushels an acre on fields having good soil treatment, 9.4 bushels an acre on fields with fair soil treatment, and 9.2 bushels an acre on fields having poor soil treatment. Those practices having to do with the kind or strain and with the selection, storage, and testing of seed resulted in total gains of 9.8 bushels an acre on well-treated soil, 10.5 bushels an acre on fairly well treated soil, and 7.4 bushels an acre on poorly treated soil.

The total gains for all of these superior practices, which cover approximately all measurable practices involved in the growing of

TABLE 20.—GAINS IN CORN YIELDS, AND ESTIMATED TOTAL YIELDS, FROM VARIOUS PRACTICES

Practice followed	Quality of soil treatment		
	Good	Fair	Poor
Gains in corn yields from various practices			
Soil treatments	*bu.*	*bu.*	*bu.*
Clover in rotation	5.0	2.5	....
Manure during preceding four years	2.8	1.4	....
Rock phosphate used	3.9	1.9	....
Total gain from soil treatments	11.7	5.8	....
Cultural practices			
Timely working of soil in spring	1.7	1.7	1.7
Harrowing after planting	1.6	1.6	1.6
Blade cultivator rather than shovels	.9	0	0
Shovel cultivator rather than blades	0	.7	1.8
Time of planting—May 1 to 10 rather than May 10 to 20	1.4	1.4	1.4
Thickness of planting	4.3	4.0	2.7
Total gain from cultural practices	9.9	9.4	9.2
Seed practices			
Kind of seed	3.3	3.6	3.3
Method of seed selection	1.5	1.1	.1
Method of seed storage	2.9	2.5	.7
Method of seed testing	1.7	2.2	2.1
Disease treatment of seed	.4	1.1	1.2
Total gain from seed practices	9.8	10.5	7.4
Total gain from good practices	**31.4**	**25.7**	**16.6**
Estimated total yields following different combinations of practices			
All poor practices	....	....	35.0
All good practices	66.4	....	....
Cultural and seed practices good, soil treatment fair	....	60.7	....
Cultural and seed practices good, soil treatment poor	....	....	51.6

corn, amounted to 31.4 bushels an acre on well-treated soil, 25.7 bushels an acre on fairly well treated soil, and 16.6 bushels an acre on poorly treated soil.

Differences in yield resulting from the different practices considered separately were small, in some cases almost too small to seem significant. But when all these differences are added together they account for about the same differences in yield as are actually found on two fields, on one of which good practices are followed and the other of which is poorly handled. For example, over the ten-year period from 1925 to 1934 a few of the fifty-seven farms that were included in the study produced an average of only about 35 bushels of corn an acre; while, on the other hand, one of the fifty-seven produced an average of 63.5 bushels an acre during the same ten years. On another farm where the operator owned 90 acres and rented 100 acres in addition, the home farm produced an average of 63.5 bushels of

corn an acre during the ten years and the rented land 53 bushels an acre. On the rented land, which would not grow clover, no measures were taken to improve the soil, but good practices were used in seedbed preparation, in cultivation, and in the selection and care of seed. Thus altho a tenant may be unable to follow good soil-improvement practices, it will pay him to follow the superior practices pertaining to the selection and care of seed and the tillage of the land.

Tho some of the increases in yield of corn attributed to different practices were probably due to the fact that the same man who followed one good practice was also following other good practices, the fact remains that the total increase in yield brought about by the good practices was approximately what is found when good farming in general is compared with poor farming.

OAT PRODUCTION

Good yields of oats help to increase the farm profits even tho oats are considered one of the least profitable crops commonly grown in north-central Illinois. In total acreage oats have continued next to corn, probably because they are a good nurse crop for clovers and grasses, a good feed crop, and their production does not interfere with the production of corn.

During the eight years from 1925 to 1932 inclusive, a study of the practices followed in growing oats, similar to the study of corn described in the foregoing section, was made. Only fields that were 10 acres or more in size and were on the best types of prairie soil of north-central Illinois were included.

Fertility Practices Affecting Oat Yields

Practices affecting soil fertility were of first importance in increasing oat yields.

Rock phosphate most effective for oats. Those fields that had been covered with rock phosphate at some previous time, and that had grown clover at least once during the preceding four years, produced an average of 8.4 bushels more oats per acre than the fields that had grown clover but had received no phosphate (Table 21). In neither case were fields included on which manure had been applied during the preceding four years. The 48 fields that received phosphate, that had grown clover, and that had been manured during the preceding four years averaged 6.3 bushels more oats an acre than the 144 fields that had grown clover and had been manured but on which no phosphate

FIG 3.—OATS STILL HAVE AN IMPORTANT PLACE ON CORN-BELT FARMS

Farmers in this study who followed the better practices in growing oats had oat yields 39.7 bushels an acre higher than the farmers who followed inferior practices (page 510). While usually considered a low-profit crop, oats fill an important place in corn-belt rotations as a nurse crop for soil-building legumes, and as feed and bedding for livestock.

had ever been applied. As an average of these two comparisons, which involve all fields where rock phosphate had been used, the phosphate apparently increased the yield of oats by about 7.3 bushels an acre.

Manure next to rock phosphate. The fields that had received manure during the preceding four years produced an average of 4.5 bushels more oats an acre than the fields that had not been manured but that had in other ways been treated the same.

That the growing of clovers in rotation was less effective in increasing yields of oats than applications of manure or rock phosphate is not surprising when one realizes that usually two crops of corn were grown on clover land between the growing of clover and the growing of oats. The corn under such conditions seems to get most of the benefit of the clover.

Classification of fields according to fertility treatments. For the purpose of eliminating the effects of the care of the soil while studying the influences of other practices, the oat fields were classified into three groups as were the cornfields—those having well-treated soil, those having fairly well treated soil, and those whose soil received poor treatment. The practices studied were seedbed preparation, seeding, and care of the seed.

TABLE 21.—KIND OF SOIL TREATMENT AS RELATED TO OAT YIELDS

(Averages of six comparisons on dark prairie soils of north-central Illinois, 1925-1927 and 1929-1931)

Soil treatment	Number of fields	Acre-yield of oats
		bu.
None[a]	522	36.6
Manure only[b]	123	40.9
Clover only[c]	277	39.4
Manure and clover	144	44.2
Clover and phosphate[d]	79	47.8
Manure, clover, and phosphate	48	50.5

[a]No manure was applied during the preceding four years; nor any clover, alfalfa, or soybeans for either hay, seed, or pasture. No phosphate had ever been used. Some limestone may have been applied to some fields.

[b]More or less manure had been applied during the preceding four years. Applications varied from 2 or 3 tons of strawstack manure per acre to 12 to 15 tons of feedlot manure. Most applications were about 5 to 7 tons per acre. No clover during preceding four years; no phosphate at any time.

[c]For one or more years during the preceding four, these fields had been left in clover—red, alsike, mammoth, or sweet clover, or alfalfa, either alone or in mixture On many fields the stands had been rather poor, but good enough to leave. No manure during preceding four years; no phosphate at any time.

[d]Rock phosphate had been applied over the entire field at some preceding time. Most applications had been from 1,000 to 2,000 pounds per acre.

The fields that were well treated from the standpoint of the use of deep-rooted legumes, manure, and phosphate produced an average of 47.6 bushels of oats an acre (Table 22). Fairly well treated fields produced an average of 43.8 bushels, and poorly treated fields only 39.7 bushels an acre a year. These data are based on the averages of eleven comparisons involving 2,225 fields on dark prairie soil of north-central Illinois during the years 1925 to 1927 and 1929 to 1932 inclusive.

Seedbed Practices Affecting Oat Yields

Double-disking before seeding. As an average of three grades of soil treatment, 191 fields that were double-disked before the oats were sown yielded 3.0 bushels an acre more than 610 fields that were not disked before seeding, and 2.3 bushels an acre more than 453 fields that were only single-disked before the seed was sown (Table 23).

The advantage of double-disking before seeding appeared to be greater on poorly treated soils than on well-treated soils. Probably the

TABLE 22.—QUALITY OF SOIL TREATMENT AS RELATED TO OAT YIELDS
(Averages of eleven comparisons on dark prairie soils of north-central Illinois, 1925-1927 and 1929-1932)

Care of soil[a]	Number of fields	Acre-yield of oats
		bu.
Well treated	350	47.6
Fairly well treated	919	43.8
Poorly treated	956	39.7
All three grades of soil treatment	2 225	43.7

[a] *Well-treated soils* were those that had received any two of the three treatments listed in *Table 21*, or that had received one of the treatments in full and each of the other two in part. *Fairly well treated soils* had received one treatment but not enough of the other two to qualify as well-treated soils. *Poorly treated soils* were those that had received little or no treatment of any of the three types listed.

reason was that poorly treated soils are in poorer physical condition and are more likely to become hard than are well-treated soils, and consequently they need thoro working to get them in better physical condition.

Single-disking after seeding. On 332 fields of poorly treated soil that were double-disked after seeding, oats yielded 1.9 bushels an acre more, on the average, than on 255 fields of poorly treated soil that were only single-disked after seeding (Table 24). But on the well-treated soil the fields that were single-disked after seeding produced an average of 2.5 bushels more oats an acre than the fields that were double-disked. Neither practice held any particular advantage over the other on the fairly well treated soil.

These data, as well as the data on disking before planting, indicate

TABLE 23.—NUMBER OF DISKINGS BEFORE SEEDING AS RELATED TO OAT YIELDS
(Averages of five comparisons on dark prairie soils of north-central Illinois, 1930-1932)

Care of soil	Times disked	Number of fields	Acre-yield of oats
			bu.
Well treated	None	81	51.0
	Single	65	51.1
	Double	34	52.8
Fairly well treated	None	239	45.5
	Single	203	47.8
	Double	88	48.7
Poorly treated	None	290	41.4
	Single	185	41.3
	Double	69	45.6
All three grades of soil treatment	None	610	46.0
	Single	453	46.7
	Double	191	49.0

TABLE 24.—NUMBER OF DISKINGS AFTER SEEDING AS RELATED TO OAT YIELDS
(Averages of five comparisons on dark prairie soils of north-central Illinois, 1929-1932)

Care of soil	Times disked	Number of fields	Acre-yield of oats
			bu.
Well treated	Single	73	54.1
	Double	93	51.6
Fairly well treated	Single	219	47.0
	Double	309	47.4
Poorly treated	Single	255	41.3
	Double	332	43.2
All three grades of soil treatment	Single	547	47.5
	Double	734	47.4

that on poorly treated land the more thoro working of the seedbed for oats is an advantage. On the well-treated soil the extra work may have given no advantage because of the tendency to plant the oats too deep or to make the seedbed too loose when land that works up readily is double-disked.

Tractor or horses for disking before seeding. As an average of six comparisons during the four years 1929-1932, in which all three grades of soil treatment were included, 386 fields disked with a tractor before the oats were seeded averaged 48.9 bushels an acre, while 440 fields disked with horses before the oats were seeded averaged 47.3 bushels—an average difference of 1.6 bushels an acre in favor of tractor disking (Table 25). There was a somewhat greater advantage in favor of tractor disking on well-treated land than on either fairly well treated or poorly treated soil.

The difference in favor of tractor disking is probably accounted

TABLE 25.—USE OF HORSES OR TRACTOR FOR DISKING BEFORE SEEDING AS RELATED TO OAT YIELDS
(Averages of six comparisons on dark prairie soils of north-central Illinois, 1929-1932)

Care of soil	Power used	Number of fields	Acre-yield of oats
			bu.
Well treated	Horses	73	51.7
	Tractor	55	54.5
Fairly well treated	Horses	196	47.4
	Tractor	180	49.0
Poorly treated	Horses	171	42.8
	Tractor	151	43.2
All three grades of soil treatment	Horses	440	47.3
	Tractor	386	48.9

for by the more thoro working of the soil by the heavy tractor disks than by the lighter horse-drawn implements. Timeliness in getting the work done with a tractor was also probably a reason for the better yields.

Tractor or horses for disking after seeding. In comparisons involving 1,588 fields and all three grades of soil treatment during the four years 1929-1932, tractor-drawn disks and horse-drawn disks appeared to be equally effective for working land after the oats were seeded (Table 26). Probably the tendency to cover the oats too deep or to make the seedbed too loose when disking with heavy tractor

TABLE 26.—USE OF HORSES OR TRACTOR FOR DISKING AFTER SEEDING AS RELATED TO OAT YIELDS

(Averages of eight comparisons on dark prairie soils of north-central Illinois, 1929-1932)

Care of soil	Power used	Number of fields	Acre-yield of oats
			bu.
Well treated	Horses	83	53.3
	Tractor	125	53.0
Fairly well treated	Horses	244	47.7
	Tractor	445	47.9
Poorly treated	Horses	235	44.3
	Tractor	456	43.8
All three grades of soil treatment	Horses	562	48.4
	Tractor	1 026	48.2

disks accounts for the failure of tractor disking after seeding to hold the same advantage over disking with horses that it held before seeding.

Tractor or horses for harrowing after seeding. The 902 fields of oats harrowed with horses produced average yields of 47.3 bushels an acre in six comparisons during the four years 1929-1932 inclusive, whereas the 570 fields harrowed with tractors produced average yields of 46.7 bushels, or .6 bushel less than the fields harrowed with horses (Table 27). There was a slight advantage for the horses on the well-treated land and on the poorly treated land, but on the fairly well treated land the yields accompanying the two methods were practically the same.

Use of roller after seeding. In four of six comparisons involving 1,443 fields of oats, 213 of which were rolled either before or after the grain was up, the use of the roller resulted in higher average yields than those obtained on fields that were not rolled at all (Table 28). The value of rolling was especially noticeable during the dry season

TABLE 27.—USE OF HORSES OR TRACTOR FOR HARROWING AFTER SEEDING AS RELATED TO OAT YIELDS

(Averages of six comparisons on dark prairie soils of north-central Illinois, 1929-1932)

Care of soil	Power used	Number of fields	Acre-yield of oats
			bu.
Well treated	Horses	143	52.0
	Tractor	73	51.5
Fairly well treated	Horses	386	47.1
	Tractor	245	47.3
Poorly treated	Horses	373	42.7
	Tractor	252	41.2
All three grades of soil treatment	Horses	902	47.3
	Tractor	570	46.7

of 1930. As an average of the six studies, fields rolled before the grain was up produced 49.0 bushels; fields rolled after the grain was up, 48.4 bushels; and fields not rolled at all, only 46.7 bushels an acre a year.

Seeding Practices Affecting Oat Yields

Early seeding. Oats seeded in March yielded an average of 47.8 bushels an acre on 833 fields in six comparisons involving all three grades of soil treatment. Oats seeded from April 1 to April 15 on 756 fields yielded an average of only 44.0 bushels an acre, or 3.8 bushels less than the March seeding. On well-treated land the difference in favor of the March seeding amounted to 5.7 bushels; on fairly well

TABLE 28.—USE OF ROLLER AS RELATED TO OAT YIELDS

(Averages of six comparisons on dark prairie soils of north-central Illinois, 1928 and 1930-1932)

Counties and year	Rolled before grain was up		Rolled after grain was up		Not rolled	
	Number of fields	Acre-yield of oats	Number of fields	Acre-yield of oats	Number of fields	Acre-yield of oats
Livingston, McLean, Tazewell, Woodford		*bu.*		*bu.*		*bu.*
1928	15	52.1	13	53.6	155	56.3
1930	24	42.6	12	43.3	318	36.1
1931	10	44.3	11	47.3	340	48.8
Henry, Knox, Peoria, Stark						
1930	23	49.9	21	48.6	107	44.9
1931	32	49.8	7	46.9	167	44.0
1932	34	55.5	11	50.8	143	49.9
All six comparisons	138	49.0	75	48.4	1 230	46.7

TABLE 29.—TIME OF SEEDING AS RELATED TO OAT YIELDS
(Averages of six comparisons on dark prairie soils of north-central Illinois, 1929-1931)

Care of soil	Time of seeding	Number of fields	Acre-yield of oats
			bu.
Well treated	March	109	54.0
	April 1 to 15	118	48.3
Fairly well treated	March	368	47.2
	April 1 to 15	337	43.8
Poorly treated	March	356	42.3
	April 1 to 15	301	40.0
All three grades of soil treatment	March	833	47.8
	April 1 to 15	756	44.0

treated land, 3.4 bushels; and on poorly treated land, 2.3 bushels. These records are for the three years 1929 to 1931 (Table 29).

Among the fifty-seven farmers who were in the accounting service during the ten years the four who had the highest average yields of oats practiced early seeding of oats (see page 595).

Rate of seeding. In five comparisons involving 1,264 fields and all three grades of soil treatment, the average yield of oats during the four years 1929-1932 was 46.9 bushels an acre on fields where 2 to 2½ bushels an acre was sown and 47.4 bushels where 2½ to 3 bushels an acre was sown (Table 30). Thus the increase in yield amounted to the same as the increase in amount of seed used. Few fields were seeded with less than 2 or more than 3 bushels of seed per acre. So from the standpoint of yields there seems to be no disadvantage in sowing only about 2 to 2½ bushels of seed per acre; and inasmuch as thinly seeded oats make a better nurse crop for clover

TABLE 30.—RATE OF SEEDING AS RELATED TO OAT YIELDS
(Averages of five comparisons on dark prairie soils of north-central Illinois, 1929-1932)

Care of soil	Seed sown per acre	Number of fields	Acre-yield of oats
	bu.		*bu.*
Well treated	2.1 to 2.5	56	52.3
	2.6 to 3.0	120	52.1
Fairly well treated	2.1 to 2.5	161	46.3
	2.6 to 3.0	347	47.9
Poorly treated	2.1 to 2.5	173	42.0
	2.6 to 3.0	407	42.3
All three grades of soil treatment	2.1 to 2.5	390	46.9
	2.6 to 3.0	874	47.4

than those thickly seeded, there is probably a definite advantage in the thinner seeding.

Seed Practices Affecting Oat Yields

Use of early varieties. The relatively early varieties of oats—Iowa 103 and Iowar—yielded 44.5 bushels an acre as an average of 1,305 fields including all three grades of soil treatment during the six years 1925-1931 (Table 31). The later varieties—Silvermine, Big Four, and Great American—produced on 403 fields an average of 40.2 bushels an acre, or 4.3 bushels less than the average of the two earlier

TABLE 31.—VARIETY SOWN AS RELATED TO OAT YIELDS

(Averages of six comparisons on dark prairie soils of north-central Illinois, 1925-1927 and 1929-1931)

Care of soil	Varieties	Number of fields	Acre-yield of oats
			bu.
Well treated	Iowa 103 and Iowar[a]	222	49.8
	Silvermine, Big Four, Great American[b]	77	45.7
Fairly well treated	Iowa 103 and Iowar	540	43.9
	Silvermine, Big Four, Great American	153	39.6
Poorly treated	Iowa 103 and Iowar	543	39.8
	Silvermine, Big Four, Great American	173	35.2
All three grades of soil treatment	Iowa 103 and Iowar	1 305	44.5
	Silvermine, Big Four, Great American	403	40.2

[a]Early to medium-early varieties. [b]Medium to medium-late varieties.

varieties. This superiority in yield of early varieties was approximately the same for all three grades of soil treatment. Not a large enough acreage of any other single variety of oats was grown to warrant making separate studies of other varieties.

Fanning the seed. On well-treated land 156 fields planted with seed that had been thoroly fanned and screened yielded an average of 51.5 bushels an acre during the four years 1929-1932, whereas on the same quality of land planted with seed that had not been fanned or screened, the yield was only 48.9 bushels an acre—a difference of 2.6 bushels in favor of the fields for which the seed had been fanned (Table 32). The difference in favor of the fanned seed on fairly well treated soil was 2.4 bushels an acre; and on poorly treated soil, .4 bushel an acre. As an average of all three grades of soil treatment, the difference in favor of the fanned seed was 1.8 bushels an acre.

Dust treatment for smut. Two hundred twenty fields planted with seed oats that had been treated with one of the dust treatments

TABLE 32.—FANNING THE SEED AS RELATED TO OAT YIELDS
(Averages of five comparisons on dark prairie soils of north-central Illinois, 1929-1932)

Care of soil	Use of fanning mill	Number of fields	Acre-yield of oats
			bu.
Well treated	Seed fanned	156	51.5
	Seed not fanned	38	48.9
Fairly well treated	Seed fanned	408	47.2
	Seed not fanned	149	44.8
Poorly treated	Seed fanned	314	41.1
	Seed not fanned	154	40.7
All three grades of soil treatment	Seed fanned	878	46.6
	Seed not fanned	341	44.8

for smut produced an average of 51.7 bushels an acre during the four years 1929-1932, or 5.4 bushels an acre more than 763 fields where the seed had received no treatment for smut (Table 33). The advantage of treating seed oats with formalin for smut on 417 fields was only 1.1 bushels an acre over no treatment at all.

This slight advantage of treating seed with formalin over not treating it at all, and the markedly higher yields on fields where the seed was treated with dust, was evident on each of the three grades of soil. The increase accompanying dust treatment of seed on well-treated land was 8.1 bushels an acre a year; on fairly well treated land, 4.2 bushels; and on poorly treated land, 4.1 bushels. Either the formalin treatment as used was not effective, or it was injurious to germination of the seed.

TABLE 33.—TREATMENT OF SEED FOR SMUT AS RELATED TO OAT YIELDS
(Averages of five comparisons on dark prairie soils of north-central Illinois, 1929-1932)

Care of soil	Treatment of seed	Number of fields	Acre-yield of oats
			bu.
Well treated	No treatment	73	50.3
	Treated with formalin	75	52.0
	Treated with dust[a]	52	58.4
Fairly well treated	No treatment	297	46.9
	Treated with formalin	174	47.3
	Treated with dust	99	51.1
Poorly treated	No treatment	393	41.6
	Treated with formalin	168	43.0
	Treated with dust	69	45.7
All three grades of soil treatment	No treatment	763	46.3
	Treated with formalin	417	47.4
	Treated with dust	220	51.7

[a] "Treated with dust" means that the seed was treated with one of the chemical dust treatments.

Summary of Profitable Oat-Growing Practices

The gains in yield resulting from the various practices used in growing oats are summarized in Table 34. Total gains resulting from the superior practices amounted to 39.7 bushels an acre on soils receiving good treatment, 25.2 bushels on soils receiving fair treatment, and 17.5 bushels on soils receiving poor treatment.

Unquestionably in some cases the increases credited to some one practice were partly due to other good practices followed along with the one being studied. The gains credited to the fanning of seed and to dust treatment for smut are probably of this class. On the whole,

TABLE 34.—GAINS IN OAT YIELDS FROM VARIOUS PRACTICES

Practices followed	Gains in oat yields when soil received—		
	Good treatment	*Fair* treatment	*Poor* treatment
Soil treatments	*bu.*	*bu.*	*bu.*
Rock phosphate used	7.3	3.6[a]	.....
Manure during preceding four years	4.5	2.2[a]	.....
Clover in the rotation	3.0	1.5[a]	.....
Total gain from soil treatments	14.8	7.3[a]	.....
Cultural practices			
Double rather than no disking before seeding	1.8	3.2	4.2
Double rather than single disking after seeding	0	.4	1.9
Single rather than double disking after seeding	2.5	0	0
March rather than April seeding	5.7	3.4	2.3
Total gain from cultural practices	10.0	7.0	8.4
Seed practices			
Early rather than late varieties	4.2	4.3	4.6
Fanned rather than unfanned seed	2.6	2.4	.4
Dust treatment rather than no treatment for smut	8.1	4.2	4.1
Total gain from seed practices	14.9	10.9	9.1
Total gain from all practices	**39.7**	**25.2**	**17.5**

[a]These gains from fair soil treatments with rock phosphate, manure, and clover are assumed amounts based on half the gains from full treatments, as described in Table 21, page 502.

however, the gain credited to each practice may be considered approximately a net gain for that practice as carried out under farm conditions. Thruout the ten years, records from individual farms where good practices were generally followed and from other farms where poor practices were followed show total differences in average yield of oats approximately equal to those shown in Table 34.

Evidently, then, a combination of the following practices brings the best yields of oats: early seeding of early varieties; the use of seed that has been carefully fanned and that has been treated with some good dust treatment to prevent smut; the inclusion of clover in the rotation at least one year in four; the application of manure; and the application of rock phosphate on land that is deficient in phosphorus.

BEEF AND DAIRY CATTLE ON CORN-BELT FARMS

Cattle have an important place on corn-belt farms. If well handled they make economic use of nontillable pasture, legumes needed for soil improvement, low-grade grain, and roughages which are by-products of grain production.

In this study it was not possible to make a complete analysis of cattle production practices because of (1) the relatively small number of cattle kept on the farms included; and (2) the differences in the nature of the cattle enterprises themselves, varying as these enterprises did among dairy, dual-purpose, and beef-cow herds, feeder steers, and various combinations of these four classes.

Comparisons of Four Types of Cattle Enterprises

First comparison, 1930-1932. During the three-year period 1930 to 1932 a study was made of the four kinds of cattle enterprises on farms in Henry, Knox, Peoria, and Stark counties (Table 35). Because of low and falling prices for cattle and dairy products during this period, the returns from cattle enterprises of all kinds were extremely low.

Of the different sorts of cow herds, the dairy herds brought an average return of $130 for each hundred dollars' worth of feed fed, the dual-purpose herds brought $100, and the beef-cow herds only $71. A fair farm value was assigned to all roughage used by livestock even tho it would not have been sold if livestock had not used it on the farm.

In interpreting these figures the fact must be kept in mind that the dual-purpose cattle and the beef-cow herds were at a distinct disadvantage because of the low price received for the beef produced. The three-year average selling price of beef from the dual-purpose herds was only $6.16 per hundred; from the beef-cow herds, $6.29; but from purchased feeder steers it was $8.54. While some of this lower price for beef from the beef-cow herds was due to the selling of old cows, *most of it was due to the poor quality of the beef calves sold.* That improvement could be made at this point is shown by the fact that the beef sold from one farm on which about 40 beef cows were kept, brought an average price of $8.85 per hundredweight during the same period.

Beef-cow herds and dual-purpose herds used more hay and pasture in proportion to grain than either dairy cattle or feeder steers. They likewise used a cheaper class of roughage than the dairy cattle, not so much of it being alfalfa hay and silage. These proportions are not

shown in the tables of data published here, but they are evident in the records kept.

Second and third comparisons, 1931-1933 and 1932-1934. Similar but less complete comparisons were made of the four different types of cattle enterprises from the three-year records of farms in Grundy, LaSalle, Marshall and Putnam counties in 1931, 1932, and 1933 and

TABLE 35.—KIND OF CATTLE ENTERPRISE AS RELATED TO RETURNS PER $100 FEED FED

(Averages of three three-year comparisons)

Items	Dairy-cow herd	Beef-cow herd	Dual-purpose cow herd	Feeders bought
Average 1930-1932 (Henry, Knox, Peoria, Stark)				
Number of farms	33	11	20	9
Average number of cows in herd	11.2	11.7	9.3	...
Returns per $100 feed fed	$130	$ 71	$100	$102
Percent of cattle units that were milked	61.7	12.8	36.9	8.2
Pounds of milk per cow milked	7 251	5 956	6 084	5 772
Pounds of milk per cow in herd	6 231	1 419	3 995	....
Pounds of beef per cow in herd	277	745	667	...
Price paid per 100 pounds cattle bought	$ 6.44	$ 8.23	$ 7.14	$ 7.47
Price received per 100 pounds cattle sold	5.20	6.29	6.16	8.54
Returns per 100 pounds beef produced	$ 2.76	$ 4.34	$ 3.83	$ 7.21
Returns per 100 pounds milk produced	1.32	1.13	1.16	1.13
Feed cost per 100 pounds beef or 1,000 pounds milk[a]	7.67	7.72	6.74	7.29
Percent of total value of feed representing—				
Grain and grain in silage	35.0	35.2	35.4	62.7
Protein concentrates	6.5	1.2	2.1	8.0
Hay and roughage in silage	39.9	31.6	31.6	15.7
Pasture	18.6	32.0	30.9	13 6
Average 1931-1933 (Grundy, LaSalle, Marshall, Putnam) and 1932-1934 (Livingston, McLean, Tazewell, Woodford)				
Total number of farms	130	17	17	19
Returns per $100 feed fed	$166	$ 76	$103	$117
Price paid per 100 pounds of beef bought	....	$ 4.75	$ 4.51	$ 5.05
Price received per 100 pounds of beef sold	....	5.30	4.41	6.28

[a]In a comparison of beef and dairy farms approximately the same value of feed was required to produce 1 pound of beef or 10 pounds of milk.

in Livingston, McLean, Tazewell, and Woodford counties in 1932, 1933, and 1934 (Table 35). The average price received for beef in these two comparisons was $4.41 per hundred-weight from dual-purpose herds, $5.30 from beef-cow herds, and $6.28 from feeder cattle, mostly range calves. As in the earlier comparison, this difference in price was due largely to differences in quality of cattle sold.

Place of Beef and Dual-Purpose Cattle

Despite these apparently low returns there is an important place on many corn-belt farms for beef and dual-purpose cows. The use made of large quantities of pasture and unsalable roughage, as shown in Table 35, and the effect that plenty of livestock has on crop yields, as shown in Table 69, page 568, offset to a large degree the apparently low returns for feed.

FIG. 4.—PLENTY OF LEGUMES AND LIVESTOCK INCREASE THE PRODUCTIVITY OF THE SOIL

Of forty farms in this study, twenty had 92 percent more legumes than the others, enough livestock to use the legumes, 20 percent less corn, and 38 percent less oats. The twenty with the most legumes and livestock produced the higher average net incomes (page 560).

Beef and dual-purpose cows could be made much more profitable on these farms, however, by keeping only good-quality cows, using only low-set, beef-type sires, disposing of all cows that do not breed regularly, keeping the cows almost entirely on pasture and unsalable roughage, and full-feeding the calves on grain from weaning or earlier until marketed as fat calves or baby beeves. All these practices are necessary if such herds are to pay well for feed used.

Returns From Dairy Cattle

The returns for feed fed to dairy cattle varied greatly according to (1) the production per cow, and (2) the percentage of the total cattle units[1] in the dairy herd that consisted of cows being milked. Three-year records of dairy herds in which eight or more cows were being milked and for which there was no special dairy market, were selected for study. The records for 1930-1932 were from herds in Henry, Knox, Peoria, and Stark counties, and those for 1931-1933 were from herds in Grundy, LaSalle, Marshall, and Putnam counties (Table 36).

TABLE 36.—PRODUCTION OF MILK PER COW MILKED, AND PERCENT OF CATTLE UNITS THAT WERE COWS MILKED, AS RELATED TO RETURNS PER $100 FEED FED TO ALL CATTLE, ON FARMS WHERE ONLY DAIRY CATTLE WERE KEPT

(Averages of two three-year comparisons: one in Henry, Knox, Peoria, and Stark counties in 1930-1932, and the other in Grundy, LaSalle, Marshall, and Putnam counties in 1931-1933)

Basis for grouping farms	Number of herds	Average number of cows per herd	Average production of milk per cow	Percent of cattle units that were cows milked	Dairy returns per 100 pounds milk	Returns[a] per $100 feed fed
			lb.			
Herds producing most milk per cow						
Herds with highest proportion of cows milked	14	11.2	8 815	71.1	$1.18	$168
Herds with lowest proportion of cows milked	14	10.6	8 518	57.3	1.20	143
Herds producing least milk per cow						
Herds with highest proportion of cows milked	14	11.3	5 930	64.0	1.31	142
Herds with lowest proportion of cows milked	14	9.7	6 107	43.5	1.13	107
All herds having—						
Highest producing cows	28	10.9	8 666	64.2	1.19	156
Lowest producing cows	28	10.5	6 018	53.7	1.17	125
Highest proportion of cows milked	28	11.2	7 372	67.5	1.24	155
Lowest proportion of cows milked	28	10.2	7 312	50.4	1.17	125

[a]Includes returns from dairy products and stock sold.

Thru the sale of dairy products and cattle, twenty-eight herds that produced an average of 8,666 pounds of milk per cow milked returned $156 per hundred dollars' worth of feed fed. On the other hand, a like number of herds that produced an average of only 6,018 pounds of milk per cow milked returned only $125 per hundred dollars' worth of feed fed.

When the same farms were regrouped, the twenty-eight herds in which 67.5 percent of the total cattle units[1] in the dairy herd consisted of cows milked returned $155 per hundred dollars' worth of feed fed. In the same number of herds where only 50.4 percent of

[1]A "cattle unit" is one mature cow or bull, or the equivalent in young stock.

the cattle units consisted of cows that were being milked, the returns were only $125 per hundred dollars' worth of feed fed.

Herds combining high production per cow and high proportion of cows milked were, of course, the most profitable. Fourteen herds in which 71.1 percent of all the cattle were milked and in which the cows were all high producers brought the relatively high return of $168 per hundred dollars' worth of feed fed. In contrast, the fourteen herds in which only 43.5 percent of all the cattle were milked and in which the cows were low producers brought the low average return of only $107. When one realizes that under normal conditions the total cost of maintaining a dairy herd (costs of feed, labor, depreciation of equipment, veterinary fees, etc.) amounts to about $170 for each $100 of feed fed, the desirability of keeping only as many cattle other than cows milked as is necessary to replenish the dairy herd, and the importance of keeping only high-producing cows, becomes evident. Of course in herds where good quality young dairy stock are being raised for sale at profitable prices, the proportion of cows milked may well be lower.

HOG PRODUCTION, FEEDING, AND MARKETING

As is typical of north-central Illinois, more of the average annual income on the farms included in this study was gained from hogs than from any other kind of livestock. The efficiency with which hogs are produced, fed, and marketed is undoubtedly the most important factor determining the net income on farms where half or more of the grain produced is fed to hogs.

For the present study the practices followed in producing pork on 280 farms in 1930, 388 farms in 1931, and 320 farms in 1932 formed the basis for the following comparisons.[1]

Wide Variation in Efficiency of Pork Production

According to the "enterprise studies" made by this Station, the total returns from pork sold must be about $120 or more per $100 of feed fed in order for the pork-producing enterprise to be profitable.[2]

[1]Tho most of the more economical producers of pork in this study followed the general practices outlined in what is known as the McLean County System of Swine Sanitation, it was practically impossible to find an accurate measure of the *effectiveness* with which the sanitation practices were carried out. Consequently no data on these practices are included in this bulletin.

[2]See Ill. Agr. Exp. Sta. Bul. 390, "Some Important Factors Affecting Costs in Hog Production."

FIG. 5.—LARGE LITTERS OF HEALTHY PIGS ARE ESSENTIAL TO PROFITABLE PORK PRODUCTION

On farms in this study where large litters of pigs were raised (7 to 9 pigs at weaning time), the pork enterprise returned about $22 more income per hundred dollars' worth of feed than it did on farms where the litters at weaning time were smaller (3 to 5 pigs—page 521). Raising the pigs on legume pasture where no hogs were kept the preceding year is an important measure in keeping the pigs healthy.

In the present study of hog enterprises, the records were divided into five equal-numbered groups according to the returns per hundred dollars' worth of feed fed to hogs (Table 37). During the three years the returns earned by the five groups on this basis of feed fed averaged from lowest to highest as follows: $87, $111, $124, $139, and $167. Thus during those years approximately 40 percent of the hog enterprises failed to bring in enough income to pay for the feed and the other expenses involved in producing pork. But, on the other hand, farmers who managed this enterprise reasonably well made money even during the years of extremely low hog prices.

Profits from hogs vary, of course, according to the relative prices of feed and hogs. Thus in 1930 and in 1932, when the corn-hog ratio was favorable for hogs, only the one-fifth of the farms that had the lowest returns for feed fed failed to have income enough from the hogs to pay for the feed and the other expenses of production. But in 1931, when prices of feed were comparatively high, hogs were

TABLE 37.—RETURNS PER $100 FEED FED TO HOGS AS RELATED TO SEVERAL FACTORS THAT AFFECT SUCH RETURNS
(Three comparisons on farms in north-central Illinois, 1930-1932)

Grouping of farms according to returns per $100 feed fed to hogs	Number of farms	Pigs weaned per litter	Proportion of hogs on hand January 1[a]	Feed fed per 100 pounds pork	Protein feed per 100 pounds grain	Feed cost per 100 pounds pork	Returns per 100 pounds pork	Returns per $100 feed fed
			perct.	*lb.*	*lb.*			
One-fifth of farms with lowest returns								
1930	56	5.5	53.1	578	8.3	$8.25	$8.05	$ 98
1931	78	5.3	58.7	530	5.5	4.58	3.34	73
1932	64	5.4	65.3	462	6.3	2.19	1.96	89
Average	198	5.4	59.0	523	6.7	5.01	4.45	87
One-fifth of farms with next to lowest returns								
1930	56	5.9	56.3	483	6.1	6.90	8.06	117
1931	77	5.7	53.4	448	6.9	3.92	3.78	97
1932	64	5.8	54.2	468	5.6	2.18	2.61	120
Average	197	5.8	54.6	466	6.2	4.33	4.82	111
One-fifth of farms with intermediate returns								
1930	56	6.2	45.9	432	6.5	6.27	8.14	130
1931	78	6.1	51.4	416	7.3	3.68	4.05	110
1932	64	6.2	50.0	424	7.4	2.03	2.71	133
Average	198	6.2	49.1	424	7.1	3.99	4.97	124
One-fifth of farms with next to highest returns								
1930	56	6.1	41.6	408	8.4	5.99	8.51	142
1931	77	6.3	42.6	380	8.0	3.39	4.29	126
1932	64	5.9	49.7	400	5.5	1.89	2.83	150
Average	197	6.1	44.6	396	7.3	3.76	5.21	139
One-fifth of farms with highest returns								
1930	56	6.2	47.8	358	6.7	5.16	8.38	162
1931	78	6.4	43.2	323	7.6	2.89	4.48	155
1932	64	6.2	46.2	345	6.2	1.63	3.01	184
Average	198	6.3	45.7	342	6.8	3.23	5.29	167
All farms								
1930	280	6.0	48.7	450	7.3	6.50	8.24	127
1931	388	5.9	50.2	421	6.9	3.71	3.98	108
1932	320	5.9	52.8	430	6.2	2.03	2.70	133
Average	988	5.9	50.6	434	6.8	4.08	4.97	123

[a]Percentage of total weight of hogs sold during the year represented by the weight of hogs on hand January 1.

profitable on only the two-fifths of the farms that had the highest returns for feed fed.

Average return from hogs on all farms over the three-year period was $123 per hundred dollars' worth of feed fed.

The greater profitableness of the pork enterprise on some of the farms was due both to higher gross returns and to lower feed costs per hundredweight of pork produced (Table 37). The average return for pork produced on the one-fifth of the farms that earned the lowest returns for feed was $4.45 per hundredweight; whereas on the one-fifth with the most profitable production the average was $5.29. Feed costs on the least profitable farms amounted to $5.01 per hundredweight of pork, and on the most profitable farms to only $3.23.

The differences in feed costs and in gross returns were largely influenced by number of pigs weaned per litter and proportion of hogs carried past January 1. Pigs weaned per litter averaged 5.4 on the one-fifth of the farms that had the lowest returns from feed fed to hogs, but 6.3 on the one-fifth having the best returns. Pork on hand January 1 represented 59 percent of the sales of pork during the year on the one-fifth of the farms that had the lowest returns, but only 45.7 percent on the one-fifth that had highest returns for feed fed.

These factors affecting the profitableness of pork production are discussed in more detail in the following sections.

Larger Hog Enterprises Relatively More Profitable

The average return from hogs on 121 farms producing from 10,000 to 20,000 pounds of pork per farm was only $117 per hundred dollars' worth of feed fed (Table 38). This return approximates the cost of feed and other costs incident to pork production. Average returns of approximately $125 per hundred dollars' worth of feed fed were secured on farms producing more than 20,000 pounds of pork per year. Above the 20,000-pound level about the same returns for feed fed were secured regardless of the size of the enterprise. On the farms having the smaller hog enterprises the average number of pigs weaned per litter was smaller; the feed costs per hundredweight of pork were slightly higher; and the returns per hundredweight of pork were lower. The lower returns for feed fed in smaller herds were apparently due in part to the fact that these farmers carried past January 1 a higher percentage of the hogs marketed during the year. While there was practically no difference in total weight of feed required per hundredweight of pork produced, more protein feed per hundred pounds of grain was fed on the farms having the large enterprises.

TABLE 38.—SIZE OF HOG ENTERPRISE AS RELATED TO RETURNS PER $100 FEED FED
(Averages of three comparisons on farms in north-central Illinois, 1930-1932)

Basis for grouping farms: pounds of pork produced per farm	Number of farms	Pigs weaned per litter	Proportion of hogs on hand January 1[a]	Feed fed per 100 pounds pork	Protein feed per 100 pounds grain	Feed cost per 100 pounds pork	Returns per 100 pounds pork	Returns per $100 feed
			perct.	*lb.*	*lb.*			
10,000 to 19,999	121	5.8	54.3	442	5.9	$4.13	$4.85	$117
20,000 to 29,999	88	5.9	51.2	419	6.5	3.97	4.92	125
30,000 to 39,999	55	5.8	51.0	437	5.6	4.07	4.93	121
40,000 to 49,999	28	6.0	49.5	423	6.5	3.96	5.04	128
50,000 or more	38	6.2	47.9	441	8.7	4.20	5.11	123

[a]Weight of hogs on hand January 1 expressed as percentage of total weight of hogs sold during the year.

Large Litters Weaned Essential for Best Returns

Large litters of healthy pigs must be raised if pork production is to be profitable. During the three years studied, the farms where 8 to 9 pigs per litter were weaned averaged $132 returns per hundred dollars' worth of feed fed to hogs, and those having 7 to 8 pigs weaned per litter averaged $131 (Table 39). On the other hand, those farms where 3 to 4 pigs per litter were weaned had returns amounting to only $107, and those weaning 4 to 5 pigs per litter, only $112. Part of the higher returns on the farms where the litters weaned were large came from a more efficient use of feed,—only 403 pounds of feed being required for 100 pounds of gain, as compared with 468 pounds required on the farms where only 3 to 4 pigs per litter were weaned.

The close relation between number of pigs weaned per litter and some of the other factors that influence the returns for feed is apparent in Tables 39, 40, 41, and 48. Thus on the farms with the small litters a difference in the amount of protein feed fed probably accounted for some of the increase in the amount of feed required per hundred pounds of gain. On these farms only 4.8 pounds of protein feed was fed per 100 pounds of grain, whereas 7.6 pounds was used where litters were large. Furthermore the farms weaning the large litters obtained somewhat higher prices for their hogs,—$4.99 per hundredweight compared with $4.70 obtained by the farms with the small litters. Much of this difference was apparently due to difference in time of marketing. On the farms when the larger litters were weaned, a considerably larger portion of the hogs was sold in the fall than was sold from the farm where the small litters were weaned, as is indicated in the difference in the proportions of hogs on hand January 1.

Feeding and Marketing Practices Affecting Returns

Marketing spring pigs before January 1. Of all the practices studied in the pork-production enterprise, none appears to be more effective in bringing about high returns for feed fed than pushing the spring pigs along with rapid gains so that they may be put on the market in the fall while the price is usually best. Rapid gains are usually cheap gains.[1] And furthermore it is quite generally known that the price of hogs is usually highest during August, September, and the first part of October. A second period of relatively high prices usually comes during March and April (see Fig. 6).

[1]See Ill. Agr. Exp. Sta. Bul. 390, "Some Important Factors Affecting Hog Production," p. 33.

TABLE 39.—NUMBER OF PIGS WEANED PER LITTER AS RELATED TO RETURNS PER $100 FEED FED TO ALL HOGS
(Averages of three comparisons on farms in north-central Illinois, 1930-1932)

Basis for grouping: pigs weaned per litter	Average number of farms	Pigs weaned per litter	Proportion of hogs on hand January 1[a]	Feed fed per 100 pounds pork	Protein feed per 100 pounds grain	Feed cost per 100 pounds pork	Returns per 100 pounds pork	Returns per $100 feed
			perct.	*lb.*	*lb.*			
3.00 to 3.99	12	3.6	56.9	468	4.8	$4.45	$4.70	$107
4.00 to 4.99	41	4.5	55.5	464	6.2	4.38	4.91	112
5.00 to 5.99	95	5.5	52.1	439	6.6	4.08	4.92	121
6.00 to 6.99	101	6.4	49.1	432	7.1	4.07	5.00	123
7.00 to 7.99	57	7.3	47.0	411	7.4	3.93	5.10	131
8.00 to 8.99	18	8.4	45.5	403	7.6	3.86	4.99	132

[a]Weight of hogs on hand January 1 expressed as percentage of total weight of hogs sold during the year.

TABLE 40.—PROPORTION OF HOGS ON HAND JANUARY 1 AS RELATED TO RETURNS PER $100 FEED FED TO HOGS
(Averages of three comparisons on farms in north-central Illinois, 1930-1932)

Basis for grouping: proportion of hogs on hand January 1[a]	Number of farms	Pigs weaned per litter	Proportion of hogs on hand January 1[a]	Feed fed per 100 pounds pork	Protein feed per 100 pounds grain	Feed cost per 100 pounds pork	Returns per 100 pounds pork	Returns per $100 feed
			perct.	*lb.*	*lb.*			
0.0 to 19.9	4	6.4	17.8	399	8.1	$3.84	$5.03	$133
20.0 to 39.9	93	6.3	32.9	414	8.3	3.95	5.16	132
40.0 to 59.9	130	5.8	49.7	434	6.9	4.10	4.97	122
60.0 to 79.9	72	5.7	67.6	450	5.3	4.16	4.85	117
80.0 to 99.9	21	5.7	85.6	480	4.6	4.39	4.60	103
100.0 or more	10	5.6	114.7	490	3.9	4.38	4.35	94

[a]Weight of hogs on hand January 1 expressed as percentage of total weight of hogs sold during the year.

FIG. 6.—AVERAGE MONTHLY ILLINOIS PRICES OF HOGS AND EGGS DURING TEN-YEAR PERIOD, 1925-1934

Spring pigs ready for market during August, September, or early October usually bring distinctly higher prices than those marketed later. Fall pigs ready during March usually hold a similar price advantage. The price advantage of late fall and early winter eggs is very pronounced. (Based on prices reported in Circular 434, *Illinois Crop and Livestock Statistics.*)

As an indication of the time when the hogs on these farms were marketed, the ratio between the total weight of hogs on hand January 1 and the total weight of all hogs sold during the year was calculated. Where pork on hand January 1 represented 80 percent or more, by weight, of the sales during the year, most of the spring pigs as well as the breeding stock and fall pigs were carried past the first of the year. Where pork on hand January 1 represented less than 40 percent of the sales for the year, practically all the spring crop of pigs had been marketed by that time.

During the three-year period 1930-1932 the farms on which only 20 to 40 percent, by weight, of the hogs marketed during the year was carried past January 1 had average returns of $132 per hundred dollars' worth of feed fed (Table 40). On the other hand, the farms on which from 80 to 100 percent of the pork sold was carried past January 1 realized only $103 per hundred dollars' worth of feed fed. And

TABLE 41.—POUNDS OF PROTEIN FEEDS (INCLUDING SOYBEANS) FED PER 100 POUNDS OF GRAIN, AS RELATED TO RETURNS PER $100 FEED FED TO HOGS

(Averages of three comparisons on farms in north-central Illinois, 1930-1932)

Basis for grouping farms: amount of protein feed fed per 100 pounds of grain	Number of farms	Pigs weaned per litter	Proportion of hogs on hand January 1[a]	Feed fed per 100 pounds pork	Protein feed per 100 pounds grain	Feed cost per 100 pounds pork	Returns per 100 pounds pork	Returns per $100 feed
			percl.	*lb.*	*lb.*			
0.0 to 1.99	35	5.7	63.1	460	1.1	$4.05	$4.70	$117
2.00 to 3.99	56	5.8	57.6	452	2.9	4.09	4.87	120
4.00 to 5.99	81	5.8	52.1	438	5.0	4.09	4.89	121
6.00 to 7.99	61	5.9	48.4	421	6.9	3.99	4.97	125
8.00 to 9.99	31	6.0	46.0	435	8.8	4.13	5.11	123
10.00 or more	65	6.3	44.2	419	13.5	4.16	5.14	124

[a]Weight of hogs on hand January 1 expressed as a percentage of the total weight of hogs sold during the year.

TABLE 42.—METHOD OF RAISING BROOD SOWS AS RELATED TO RETURNS PER $100 FEED FED TO HOGS

(Averages of three comparisons on farms in north-central Illinois, 1930-1932)

Method of raising sows	Number of farms	Pigs weaned per litter	Proportion of hogs on hand January 1[a]	Feed fed per 100 pounds pork	Protein feed per 100 pounds grain	Feed cost per 100 pounds pork	Returns per 100 pounds pork	Returns per $100 feed
			percl.	*lb.*	*lb.*			
Selected from feed lot	154	5.9	53.3	440	6.0	$4.10	$4.94	$121
Grown separately	61	6.1	45.8	425	7.5	4.02	5.06	125

[a]Weight of hogs on hand January 1 expressed as a percentage of the total weight of hogs sold during the year.

those on which 100 percent or more of the total sold during the year was carried past that date realized only $94 per hundred dollars' worth of feed fed.

Feeding liberal amounts of protein feed. A return of only $117 per hundred dollars' worth of feed fed to hogs was realized on the farms where less than 2 pounds of protein feed was fed with 100 pounds of grain (Table 41). On the other hand, on the farms where 2 to 4 pounds of protein feed was fed, $120 was received, and on those where 6 pounds or more was fed, about $124 was realized per hundred dollars' worth of feed fed. Similarly on those farms where less than 2 pounds of protein feed per 100 pounds of grain was fed, 460 pounds of feed for each hundredweight of pork produced was required. But on the farms where protein feed was fed at the rate of 6 or more pounds per 100 pounds of grain, only about 420 to 430 pounds of feed was required for each hundredweight of pork produced.

Again the close connection between the various factors influencing returns for feed fed may be pointed out. The rapid and economical gains of the pigs on the 93 farms which apparently marketed all spring pigs before the first of the year was made possible, in part at least, by the liberal use of protein feed and in part by raising larger litters (Table 40). On the farms where the spring pigs were sold early, 8.3 pounds of protein feed was fed per hundred pounds of grain and the litters averaged 6.3 pigs per litter; whereas only 4.6 pounds of protein feed per hundred pounds of grain was fed and only 5.7 pigs per litter were weaned, on the average, on the farms that carried 80 to 100 percent of their sales past January 1.

Practices Used in Handling Brood Sows

Gilts for brood sows grown separate from herd on most profitable farms. Tho many of the brood sows used on these corn-belt farms were selected from the feedlots at breeding time, the most profitable pork production was found on farms where the gilts to be used for breeding purposes were selected early and grown separately from the hogs being fed for market (Table 42). An average of 61 farms per year followed the practice of growing brood sows separately from the feeding herd, and as an average of the three years 1930-1932 these farms produced $125 worth of pork per hundred dollars' worth of feed fed. On the other hand, on an average of 164 farms per year where the brood sows were picked from the feedlot at breeding time, only $121 per hundred dollars' worth of feed fed was realized.

While it is difficult to determine how much of the advantage on the farms that raised gilts separate from fattening hogs was due to this practice and how much was due to various other good practices, the fact remains that those who followed the practice were somewhat more successful than those who did not follow it.

The most successful producers of pork among the farms included in the ten-year study were very particular in the selection and feeding of brood sows (page 599).

Two-litter system most profitable. The two-litter system in which one lot of sows produces early spring pigs and fall pigs, appeared to be more profitable than any other system in common use (Table 43). As an average of the three years during which these studies were made, the farms using this two-litter system had average returns of $126 per hundred dollars' worth of feed fed to hogs. The next best systems seemed to be the one-litter system where late spring pigs are raised and the two-litter system where *late* spring pigs and fall pigs are produced. Where early spring pigs were produced under the one-litter system, the returns were not enough to justify the greater expense for production. Tho the three-litter system (which means, usually, first litters from gilts farrowing in May or June, second litters from the same mothers farrowing in February or March, and third litters farrowing the following August) proved profitable on some of the best pork-producing farms, the average return for feed fed was not so high on the farms using this system as on those using the two-litter system.

Early weaned pigs made most efficient growth. Farms where pigs were weaned at seven or eight weeks of age had average returns of $126 per hundred dollars' worth of feed fed (Table 44). Where the pigs were not weaned until they were 11 or 12 weeks old, however, the average returns amounted to only $114. With the late weaning of pigs was associated large feed requirements and the carrying of large numbers of hogs past January 1.

Type of Farrowing House and Returns From Feed Fed

Individual houses most profitable. Average income from hogs on the farms where only individual farrowing houses were used amounted to $123 per hundred dollars' worth of feed fed (Table 45); whereas on farms on which either stationary or movable colony houses, each accommodating several sows, were used, a return of only $119 for the same value of feed fed was obtained. Slightly larger litters were produced on the farms using colony houses, but the pigs

TABLE 43.—TIME OF FARROWING AND NUMBER OF LITTERS PER YEAR AS RELATED TO RETURNS PER $100 FEED FED TO HOGS
(Averages of three comparisons on farms in north-central Illinois, 1930-1932)

Farrowing system used	Number of farms	Pigs weaned per litter	Proportion of hogs on hand January 1[a]	Feed fed per 100 pounds pork	Protein feed per 100 pounds grain	Feed cost per 100 pounds pork	Returns per 100 pounds pork	Returns per $100 feed
			percl.	*lb.*	*lb.*			
One litter per year								
Early spring	18	6.1	48.7	433	6.1	$4.01	$4.82	$117
Late spring	69	6.0	60.6	430	5.2	3.99	4.80	120
Two-litter system								
Early spring and fall	97	5.9	46.3	430	7.2	4.09	5.13	126
Late spring and fall	70	5.8	53.6	434	6.0	4.03	4.86	120
Three-litter system								
Early spring, late spring, and fall	33	6.0	49.0	453	8.8	4.31	5.09	119

[a]Weight of hogs on hand January 1 expressed as a percentage of the total weight of hogs sold during the year.

TABLE 44.—AGE OF WEANING PIGS AS RELATED TO RETURNS PER $100 FEED FED TO HOGS
(Averages of three comparisons on farms in north-central Illinois, 1930-1932)

Age of pigs when weaned	Number of farms	Pigs weaned per litter	Proportion of hogs on hand January 1[a]	Feed fed per 100 pounds pork	Protein feed per 100 pounds grain	Feed cost per 100 pounds pork	Returns per 100 pounds pork	Returns per $100 feed
			percl.	*lb.*	*lb.*			
5 or 6 weeks	14	6.4	52.7	423	5.9	$3.94	$4.81	$124
7 or 8 weeks	119	5.9	48.6	428	6.6	4.01	5.02	126
9 or 10 weeks	69	5.9	52.0	442	6.9	4.14	4.94	119
11 or 12 weeks	20	5.8	61.7	447	5.3	4.14	4.76	114

[a]Weight of hogs on hand January 1 expressed as a percentage of the total weight of hogs sold during the year.

TABLE 45.—KIND OF FARROWING HOUSES USED AS RELATED TO RETURNS PER $100 FEED FED TO HOGS
(Averages of three comparisons on farms in north-central Illinois, 1930-1932)

Kind of farrowing house	Number of farms	Pigs weaned per litter	Proportion of hogs on hand January 1[a]	Feed fed per 100 pounds pork	Protein feed per 100 pounds grain	Feed cost per 100 pounds pork	Returns per 100 pounds pork	Returns per $100 feed
			perct.	*lb.*	*lb.*			
Colony, stationary	109	6.0	53.6	438	5.9	$4.09	$4.88	$119
Colony, movable	10	6.0	53.7	441	6.8	4.20	4.90	119
Individual	63	5.9	49.6	433	7.2	4.08	5.03	123

[a]Weight of hogs on hand January 1 expressed as a percentage of the total weight of hogs sold during the year.

TABLE 46.—KIND OF FLOOR IN FARROWING PENS AS RELATED TO RETURNS PER $100 FEED FED TO HOGS
(Averages of three comparisons on farms in north-central Illinois, 1930-1932)

Kind of floor	Number of farms	Pigs weaned per litter	Proportion of hogs on hand January 1[a]	Feed fed per 100 pounds pork	Protein feed per 100 pounds grain	Feed cost per 100 pounds pork	Returns per 100 pounds pork	Returns per $100 feed
			perct.	*lb.*	*lb.*			
Dirt floor								
Stationary colony house	14	5.9	53.0	424	5.8	$3.89	$4.77	$121
Individual house	27	5.8	53.5	421	5.9	3.92	4.93	126
Wood floor								
Stationary colony house	29	6.0	58.2	433	5.4	4.05	4.90	123
Individual house	24	6.1	47.1	427	8.6	4.05	5.02	123
Concrete floor								
Stationary colony house	51	6.1	51.8	448	6.4	4.15	4.86	116

[a]Weight of hogs on hand January 1 expressed as a percentage of the total weight of hogs sold during the year.

produced in the individual houses were apparently pushed along with more rapid gains for an earlier market, and brought 15 cents per hundredweight more than the others.

Farmers who used individual farrowing houses fed more protein feed with the grain and got more rapid gains than those who used the stationary colony houses. The more rapid gains were probably due in part to better sanitation, since the individual houses are usually placed on clean ground, preferably on clover or alfalfa.

Dirt or wood floors superior to concrete. Pigs farrowed on dirt floors in stationary colony houses produced $121 worth of pork, and pigs farrowed on wood floors $123, for each hundred dollars' worth of feed fed (Table 46). Pigs farrowed on concrete floors in stationary houses produced an average return of only $116 for the same value of feed fed. In each of the three years during which the study was made, the concrete floors proved inferior to dirt or wood.

In the individual houses pigs farrowed on dirt floors produced $125, on an average, and pigs farrowed on wood floors $123, per hundred dollars' worth of feed fed. Dirt floors in individual houses were superior to wood in each of the three years.

Heated colony houses more profitable than unheated. The average returns per hundred dollars' worth of feed fed to pigs farrowed in heated or unheated houses were: $125 in heated colony houses, $118 in unheated colony houses, and $124 in individual houses without heat (Table 47). Pigs farrowed in colony houses without heat made slow gains, as is indicated by the large proportion of hogs on hand January 1; and they made expensive gains, as is indicated by the large feed requirement for 100 pounds of pork produced. These late-marketed pigs farrowed in unheated colony houses brought a low return per hundredweight of pork produced, as compared with the return for pigs farrowed in heated colony houses or in individual houses.

Summary of Good Pork-Producing Practices

Early farrowing of pigs to be pushed along for an early fall market, the weaning of large litters of healthy pigs, and the feeding of liberal amounts of protein feeds with the grain, preferably on clover or alfalfa pasture, formed a combination of practices which led to the most profitable production of pork (Table 48).

A three-year average return of $135 per hundred dollars' worth of feed fed was secured on an average of 27 farms on which 6.5 or more pigs were weaned per litter, 7 or more pounds of protein feed were fed per 100 pounds of grain, and the weight of hogs on hand January 1

TABLE 47.—USE OF ARTIFICIAL HEAT AT FARROWING TIME AS RELATED TO RETURNS PER $100 FEED FED TO HOGS
(Averages of three comparisons on farms in north-central Illinois, 1930-1932)

Kind of house and use of heat	Number of farms	Pigs weaned per litter	Proportion of hogs on hand January 1[a]	Feed fed per 100 pounds pork	Protein feed per 100 pounds grain	Feed cost per 100 pounds pork	Returns per 100 pounds pork	Returns per $100 feed
			perct.	*lb.*	*lb.*			
Colony house								
Heated	25	6.2	46.5	421	6.9	$4.02	$4.97	$125
Not heated	110	5.9	55.7	441	5.9	4.11	4.86	118
Individual house, not heated	68	5.9	49.0	432	7.3	4.07	5.04	124

[a]Weight of hogs on hand January 1 expressed as a percentage of the total weight of hogs sold during the year.

TABLE 48.—COMBINED INFLUENCE OF (1) NUMBER OF PIGS WEANED PER LITTER, (2) PROPORTION OF PROTEIN FEED FED, AND (3) PROPORTION OF HOGS ON HAND JANUARY 1, ON RETURNS PER $100 FEED FED TO HOGS

(Three comparisons on farms in north-central Illinois, 1930-1932)

Year	Number of farms	Pigs weaned per litter	Proportion of hogs on hand January 1[a]	Feed fed per 100 pounds pork	Protein feed per 100 pounds grain	Feed cost per 100 pounds pork	Returns per 100 pounds pork	Returns per $100 feed
Farms weaning 0 to 5.4 pigs per litter, feeding 0 to 3.9 pounds protein feed per 100 pounds grain, and having on hand on January 1, 60 percent or more of the weight of hogs sold during the year								
				lb.	*lb.*			
1930	16	4.6	76.5	527	2.1	$7.35	$7.96	$108
1931	23	4.4	69.4	465	2.4	3.94	3.67	93
1932	16	4.7	85.3	528	1.8	2.29	2.42	106
Average	18	4.6	77.1	507	2.1	4.53	4.68	102
Farms weaning 5.5 to 6.4 pigs per litter, feeding 4.0 to 6.9 pounds protein feed per 100 pounds grain, and having on hand on January 1, 40.0 to 59.9 percent of weight of hogs sold during the year								
1930	16	5.8	49.0	475	5.5	6.72	8.09	120
1931	19	6.0	51.4	453	5.0	3.90	3.99	102
1932	18	5.9	49.8	431	5.3	2.04	2.69	132
Average	18	5.9	50.1	543	5.3	4.22	4.92	118
Farms weaning 6.5 or more pigs per litter, feeding 7.0 or more pounds protein feed per 100 pounds grain, and having on hand on January 1, 0 to 39.9 percent of weight of hogs sold during the year								
1930	30	7.0	31.5	398	10.5	6.01	8.54	142
1931	34	7.1	29.2	383	11.3	3.55	4.32	122
1932	18	7.3	33.9	427	11.1	2.12	3.01	142
Average	27	7.1	31.5	403	11.0	3.89	5.29	135

[a]Weight of hogs on hand January 1 expressed as a percentage of the total weight of hogs sold during the year.

was less than 40 percent of the sales for the year. In contrast to this, only $102 return per hundred dollars' worth of feed fed was secured on an average of 18 farms on which less than 5.5 pigs were weaned per litter, less than 4 pounds of protein feed were fed per 100 pounds of grain, and the hogs on hand January 1 were 60 percent or more of the sales of pork during the year. Eighteen farms on which medium-sized litters were weaned, on which a medium amount of protein feed was fed, and on which a medium amount of pork was on hand January 1, gave a medium return of $118 per hundred dollars' worth of feed fed.

POULTRY PRODUCTION, FEEDING, AND MARKETING

Poultry is a minor enterprise on most farms of north-central Illinois when the entire farm business is considered. From the viewpoint of income for family living expenses, however, it becomes a major enterprise on a large portion of the farms. The average annual income from poultry per farm on fifty-seven farms enrolled in the Farm Bureau Farm Management Service thruout the ten-year period from 1925 to 1934 was $251 in addition to the poultry and eggs used by the family. During the four years from 1929 to 1932, records were kept of the practices followed in raising poultry on several hundred farms each year. These records are the basis for this part of the study.

Larger Flocks Relatively More Profitable

Poultry flocks consisting of 200 to 300 hens were more profitable than smaller flocks. The measure of relative profitableness was the total return from poultry and eggs, both those sold and those used on the farm, per $100 invested in the flock at the beginning of the year (Table 49).[1]

An average return of $260 for each hundred dollars invested was realized from flocks of 250 to 300 hens during the four years from 1929 to 1932. Almost as good a return was received from flocks of 200 to 250 hens. But during the same period an average of only $199 for each hundred dollars invested was secured from flocks of 50 to 100 hens. Nearly half the flocks compared contained fewer than 100 hens per flock.

It was quite clear that the average small flock was not handled carefully enough to give the best results.

[1]This inventory value includes only the value of the poultry, and not the value of feed, equipment, or supplies on hand.

TABLE 49.—SIZE OF FLOCK AS RELATED TO RETURNS
(Averages of four comparisons on farms in north-central Illinois, 1929-1932)

Basis for grouping farms: number of hens in flock	Number of farms	Number of hens per flock	Number of eggs per hen	Returns from eggs per hen	Returns from stock per $100 invested in flock	Total returns per $100 invested in flock
50 to 99 hens	151	76	92	$1.63	$91	$199
100 to 149 hens	111	126	94	1.70	75	197
150 to 199 hens	42	170	101	1.82	72	213
200 to 249 hens	14	222	117	2.23	67	254
250 to 299 hens	7	274	126	2.43	68	260
All flocks	366	113	96	1.78	79	209

Hatching and Feeding Practices Affecting Returns

Early hatching. Poultry flocks in which the chicks were hatched in March showed average returns of $255 per hundred dollars invested (Table 50). On the other hand, flocks in which chicks were hatched during April brought in only $213, and flocks in which chicks were hatched in May brought in only $175, per hundred dollars invested. Average egg yields per hen were 112, 101, and 91 eggs per year for flocks having chicks hatched in March, April, and May respectively.

Fall and winter egg production. The time of year that hens are

FIG 7.—POULTRY PROVIDES LARGE PART OF INCOME FOR FAMILY LIVING ON MANY CORN-BELT FARMS

Early hatched pullets raised on clean ground, brought into production for fall and winter eggs, and fed a good laying mash thruout the year, usually brought profitable returns.

TABLE 50.—TIME OF HATCHING CHICKS AS RELATED TO RETURNS FROM POULTRY
(Four comparisons on farms in north-central Illinois, 1929-1932)

Month hatched	Number of farms	Number of hens per flock	Number of eggs per hen	Returns from eggs per hen	Returns from stock per $100 invested in flock	Total returns per $100 invested in flock
March						
1929[a]	24	128	115	$3.09	$128	$332
1930	41	126	102	2.09	88	240
1931	63	133	122	2.01	90	247
1932	28	162	110	1.56	49	199
Average	39	137	112	2.19	89	255
April						
1929	61	118	91	2.27	108	238
1930	104	115	96	2.04	69	209
1931	142	116	107	1.61	73	203
1932	46	135	109	1.39	60	201
Average	88	121	101	1.83	78	213
May						
1929[b]	30	96	80	1.85	69	176
1930	41	138	91	1.86	63	202
1931	65	123	98	1.34	48	165
1932	30	98	96	1.16	48	157
Average	42	114	91	1.55	57	175

[a]Hatched in February and March. [b]Hatched in May and June.

in production affects both the total number of eggs produced per hen and the average price received per dozen for all eggs sold during the year. Flocks that produced during October, November, and December 20 percent or more of their total egg production for the year, produced an average of 36 eggs per hen more in 1933, 34 more in 1934, and 38 more in 1935 than flocks that produced less than 10 percent of their eggs during those months (Table 51). Furthermore, average Illinois prices of eggs during the late fall and early winter were during this period well above the average prices during the remainder of the year (Fig. 6, page 522). The average price received for all eggs sold during the year was 4.6 cents more in 1933, 4.3 cents more in 1934, and 4.0 cents more in 1935 where the larger production was obtained during the fall and winter months.

Thus while the three-year average price received for eggs by the owners of the flocks that produced the most eggs during the fall was 4.3 cents more per dozen, the feed cost was only 2.4 cents per dozen more even when all feed fed to the flock was charged to egg production. Thus it is evident that the early hatching of chicks and the feeding of pullets for fall and winter production were highly profitable practices.

Year-round feeding of laying mash. Hens fed a laying mash all the year produced an average of 112 eggs per hen; the eggs were

TABLE 51.—TIME OF PRODUCING EGGS: RELATION TO PRODUCTION PER HEN, COST OF FEED, AND PRICE RECEIVED FOR EGGS
(Averages of three comparisons on farms in north-central Illinois, 1933-1935)

Basis for grouping: percent of eggs produced during October, November, and December	Number of farms	Average number of hens per farm	Average number of eggs per hen	Average feed cost per dozen eggs[a]	Average price per dozen all eggs sold
1933				*cents*	*cents*
None to 9.9	95	111	97	8.6	13.2
10.0 to 19.9	72	132	117	9.6	14.4
20.0 or more	40	165	133	10.3	17.8
All farms	207	128	113	9.5	15.1
1934					
None to 9.9	92	120	102	13.6	16.4
10.0 to 19.9	73	137	118	15.1	17.5
20.0 or more	45	148	136	15.1	20.7
All farms	210	132	116	14.5	18.1
1935					
None to 9.9	83	101	97	16.0	23.1
10.0 to 19.9	88	121	117	18.2	24.7
20.0 or more	51	151	135	19.8	27.1
All farms	222	121	116	18.2	25.2
Three-year average					
None to 9.9	90	111	99	12.7	17.6
10.0 to 19.9	78	130	117	14.3	18.9
20.0 or more	45	155	135	15.1	21.9
All farms	213	127	115	14.1	19.5

[a]All feed fed to poultry charged to egg production.

valued at $2.11 per hen, and there was a total return of $238 per hundred dollars invested in the poultry flock (Table 52). In contrast to this, the hens on farms where mash was fed only part of the year produced only 86 eggs per hen, valued at $1.48, and a total return of only $185 was earned for each hundred dollars invested in the flock. On a relatively small number of farms where no mash was fed, only 79 eggs were produced per hen per year, valued at $1.27, and the entire flock brought an income of only $156 per hundred dollars invested.

Thus the feeding of a laying mash the year around is necessary if the farm flock is to bring a desirable return on the investment.

Combination of early hatching and year-round use of laying mash. Early hatching of chicks and the use of laying mash thruout the year led, in combination, to excellent results. In order to measure the results where this combination of practices was used, the poultry records for each of the four years 1929, 1930, 1931, and 1932 were divided into three groups according to the months in which chicks were hatched. Each of the three groups was then subdivided into two groups, one consisting of those farms on which laying mash was fed all twelve months and the other of the farms on which laying mash was fed only part or none of the time (Table 53).

TABLE 52.—FEEDING LAYING MASH TO HENS AS RELATED TO RETURNS FROM POULTRY
(Four comparisons on farms in north-central Illinois, 1929-1932)

Use of laying mash	Number of farms	Number of hens per flock	Number of eggs per hen	Returns from eggs per hen	Returns from stock per $100 invested in flock	Total returns per $100 invested in flock
Mash fed thruout the year						
1929	95	134	106	$2.71	$100	$268
1930	150	135	105	2.25	78	234
1931	161	135	118	1.88	84	231
1932	72	164	118	1.61	57	218
Average	120	142	112	2.11	80	238
Mash fed part of year						
1929	91	100	80	1.95	99	214
1930	98	112	75	1.52	74	184
1931	217	114	100	1.44	73	186
1932	82	104	87	.99	60	155
Average	122	108	86	1.48	76	185
No mash fed						
1929	24	112	68	1.49	99	191
1930	22	122	83	1.51	69	168
1931	47	97	78	1.10	53	141
1932	16	84	87	.99	41	122
Average	27	104	79	1.27	66	156

Flock owners who hatched their chicks in February or March and fed a laying mash all the year had a yearly production of 117 eggs per hen and a return of $267 per hundred dollars invested in the flock. In contrast, on those farms where the chicks were not hatched until May or June and laying mash was not fed at all or was fed only part of the year, only 81 eggs were produced per hen and only $148 was realized per hundred dollars invested in the flock.

TABLE 53.—COMBINED EFFECT OF EARLY HATCHING OF CHICKS AND YEAR-ROUND FEEDING OF LAYING MASH ON RETURNS FROM POULTRY FLOCKS
(Averages of four comparisons on farms in north-central Illinois, 1929-1932)

Time of hatching chicks	Use of laying mash	Number of farms	Number of hens per flock	Number of eggs per hen	Returns from eggs per hen	Returns from stock per $100 invested in flock	Total returns per $100 invested in flock
February and March	Used thruout year	27	148.5	117	$2.38	$89	$267
	None used, or used part of year	14	110.3	96	1.75	97	224
April	Used thruout year	42	139.0	114	2.11	73	236
	None used, or used part of year	42	105.1	86	1.48	81	186
May and June	Used thruout year	14	156.9	106	1.85	59	203
	None used, or used part of year	33	94.0	81	1.31	56	148

TABLE 54.—RAISING CHICKS ON CLEAN GROUND AS RELATED TO RETURNS FROM POULTRY
(Four comparisons on farms in north-central Illinois, 1929-1932)

Method used	Number of farms	Number of hens per flock	Number of eggs per hen	Returns from eggs per hen	Returns from stock per $100 invested in flock	Total returns per $100 invested in flock
Chicks raised on clean ground						
1929	77	121	96	$2.50	$113	$257
1930	88	122	97	2.08	85	233
1931	126	130	115	1.78	74	214
1932	55	132	104	1.36	59	196
Average	86	126	103	1.93	83	225
Chicks raised on old ground						
1929	83	111	91	2.20	85	219
1930	123	115	85	1.71	69	189
1931	292	115	101	1.50	78	196
1932	119	121	102	1.28	57	179
Average	154	116	95	1.68	72	196

By adopting these two practices many owners of farm flocks could double their poultry returns.

Health Practices Affecting Returns

Raising chicks on clean ground. Farmers who provided clean ground for their chicks had an average income of $225 per hundred

TABLE 55.—PROTECTION FROM MITES AS RELATED TO RETURNS FROM POULTRY
(Three comparisons on farms in north-central Illinois, 1930-1932)

Treatment used	Number of farms	Number of hens per flock	Number of eggs per hen	Returns from eggs per hen	Returns from stock per $100 invested in flock	Total returns per $100 invested in flock
None						
1930	11	116	86	$1.62	$ 57	$169
1931	28	96	104	1.57	63	194
1932	4	98	99	1.28	10	129
Average	14	103	96	1.49	43	164
Creosote						
1930	50	115	90	1.77	86	208
1931	58	122	99	1.43	72	184
1932	17	107	100	1.26	73	199
Average	42	115	96	1.49	77	197
Crankcase oil						
1930	34	130	72	1.57	83	194
1931	46	139	104	1.68	72	213
1932	15	133	92	1.18	61	169
Average	32	134	89	1.48	72	192
Other treatments						
1930	43	121	97	2.03	84	223
1931	76	111	105	1.57	78	201
1932	38	138	117	1.44	61	207
Average	52	123	106	1.68	74	210

dollars invested in the flock (Table 54). In contrast, an average of only $196 was received by those who raised their chicks on old ground. The higher income from flocks where the chicks were raised on clean ground, however, cannot be credited entirely to this practice, for these flocks had better egg production per hen and produced more poultry for sale, as is indicated by the higher return from stock.

Protection from mites. Creosote, crankcase oil, and various other treatments appeared to be of equal value in controlling mites. As an average of the comparisons made during the three years 1930-1932, flocks which were given some form of treatment for mites brought returns of approximately $200 per hundred dollars invested in the flock (Table 55). In contrast, flocks which were given no treatment for mites earned an average return of only $164 per hundred dollars invested.

Protection from lice. The flock owners who used patented remedies to destroy lice had returns of only $174 per hundred dollars of flock investment (Table 56). The average egg production per hen in these flocks was only 92 eggs. On the other hand, where sodium fluorid and other simple treatments were used the returns ranged from $200 to $214 per hundred dollars invested and egg production ranged from 99 to 105 eggs per hen.

TABLE 56.—PROTECTION FROM LICE, AS RELATED TO RETURNS FROM POULTRY
(Three comparisons on farms in north-central Illinois, 1930-1932)

Treatment used	Number of farms	Number of hens per flock	Number of eggs per hen	Returns from eggs per hen	Returns from stock per $100 invested in flock	Total returns per $100 invested in flock
None						
1930	60	126	96	$2.01	$ 68	$212
1931	153	120	105	1.57	74	202
1932	45	120	99	1.17	50	163
Average	86	122	100	1.58	64	192
Sodium fluorid						
1930	57	116	97	1.98	85	217
1931	47	115	100	1.47	77	193
1932	17	128	101	1.27	63	189
Average	40	120	99	1.57	75	200
Patent remedies						
1930	42	115	83	1.67	87	206
1931	35	120	94	1.39	63	174
1932	9	125	99	1.32	19	143
Average	29	120	92	1.46	56	174
Other treatments						
1930	63	127	99	2.13	76	227
1931	117	120	111	1.70	83	214
1932	49	141	106	1.40	62	201
Average	76	129	105	1.74	74	214

PART II: MANAGEMENT AND EARNINGS

Tho farmers are interested in improving their methods of producing a given crop or of raising a certain kind of livestock, there is much more than this involved in the matter of organizing and operating their farms profitably. It is not unusual for a farmer to excel in one or a few lines of work but to do so poorly in others that the gains from the good work are offset by the losses from the poor, with the result that his farming operations as a whole are unprofitable.

In general, satisfactory farm earnings depend to a large extent upon the skill of the farmer in so organizing his business that a large portion of the good farming practices may be followed and a reasonable balance between the different factors influencing farm earnings may be maintained. In Part II, therefore, the various factors which cause differences in earnings among similar farms, and the interrelations of those factors as they affect the organization and operation of a farm, will be discussed.

DIFFERENCES IN EARNINGS AMONG FIFTY-SEVEN FARMS, 1925-1934

In the preceding section the analysis was centered around certain specific, or individual, practices followed in crop and livestock production. In this section analysis is centered around certain so-called "factors," each of which involves a number of specific practices. The effects which these factors had on net earnings is described. Inasmuch as the farms varied considerably with respect to the practices followed, the earnings also, as might be expected, varied widely. This variation occurred even tho the farms were in the same community and had similar natural advantages (soil, topography, and weather) and market opportunities.

Records of fifty-seven farms for which data were available thruout the ten years from 1925 to 1934 furnished the data for this part of the study. The operators of these farms were members of the Farm Bureau Farm Management Service continuously thruout this period. Six others of the original 235 cooperators also kept continuous records thruout this period, but those records have not been included because the farms were of unusual size or the type of farm organization was decidedly different from that of the others, or the operator moved from one farm to another within the ten-year period.

Earnings of High- and of Low-Profit Farms

Of the fifty-seven farms the one-third having the highest yearly net incomes averaged $2,888 per farm, and the one-third having lowest net incomes averaged $1,102—a difference of $1,786 a year (Table 57 and Fig. 8). Thus, as an average, each of the nineteen most profitable farms had $17,860 more net income for the ten years than each of the nineteen least profitable farms.

TABLE 57.—INVESTMENTS, RECEIPTS, EXPENSES, AND EARNINGS ON INVENTORY BASIS ON FIFTY-SEVEN ILLINOIS FARMS, 1925-1934

Items	19 *most* profitable farms	19 *medium* profitable farms	19 *least* profitable farms	Average, 57 farms
Capital investments				
Land	$ 36 202	$ 37 032	$ 33 148	$ 35 460
Farm improvements	5 514	7 037	7 084	6 545
Livestock, total	3 433	3 174	2 913	3 173
Horses	734	696	808	746
Cattle	1 469	1 521	1 012	1 334
Hogs	954	622	659	745
Sheep	102	107	257	155
Bees	1	92	15	36
Poultry	173	136	162	157
Machinery and equipment	2 229	2 612	1 996	2 279
Feed, grain, and supplies	3 777	4 204	3 087	3 690
Total capital investment	$ 51 155	$ 54 059	$ 48 228	$ 51 147
Receipts and net increases				
Livestock, total	$ 3 567	$ 2 443	$ 2 196	$ 2 728
Horses	23	....	....	....
Cattle	885	496	373	585
Hogs	1 800	1 021	1 118	1 313
Sheep	72	32	129	78
Bees	....	40	2	14
Poultry	114	86	119	106
Egg sales	193	103	140	145
Dairy sales	480	665	315	487
Feed, grain, and supplies	1 944	2 750	1 629	2 107
Labor off farm	96	108	69	92
Miscellaneous receipts	47	50	49	49
Family living from farm	424	325	348	368
Total receipts and net increases	$ 6 078	$ 5 676	$ 4 291	$ 5 344
Expenses and net decreases				
Farm improvements	$ 272	$ 340	$ 334	$ 316
Horses	....	25	3	2
Productive-livestock decreases	1	....	....	....
Machinery and equipment	525	570	504	533
Feed, grain, and supplies	....	....	....	....
Livestock expense	46	47	52	48
Crop expense	214	267	239	240
Hired labor	516	659	443	539
Taxes	474	509	465	483
Miscellaneous expenses	49	53	53	52
Total expenses and net decreases	$ 2 097	$ 2 470	$ 2 093	$ 2 213
Receipts less expenses	$ 3 981	$ 3 206	$ 2 198	$ 3 131
Unpaid labor, total	1 093	1 098	1 096	1 095
Operator's labor	913	856	890	886
Family labor	180	242	206	209
Net income from investment and management	2 888	2 108	1 102	2 036
Rate earned on total farm investment	5.65%	3.90%	2.28%	3.98%
Return to capital and to operator's labor and management, total	$ 3 801	$ 2 964	$ 1 992	$ 2 922
5% of capital investment	2 558	2 703	2 411	2 558
Labor and management wage	1 243	261	− 419	364

The amount by which the earnings of the most profitable farms exceeded the earnings of the least profitable farms varied from year to year in keeping with changes in the general level of farm earnings (Table 58 and Fig. 9). When the average earnings of all farms were high there was a large difference between the earnings of the two groups; when the average earnings were low, the differences were

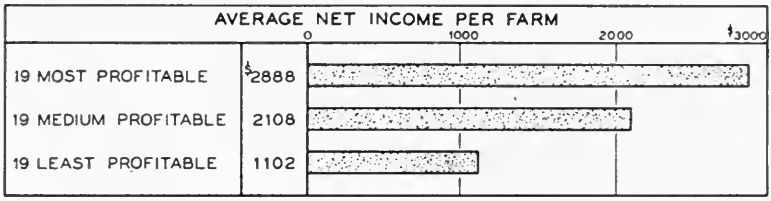

FIG. 8.—AVERAGE NET INCOME FROM THREE GROUPS OF FARMS, 1925-1934

The nineteen most profitable farms in a group of fifty-seven averaged $780 more net income per year than the nineteen medium profitable farms, and they averaged $1,786 more per year than the nineteen least profitable farms. These pronounced differences are largely traceable to differences in organization and operation.

much smaller. In 1931 and 1932, the years of heaviest losses in farming, the one-fifth most profitable farms had, on an average, $2,000 more net income than the one-fifth least profitable farms. In 1928 and 1934, on the other hand, when the average net income per farm in this study was more than $3,000, the most profitable

TABLE 58.—AVERAGE NET EARNINGS OF ALL FARMS IN FARM BUREAU FARM MANAGEMENT SERVICE, AND DIFFERENCES IN NET EARNINGS BETWEEN LEAST PROFITABLE AND MOST PROFITABLE FARMS, 1925-1934

Year	Number of farms	Average earnings of—			Difference between most profitable and least profitable groups
		All farms	One-fifth *most* profitable farms	One-fifth *least* profitable farms	
1925	225	$1 920	$3 788	$ 80	$3 708
1926	210	1 665	3 480	− 6[a]	3 486
1927	200	2 187	3 849	455	3 394
1928	150	3 344	4 947	1 073	3 874
1929	380	3 133	4 728	1 351	3 377
1930	380	558	2 161	− 799[a]	2 960
1931	315	−550[a]	646	−1 619[a]	2 265
1932[b]	430	−506[a]	678	−1 241[a]	1 919
1933	324	2 131	3 770	712	3 058
1934	335	3 090	5 305	1 019	4 286
Average	295	$1 697	$3 335	$ 103	$3 232

[a] Minus sign indicates a net loss.

[b] From 1925 to 1931 farms in Livingston, McLean, Tazewell, and Woodford counties only were included. Beginning in 1932 farms in other adjoining counties in north-central Illinois were included.

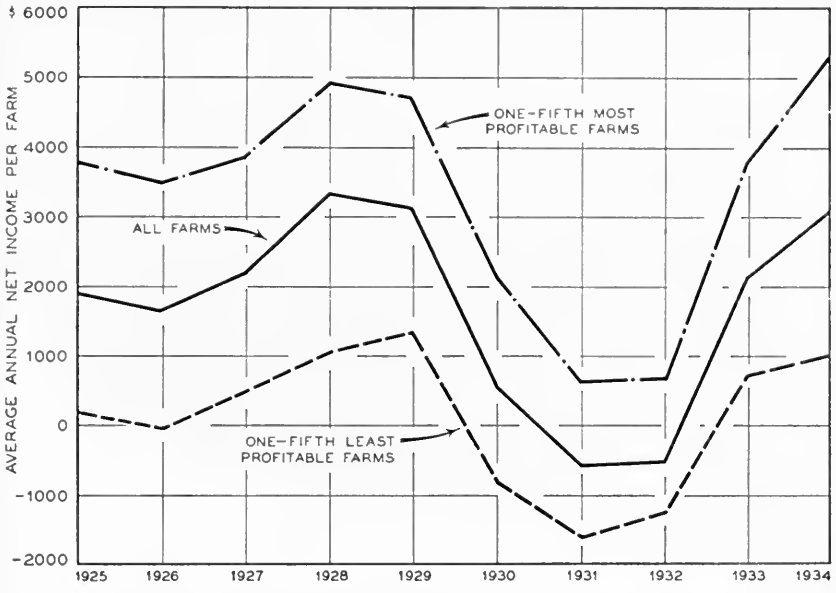

FIG. 9.—INCOME TRENDS DURING A TEN-YEAR PERIOD ON THE MOST PROFITABLE, THE LEAST PROFITABLE, AND ALL FIFTY-SEVEN FARMS

When farm incomes in general were low, the net-income differences between the most profitable and the least profitable farms tended to decrease; and when they were higher, the differences tended to increase. Thruout the ten-year period, however, there were distinct differences between the incomes of the two groups of farms.

farms earned approximately $4,000 per farm more net income than the least profitable farms.

These differences of $2,000 per farm when average earnings were low and about $4,000 per farm during years of relatively high average earnings, were due largely to differences in the organization and operation of the two groups of farms. The obvious conclusion is that good farming pays at all times—during depressions as well as during periods of prosperity.

Changes in Practices Caused Changes in Earnings

As a group these fifty-seven farmers improved the organization and operation of their farms more rapidly than the average farmer usually does. Among the fifty-seven, however, some made more rapid progress than others. In the three-year period 1932-1934 the earnings of ten farms were increased above those of the three-year period 1925-1927 by $1,463 per farm per year *more* than the average

of the entire group. The farms on which the greatest improvement was made were, for the most part, those that were in the lower half of the group at the beginning of the ten-year period (Fig. 10). Two farms that were in about the middle of the group during 1925-1927 moved to the fourth and sixth highest places during 1932-1934. Two others changed from thirty-ninth and thirty-eighth positions to second and third places. Others moved from near the lowest of the entire

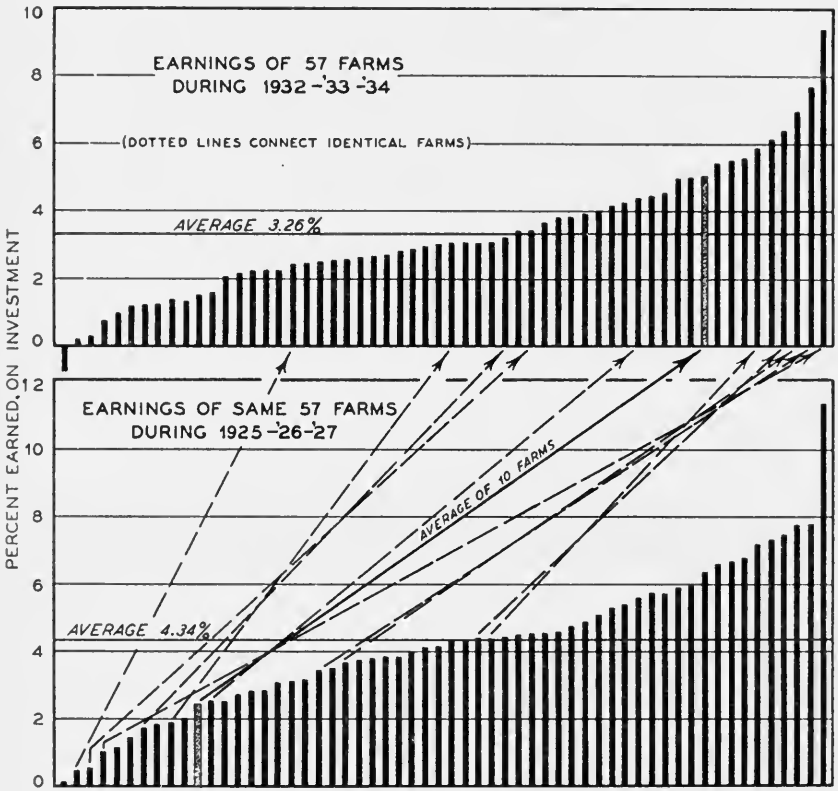

FIG 10.—RATES EARNED ON TOTAL FARM INVESTMENTS ON FIFTY-SEVEN FARMS DURING TWO THREE-YEAR PERIODS, 1925-1927 AND 1932-1934

Each bar represents a farm. The dotted lines connect ten farms whose earnings advanced most from the earlier period *(lower part of graph)* to the later period *(upper part of graph)*. In spite of price declines, drouth, and chinch bug damage, which caused a general lowering of farm incomes at this time, the operators of these ten farms succeeded in raising their earnings to quite a marked degree. All but one of them were in the lower half of the group in the earlier period and all but one were in the upper group in the later period. Changes in organization and operation were responsible for this improvement as shown in Table 59.

group up to midway or higher. One farm changed from fifty-fourth position during the first three years to the highest in earnings during the last three years. A few farms were consistently high in earnings thruout the ten-year period, and others were consistently low. Some, of course, moved from higher to lower positions.

Ten farms that improved most. The points at which changes were made in the practices of the ten farms showing most improvement during the ten-year period are indicated in Table 59. In reading this table or the following discussion, it must be carefully kept in mind that the "improvement" or "net change" indicated for each item is *relative*. It is the *difference* between the average change on all fifty-seven farms and the average change on the ten farms. For example, the net change in rate earned on the total farm investment shown for the ten farms, 3.73 percent, is not an absolute increase; it represents a decline of 1.08 in the average rate earned by all fifty-seven farms and an increase of 2.65 in the rate earned by the ten farms.

Changes affecting crop production accounted for part of the improvement of these ten farms. Thus in relation to the average of the fifty-seven farms, the yield of corn on the ten farms increased an

TABLE 59.—CHANGES AFFECTING PROFITABLENESS OF TWO GROUPS OF ILLINOIS FARMS, COMPARED WITH THE AVERAGE CHANGES MADE ON FIFTY-SEVEN FARMS FROM 1925-1927 TO 1932-1934

Item	10 farms whose earnings *improved* most		10 farms whose earnings *declined* most	
	Above or below average[a]	Average net changes	Above or below average[a]	Average net changes
Rate earned on total farm investment	+	3.73%	−	3.00%
Yield of corn—bushels per acre	+	4.0	−	5.4
Proportion of acreage in higher-profit crops[b]	+	5.5%	+	.1
Value of feed fed to productive livestock, per acre	+	$2.24	+	$ .06
Returns per $100 feed fed to productive livestock	+	$26.00	−	$11.00
Labor cost per acre of crops	−	$ .50	+	$ .34
Horse and machinery cost per acre of crops	+	$ 1.09	+	$ .28
Number of cows milked	−	1.4	+	1.8
Dairy returns per cow milked	+	$34.00	−	$13.00
Number of hens kept	+	13.8	+	2.9
Number of eggs produced per hen	+	2.9	−	5.1

[a]A plus sign (+) indicates an increase, and a minus sign (−) a decrease as compared with the average of all farms.

[b]Percentage of tillable land in high-profit crops plus one-half of the percentage in medium-profit crops.

average of 4 bushels an acre. Likewise a higher percentage than average of tillable land was planted to the higher-profit crops. When full credit is given to the high-profit crops and one-half credit to medium-profit crops, the increased amount of tillable land devoted to the higher-profit crops on these farms was 5.5 percent more than the average.

Changes in practices used in handling livestock were, however, more important than those affecting crop production in accounting for the increased earnings of the ten farms making the most improvement. The value of feed fed to productive livestock on the ten farms increased, in relation to the average change in this item on the fifty-seven, by $2.24 an acre; and the returns per hundred dollars' worth of feed fed increased relatively by $26. While the number of cows milked per farm declined on the ten farms, in relation to the fifty-seven-farm average, the returns per cow increased $34. Also the number of hens kept per farm increased 13.8 hens relatively, and the number of eggs laid per hen increased 2.9 eggs relatively.

That the increases in earnings on these ten farms were due to the improvement of farming practices is indicated also by the fact that the ten farms averaged 190 acres per farm, whereas the average size of the fifty-seven farms was 246 acres. This is a significant fact, clearly indicating that in this area where farms generally are 160 acres or larger *the first step in attempting to increase the farm earnings should be to study the way in which the farm is organized* rather than to set about to increase the size of the farm. The farms in the areas studied are generally large enough to be operated profitably if they are well organized and well managed. Also acreage, as a rule, is quite definitely fixed, and it is not an easy matter to increase it as a means of increasing the income.

Ten farms that declined most. When in comparison with the average of a group some farms advance in earning power, others naturally must show a decline. Of the fifty-seven farms the ten that had the greatest relative declines in earning power showed an average reduction in earnings, in relation to the average of the fifty-seven farms, of 3 percent on the investment from 1925-1927 to 1932-1934 (Table 59). This 3 percent on the average capital investment of $48,325 per farm amounted to an average of $1,450 less income per farm each year.

A lower acre-yield of crops was the most obvious factor accounting for the relative decline in earnings on these ten farms. The corn yield, compared with the general average, declined 5.4 bushels an acre

from 1925-1927 to 1932-1934. Nor were the livestock handled so efficiently in the later period. The returns on these ten farms declined $11 more per hundred dollars' worth of feed fed than did the average returns on the fifty-seven farms; and, while the number of cows milked per farm increased 1.8 cows, the returns per cow declined $13.

Price-levels of farm products were lower in 1932-1934 than during the earlier period, as may be seen from Fig. 10, but price-levels affected the earnings of farms that improved as well as of those that declined.

Some Possible Factors That Proved Negligible

Most farmers who give thought to the reasons why one farmer earns more or less than another do not distinguish closely enough between those matters which have an important effect and certain others which, tho they must be considered, have a lesser effect upon farm earnings. For example, size of farm and quality of soil are thought by most farmers to be matters of first importance in determining income. To a certain extent, of course, they are right: the farm must be large enough to support an enterprise of reasonable size, and high-quality soil is a valuable asset. But from the fact that incomes vary greatly among farms of the same size, having soils of similar quality, one might well conclude that there are other reasons more important than these.

The factors which proved in this study to be more or less negligible in their effects will be discussed here, before considering those other factors which did largely account for the differences in farm earnings.

Size of farms was not an important factor. Within the range of acreages represented by these fifty-seven farms, the relative size of the farms had little influence on the returns on the farm investment. The nineteen most profitable farms had an average of 244.4 acres per farm, and the nineteen least profitable farms averaged 234.4 acres per farm (Table 60). On the most profitable farms 92.1 percent of the acreage was tillable, and on the least profitable farms 89.3 percent was tillable. The differences of 10 acres per farm and 2.8 percent tillable land were not enough to have any appreciable influence on farm earnings.

Both the net income per acre and the rate earned on the total farm investment were practically the same for large, medium-sized, and small farms (Table 61), tho the net income per acre of the medium-sized farms was slightly the largest. Medium-sized farms held a slight advantage in crop yields and in prices received for products sold.

TABLE 60.—FACTORS RELATED TO ORGANIZATION AND EARNINGS ON FIFTY-SEVEN ILLINOIS FARMS, 1925-1934

Items	19 *most* profitable farms	19 *medium* profitable farms	19 *least* profitable farms	Average, 57 farms
Rate earned on total farm investment	5.65%	3.90%	2.28%	3.98%
Labor and management wage	$1243	$ 261	$ −419	$ 364
Receipts, expenses, and net income				
Gross receipts per acre	24.87	21.80	18.31	21.69
Total expenses per acre	13.05	13.70	13.61	13.43
Net income per acre	11.82	8.10	4.70	8.26
Size and intensity of business				
Size of farm—acres	244.4	260.4	234.4	246.4
Total productive man-work-units per farm	438.1	407.7	369.7	405.1
Productive man-work-units per acre	1.79	1.57	1.58	1.64
Appraised value of land per acre	$ 148.13	$ 142.21	$ 141.42	$ 143.91
Percent of land tillable	92.1	91.7	89.3	91.1
Percent of tillable land in—				
Corn	44.6	46.1	42.8	44.6
Legumes other than soybeans	15.8	14.9	15.6	15.4
High-profit crops	63.9	61.4	62.6	62.6
Medium-profit crops	13.1	13.2	12.3	12.7
Low-profit crops	23.0	25.4	25.1	24.7
High-profit plus half of medium-profit crops	70.4	68.0	68.7	69.0
Crop yields				
Corn, bushels per acre	49.5	47.2	45.8	47.6
Oats, bushels per acre	38.0	38.4	35.6	37.4
Wheat, bushels per acre	22.9	23.7	21.9	22.7
Crop-yield index	103.1	100.9	95.7	100.0
Amount of livestock				
Value of feed fed per acre	$ 10.82	$ 7.36	$ 8.19	$ 8.77
Total animal units in cattle	19.9	18.1	14.7	17.6
Number of cows milked	6.7	7.2	5.4	6.4
Pounds of pork produced	25 222	14 817	16 210	18 750
Number of hens kept	124	89	106	107
Livestock efficiency				
Cattle-efficiency index	106	103	92	100
Hog returns per $100 feed	$ 150	$ 139	$ 135	$ 142
Sheep returns per $100 feed	107	87	96	98
Poultry returns per $100 invested	229	190	202	209
Returns from all livestock per $100 feed	147	138	129	139
All livestock efficiency index	104.5	98.9	95.1	100.0
Price index for products sold	101.4	101.2	97.0	100.0
Labor, power, and machinery costs				
Man-labor cost per man-work-unit	$ 3.57	$ 4.19	$ 4.09	$ 3.94
Man-labor cost per acre of farm	6.40	6.57	6.44	6.47
Horse-and-machinery cost per man-work-unit	2.07	2.42	2.52	2.33
Horse-and-machinery cost per acre of farm	3.71	3.79	3.97	3.82
Selected items of expense per acre, total	$ 13.05	$ 13.70	$ 13.61	$ 13.43
Farm improvements	1.11	1.31	1.43	1.28
Machinery and equipment	2.15	2.19	2.15	2.16
Miscellaneous livestock expense	.19	.18	.22	.20
Miscellaneous crop expense	.88	1.03	1.02	.97
Hired and home labor	6.58	6.74	6.57	6.64
Taxes	1.94	1.95	1.99	1.96
Miscellaneous expenses	.20	.30	.23	.22
Expense per $100 gross income	$ 52	$ 63	$ 74	$ 62

The small farms would have shown a disadvantage if the value of the farm produce used in the home had not been included as part of the income of the farm. The amount of farm produce used depends on the size of the family, not the size of the farm. With the farm

produce included, the smallest farms realized only slightly lower net incomes per acre than either the large or the medium-sized farms.

Quality of land was similar. Tho in quality of land the most profitable one-third of the farms had a slight advantage over the least profitable one-third, the difference was not enough to prevent

TABLE 61.—RATES EARNED ON TOTAL FARM INVESTMENT, AND OTHER MEASURES OF THE FARM BUSINESS, ON FARMS OF DIFFERENT SIZES, 1925-1934

Items	22 farms with 199.9 acres or less	19 farms with 200 to 279.9 acres	16 farms with 280 acres or more
Size of farm, acres	163.6	245.5	361.4
Rate earned on total farm investment	3.90%	3.98%	4.02%
Labor and management wage	$ 505	$369	$155
Total investment per acre	$ 206.83	$ 211.28	$ 205.04
Gross income per acre	23.88	22.52	20.31
Total expense per acre	15.83	14.12	12.07
Net income per acre	8.05	8.40	8.24
Value of crops per acre	$ 19.04	$ 18.97	$ 18.93
Value of feed fed per acre	9.21	9.20	8.14
Crop-yield index	101.1	102.4	97.4
Percent of land tillable	89.0	91.8	91.7
Percent of tillable land in higher-profit crops[a]	71.6	67.1	68.8
Percent of tillable land in legumes	22.0	17.6	17.9
Livestock-efficiency index	101.0	100.1	99.4
Total man-work-units per farm	303.8	401.5	549.0
Man-work-units on livestock per man-work-unit on crops	1.19	.85	.74
Labor cost per man-work-unit	$ 4.22	$ 4.06	$ 3.62
Horse-and-machinery cost per man-work-unit	2.28	2.31	2.37
Price index for products sold	97.8	101.8	99.7

[a]Percentage in high-profit crops plus one-half of the percentage in medium-profit crops.

a direct comparison of the two groups of farms (Table 60). On the nineteen most profitable farms the land was valued at $148.13 per acre, and 92.1 percent of all the land was tillable. On the nineteen least profitable farms the land was appraised at $141.42 an acre, and 89.3 percent was tillable.

Ownership or rental of land was not significant. The proportions of farms owned and of farms rented by the operators were approximately the same in the three groups of farms—the one-third most profitable, the one-third medium profitable, and the one-third least profitable. Thus the tenants were apparently farming as profitably as the owners. While this was true of this particular group of farms, it must be remembered that these were highly selected farms.

Factors That Influenced Relative Income Levels

Differences in net incomes on the most profitable and the least profitable farms were shown in the preceding section not to have been primarily due to differences in size of farm, in quality of land, or in ownership or rental by the operator. They must therefore have been due to differences in the organization and operation practices followed on the two groups of farms. The factors that were primarily responsible for the differences in incomes are discussed here in the order of their importance: (1) crop yields, (2) returns for feed fed to livestock, (3) amounts of livestock kept, (4) cropping systems, (5) prices received, (6) power and machinery costs, and (7) labor costs. Miscellaneous expenses, tho not considered one of the seven important factors, also has its bearing upon incomes, and is discussed along with the other factors.

Inasmuch as these were the factors that affected the earnings most, the farms that excelled in the most of them had the best incomes. One of the fifty-seven farmers who did more effective work than the average with respect to each of the above factors (Fig. 11) earned an average net income of $4,050 a year for the ten-year period,—an amount almost double the average, tho the farm itself was only about average size. Another farmer who did less effective work with respect to each of the factors earned an average net income over the ten-year period of only $1,125 a year. Also, as is shown in Fig. 11, six of the farms that excelled in six of the seven factors earned average net incomes of $2,890 per farm per year; ten farms that excelled in four factors earned average net incomes of $2,140 per farm per year; and 13 farms that excelled in only two of the factors earned only $1,550 per farm per year.

In view of these analyses the statement may safely be made that on selected farms any one of the factors discussed on the following pages may be of sufficient importance to make a farm relatively profitable or unprofitable. Crop yields and returns for feed fed to livestock were the most important factors on these particular farms during this ten-year period. During another period, or in another area where the type of farming was different, other factors might be relatively more important. In areas of low land values and uniform soil conditions, for example, the economy with which labor and power were used might be the most important factor affecting farm earnings.

Crop yields. Differences in yields of crops had more to do with placing farms in the different profit-groups than any other one factor. The nineteen most profitable farms produced 3.7 bushels more corn

per acre, 2.4 bushels more oats, 1.0 bushel more wheat, and proportionately higher yields of other crops, than the nineteen least profitable farms (Table 60). When these differences in yields of corn, oats, wheat, and other crops are multiplied by the average acreages of the several crops grown and by the average ten-year prices received, there

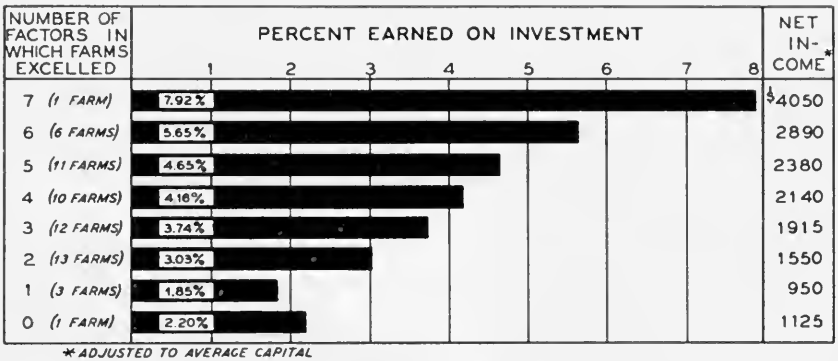

FIG. 11.—RATE EARNED AND NET INCOME FROM FARMS EXCELLING IN DIFFERENT NUMBERS OF EFFICIENCY FACTORS, FIFTY-SEVEN FARMS, 1925-1934

The factors whose influences were measured were crop yields, returns for feed fed to livestock, amounts of livestock kept, cropping systems, prices received for farm products, power and machinery costs, and labor costs. The more of these in which the farms excelled the more profitable the farms were.

is shown to have been a total difference of $484 per farm in favor of the nineteen farms having the higher average yields (Fig. 12). The ten-year average prices for the major crops were 63 cents for corn, 35 cents for oats, and 96 cents for wheat. The differences in value due to differences in yield of all crops grown on tillable land, including grain, hay, canning crops, and pasture, were considered in calculating the total difference of $484.

Efficiency of livestock. Second only to crop yields in placing the farms in the different profit-groups was the efficiency with which livestock was produced or purchased, fed, and marketed. The value of feed used annually on all the farms averaged $2,160 per farm at farm prices.[1] The most profitable one-third of the farms realized an average of $147 from each hundred dollars' worth of feed fed to productive livestock, while the least profitable one-third received only $129 (Table 60). The $18 larger returns per hundred dollars' worth of feed used on the more profitable farms would thus amount to $389

[1] A fair farm value was assigned to all roughage used by livestock even tho it would not have been sold if livestock had not used it on the farm.

more net income per year (Fig. 12). Efficiency of handling livestock, as discussed here, did not include the cost of keeping horses.

Only about 43 percent of the grain produced on the fifty-seven farms during the ten-year period was fed on the farms, and the remaining 57 percent was sold. Where most of the grain raised is fed on the farms, livestock efficiency becomes relatively more important in its effects on farm earnings and is frequently of greater importance than differences in yields (see pages 553 and 572 to 574).

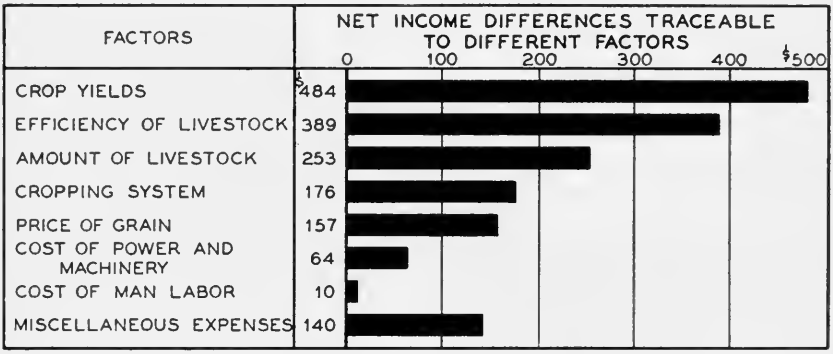

FIG. 12.—EXTENT TO WHICH CERTAIN FACTORS WERE RESPONSIBLE FOR DIFFERENCES BETWEEN AVERAGE NET INCOME OF THE NINETEEN MOST PROFITABLE OF FIFTY-SEVEN FARMS AND THE NINETEEN LEAST PROFITABLE, 1925-1934

Crop yields and livestock efficiency accounted for more than half the $1,673 difference traceable to all seven factors. The total difference between the average net incomes of the two groups of farms was $1,786 (Fig. 8).

Amount of livestock. A larger amount of livestock kept on the most profitable one-third of the farms was an important factor in the higher incomes of these farms. The amount of livestock on the different groups of farms is indicated by the value of feed fed per acre. On the most profitable one-third of the farms the average value of feed fed per acre to productive livestock was $10.82, and on the least profitable one-third, $8.19 (Table 60). On an average-sized farm in the area studied (246 acres), this greater value of feed fed on the most profitable one-third of the farms would amount to $647. And at a margin of $39 above feed value for $100 worth of feed fed (average return for the fifty-seven farms) the additional net income from feeding $647 more feed to livestock would amount to $253 per farm.

On the other hand, the value of feed fed per acre to productive livestock was 83 cents higher on the least profitable one-third of the farms than on the medium-profitable one-third. This variance is

explained by the fact that some of the least profitable farms were livestock farms on which the livestock was inefficiently handled (see page 570).

Cropping system. Analysis of the acreages, yields, and values of all grain, hay, and pasture crops grown indicates that the most profitable one-third of the farms realized an average of $176 more per farm per year than the least profitable one-third, because of better cropping systems. By "cropping system" is meant the proportion of tillable land in different crops, some of which return much lower gross incomes per acre than others. Most of the advantage in cropping systems on the nineteen most profitable farms consisted in their having larger percentages of tillable land in corn, canning crops, barley, and alfalfa, and smaller percentages in oats and timothy than were found on the nineteen least profitable farms (Table 65, page 559).

The relative values of the different crops in the cropping systems were determined by the following method. On the nineteen most profitable farms the percent of tillable land in corn, for example, was 44.6, whereas on the nineteen least profitable farms it was only 42.8 (Table 60, page 546). When applied to 224.4 acres of tillable land (the average for all fifty-seven farms), this difference of 1.8 percent amounted to 4.04 acres of corn. Since the average yield of corn was 47.6 bushels an acre, and the average price was 63 cents a bushel, the difference of 4.04 acres in corn accounted for $121 more gross income on the nineteen most profitable farms. This method was used for all crops, including hay and pasture, and the differences in percentages of the various crops grown determined the relative values of the cropping systems.

Price of grain. Higher prices obtained for grain on the most profitable one-third of the farms would have accounted for $157 more gross income than on the least profitable one-third if each farm had sold an amount equivalent to the average of the amounts sold on all fifty-seven farms. The most and the least profitable groups received the same average price for oats, but the most profitable one-third received an average of 5 cents a bushel more for corn and 9 cents more for wheat than the least profitable one-third. A part of the difference in prices received was due to differences in quality of grain.

Differences in prices received for livestock and livestock products made up part of the differences credited to "livestock efficiency" discussed on pages 549 to 550, and consequently are not taken up here. A relatively high price for dairy products was responsible for placing several farms in the high-profit group.

Cost of power and machinery. The total acre-cost of horse and tractor power and of machinery was $3.71 on the most profitable one-third of the farms and $3.97 on the least profitable one-third. The difference of 26 cents an acre amounted to $64 less cost per farm in favor of the most profitable farms.

Cost of man labor. The total labor cost, including that of the operator and his family at hired-man rates, was $6.40 an acre on the nineteen most profitable farms and $6.44 an acre on the nineteen least profitable farms. This difference of 4 cents an acre in labor costs, applied to the average number of acres on all fifty-seven farms, amounted to $10 more net income for the most profitable farms.

It is significant that with slightly lower power, machinery, and man-labor costs the nineteen most profitable farms produced and marketed crops and livestock that were worth an average of about $1,460 more per farm per year than those produced and marketed on the nineteen least profitable farms.

Miscellaneous expenses. Miscellaneous expenses (expenses other than for labor, power, and machinery) amounted to $4.32 an acre on the most profitable farms and $4.89 an acre on the least profitable farms. This difference of 57 cents an acre accounted for $140 difference in expense in favor of the most profitable one-third of the farms. More than half of the 57 cents difference per acre was due to differences in the upkeep of farm improvements (Table 60). Investments in farm improvements, not including the residence of the operator, were, on an average, $1,570 per farm larger on the nineteen least profitable farms than on the nineteen most profitable farms (Table 57, page 539), even tho the least profitable farms were the smaller (Table 60). Large and expensive buildings on a farm become a liability unless they are efficiently used for the storage of feed and machinery or the housing of livestock.

Effects of Relative Amounts of Livestock and of Grain Sold

The relative importance of livestock efficiency and of efficiency in crop production naturally varies according to whether a farm is a "livestock" farm or a "grain" farm. Together these two factors were the most important influences on net income on the fifty-seven farms during the ten-year period studied (page 548). In order to ascertain just what part these factors and the others of the eight discussed in the preceding section played in determining net incomes on farms feeding different amounts of livestock and selling different amounts of grain, three groups of three-year farm records covering periods of

differing price conditions were studied. Each group of three-year records was divided into three subgroups according to the value of feed fed per acre to productive livestock, and then each of these subgroups was further divided into three groups according to the rate earned on the total farm investment. The approximate differences between the net incomes of the most profitable and the least profitable farms were then calculated in the manner described on pages 548 to 552. The results of this analysis are shown in Table 62.

On the livestock farms on which approximately all the crops produced were fed, more than half the total located difference in incomes was found, as an average of three comparisons, to be in livestock efficiency. On these same farms an average of only 12.2 percent of the total located difference in incomes was due to differences in crop yields. This does not mean that good yields of crops are unimportant on livestock farms. As a matter of fact, livestock farms in general maintain high crop yields better than grain farms (Table 69, page 568). But it does mean that on livestock farms the gains and losses due to differences in livestock efficiency outweigh all other factors.

On mixed-livestock-and-grain farms, on which about half the total crops grown were fed, livestock efficiency and crop yields had about the same influence in placing the farms in the high- or the low-earning groups, according to the averages of three comparisons (Table 62).

Finally, *on the grain farms, where only about one-fourth of the crops grown were fed,* crop yields were definitely more important than livestock efficiency in placing the farms in high- or low-earning groups. This relationship held true in each of the three studies of these farms. The price received for grain also proved to be an important factor in placing grain farms in high- or low-earning groups.

Tho these two factors—livestock efficiency and crop yields—are in general the most important of the influences bearing upon earnings on central Illinois farms, it is essential for the farmer to study all phases of the farm business carefully in order to avoid losses wherever they may occur. As a group, and sometimes individually, the other factors—cost of horse power and machinery, miscellaneous expenses (including upkeep of farm improvements), the cost of man labor, and the price received for grain—were consistently important in their influence on farm earnings; and on some farms one or more of these apparently minor factors proved to be of major importance. For example, on one 160-acre farm during the ten-year period $12,740 was paid for new machinery, repairs, and fuel for machines. On a 200-acre farm during the same period only $4,990 was paid for the same

TABLE 62.—LOCATION OF SOME OF THE COMPONENT DIFFERENCES MAKING UP THE TOTAL DIFFERENCES BETWEEN THE INCOMES OF THE MOST PROFITABLE AND THE LEAST PROFITABLE FARMS GROUPED ACCORDING TO THE RELATIVE AMOUNTS OF CROPS FED

Factors considered	Livestock farms					Livestock and grain farms					Grain farms				
	Comparison No. 1[a]	Comparison No. 2[b]	Comparison No. 3[c]	Average of three comparisons		Comparison No. 1[a]	Comparison No. 2[b]	Comparison No. 3[c]	Average of three comparisons		Comparison No. 1[a]	Comparison No. 3[c]	Comparison No. 4[d]	Average of three comparisons	
				Amount	Per-cent of total				Amount	Per-cent of total				Amount	Per-cent of total
Number of farms in each group	31	15	17	21	.....	31	15	17	21	.....	31	17	17	22	.....
Feed fed per acre to productive livestock	$15.12	$11.46	$12.20	$12.93	.....	$ 8.05	$ 6.19	$ 5.97	$ 6.74	.....	$ 4.37	$ 3.20	$ 2.83	$ 3.47	.....
Approximate value per acre of all crops produced on all farms in area	$17.32	$11.14	$10.35	$12.94	.....	$17.32	$11.14	$10.35	$12.94	.....	$17.32	$10.35	$13.86	$13.84	.....
Percent of crops fed to productive livestock	87.3	102.6	117.9	100.0	.....	46.5	55.6	57.7	52.1	.....	25.2	30.9	20.4	25.1	.....
Approximate differences in income between ⅓ *most* profitable and ⅓ *least* profitable farms due to differences in—															
Livestock efficiency	$751	$939	$1 141	$944	53.7	$518	$385	$476	$460	32.5	$333	$282	$321	$312	22.8
Crop yields	397	110	138	215	12.2	558	299	349	402	28.5	490	448	530	489	35.7
Cost of power and machinery	334	117	94	182	10.3	156	163	143	154	10.9	271	147	136	185	13.4
Cost of labor	167	347	167	227	12.9	147	234	169	183	13.0	201	114	44	120	8.8
Cropping system	63	257	2	107	6.1	276	11	−18	90	6.4	89	132	72	98	7.2
Miscellaneous	153	60	−28	62	3.5	121	163	69	118	8.4	155	53	−68	47	3.4
Price of grain	−40	13	40	4	.2	− 3	58	14	23	1.6	118	128	192	146	10.7
Amount of livestock	30	7	22	20	1.1	9	−99	33	−19	−1.3	− 8	−14	−62	−28	−2.0
Total accounted for	$1 855	$1 850	$1 576	$1 761	100.0	$1 782	$1 214	$1 235	$1 411	100.0	$1 649	$1 290	$1 165	$1 369	100.0

[a]Comparison No. 1 was in Livingston, McLean, Tazewell, and Woodford counties during the years 1929, 1930, and 1931.
[b]Comparison No. 2 was in Henry, Knox, Peoria, and Stark counties during the years 1930, 1931, and 1932.
[c]Comparison No. 3 was in Grundy, LaSalle, Marshall, and Putnam counties during the years 1931, 1932, and 1933.
[d]Comparison No. 4 was in Livingston, McLean, Tazewell, and Woodford counties during the years 1932, 1933, and 1934.

items. The net decrease in the machinery account during the ten years was $11,340 for the first farm and only $5,730 for the second farm. The second farm was not only 40 acres larger but fed twice as much feed to livestock during the ten years. On the first farm a high machinery cost was one of the main reasons for a low net income, whereas on the second farm the low machinery cost contributed greatly to a high net income.

INTERRELATION OF DIFFERENT FACTORS IN THE ORGANIZATION AND OPERATION OF A FARM

In organizing and managing a farm for profit, a farmer should consider how he can make improvement with respect to each of the several factors which influence earnings; and in so doing he should not neglect to consider how the different practices may affect each other. Some of the factors are very closely related, as, for example, crop yields and amounts of livestock; others, such as prices received, operate more or less independently.

The interrelationships among different parts of the farm business make it difficult for a farmer to estimate the relative influence which different factors may have in determining his earnings. For example, a farmer who obtains high yields of crops or high returns from livestock may put into his farming operations more labor than is used on other farms, and he may feel that his labor costs are too high. But high labor costs may be justified if the increased labor results in correspondingly higher earnings, and he should not fail to consider the effects that lowering his labor input might have on crop yields or livestock production, and consequently on income. On the other hand, a farm may have high costs for labor, power, and equipment but only medium or poor yields of crops and low returns from feed fed to livestock. On such a farm the earnings are low—and the fault may lie either in the high costs for labor, power, and equipment or in the low yields from crops and low returns from livestock, or in both of these factors.

In order to clear up some of these interrelationships and enable farmers to estimate more accurately the importance in their own farm organizations of the various factors influencing earnings, the factors discussed in the foregoing section are taken up again here. The discussion of their bearing upon earnings is continued, but on the basis of a classification of farms according to their efficiency with the factor being considered, rather than according to their ranking in high- or

low-earning groups. Not only the fifty-seven farms with the ten-year records are included, but others, all in the Farm Bureau Farm Management Service, involving a total of about 1,000 farms in twelve counties in north-central Illinois, enter into the various comparisons.

Good Cropping System Is the Foundation of Good Farming

A well-planned rotation of high-profit crops and a careful arrangement of fields is essential to the best farming. All those farms that produced the highest yields during the ten years had well-established rotations that included sweet clover or alfalfa at least one year in four or five. The farms that produced livestock most economically used rotated legume pastures to provide both protein feed and sanitation. The farms that used labor and power most efficiently were divided into a few large fields arranged so as to extend as near to the farm buildings as practicable.

As a means of measuring the relative profitableness of different cropping systems in this study, the crops commonly grown in north-central Illinois were classified into three groups according to their profitableness—high-profit crops, medium-profit crops, and low-profit crops. The high-profit crops included corn, winter wheat, alfalfa, sweet clover, and canning crops. The medium-profit crops included spring wheat, barley, soybeans, red clover, and a mixture of red clover and timothy. The low-profit crops included oats, and timothy or bluegrass on tillable land. This classification is based largely on cost-of-production studies conducted by the Illinois Station over a long period of years in north-central Illinois.[1]

Sweet clover good for pasture and soil building. Pasture crops were classified as high-, medium-, or low-profit crops partly on the basis of their livestock-carrying capacity and partly according to their soil-building value. Pastures containing sweet clover alone or with other clovers and timothy furnished more forage per acre than any other kind of pasture common on the farms in this study (Table 63).

Sweet-clover pasture furnished approximately one-fourth more carrying capacity per acre than either bluegrass or a mixture of red clover and timothy on tillable land. Pasturage obtained during the year of seeding is not included in Table 63, tho this first-autumn pasturage sometimes amounted to as much as one-third of that obtained the following year. In comparing sweet-clover or red-clover pastures with permanent pastures of bluegrass or timothy, the pastur-

[1]See Ill. Agr. Exp. Sta. Bul. 329, "Organizing the Corn-Belt Farm for Profitable Production."

TABLE 63.—PASTURE DAYS PER SEASON SUPPLIED BY DIFFERENT KINDS OF PASTURE CROPS

(Data from farms in Livingston, McLean, Tazewell, and Woodford counties, 1925-1926 and 1928-1930)

Kind of pasture crop	Total number of fields	Total number of acres	Average number of pasture days[a] per acre per season
Sweet clover alone	113	2 621	103
Sweet clover mixed with other clovers and timothy	159	3 353	94
All pastures containing sweet clover	272	5 974	98
Red or alsike clover mixed with timothy	70	1 628	79
Bluegrass	159	4 159	77
On tillable land[b]	75	1 478	80
On nontillable land[b]	58	2 040	69

[a]One "pasture day" is equivalent to the grazing supplied for one mature cow or horse for one day.
[b]A distinction between "bluegrass on tillable land" and "bluegrass on nontillable land" was made only during the last three years of these pasture comparisons, 1928 to 1930.

age furnished the first fall after small grain should be taken into consideration.

As a soil-building crop sweet clover used either for seed or for pasture was about twice as effective as red clover used for hay or pasture (average for all farms in the study, Table 2, page 482).

Timothy and bluegrass low-profit crops on tillable land. On the farms where timothy or bluegrass was grown on tillable land, a smaller-than-average acreage of the soil-building legumes—alfalfa, sweet clover, red clover, alsike clover, and mammoth clover—was included in the rotation, a larger proportion of grain crops was grown on the rotated land, and crop yields tended to decline (Table 64). Consequently the net income per acre of the farm was lower on farms having bluegrass or timothy on tillable land than on farms using rotated legumes for pasture or hay.

On farms on which little or none of the tillable land was left in bluegrass and timothy, the yield of corn averaged 48.8 bushels an acre and soil-building legumes were grown on an average of 16.9 percent of the tillable land each year; whereas on farms on which an average of 9.5 percent of the tillable land was in timothy or bluegrass, the yield of corn averaged only 45.0 bushels an acre and soil-building legumes were grown on an average of only 11.4 percent of the tillable land (Table 64).

High proportion of land in higher-profit crops. As a means of measuring the value of different crops in the cropping system, the fifty-seven farms were divided into three groups according to the

TABLE 64.—PERCENT OF TILLABLE LAND IN BLUEGRASS AND TIMOTHY AS RELATED TO NET INCOME PER ACRE OF THE FARM

(Based on records of farms in Livingston, McLean, Tazewell, and Woodford counties during three three-year periods, 1925-1934. All these farms had good corn land and were 90 percent or more tillable)

Years represented, and basis for grouping farms: range in percent of tillable land in bluegrass or timothy	Number of farms	Percent of tillable land in—			Feed fed per acre	Yield of corn	Net income per acre of farm
		Bluegrass and timothy	Legumes except soybeans	Soybeans			
						bu.	
1925-1927							
.0 to .9	24	.1	16.7	.3	$11.09	54.2	$11.83
1.0 to 4.9	31	3.0	14.9	1.1	7.47	49.9	9.65
5.0 or more	53	11.3	11.0	1.6	9.64	49.1	8.06
1929-1931							
.0 to .9	67	.1	15.5	2.7	9.54	47.4	5.56
1.0 to 4.9	47	2.8	14.1	3.7	9.05	45.0	5.17
5.0 or more	54	9.1	10.3	2.5	8.92	43.4	4.36
1932-1934							
.0 to .9	52	.0	18.5	3.4	5.79	44.7	6.47
1.0 to 4.9	32	2.4	17.7	3.0	6.18	45.4	7.51
5.0 or more	27	8.0	12.8	6.1	5.16	42.5	5.69
Averages, all periods							
.0 to .9	48	.1	16.9	2.1	8.81	48.8	7.95
1.0 to 4.9	37	2.7	15.6	2.6	7.57	46.8	7.44
5.0 or more	45	9.5	11.4	3.4	7.91	45.0	6.04

percentage of tillable land in high-profit crops (corn, winter wheat, alfalfa, sweet clover, and canning and truck crops) plus half of the percentage of tillable land in medium-profit crops (spring wheat, barley, soybeans, and red, alsike, or mammoth clover). The advantage of growing the more profitable crops on a large proportion of the tillable land is shown in Table 65. The nineteen farms on which the highest percent of profitable crops was grown during the ten years received higher annual returns (higher on the average by 1.05 percent of the farm investment) than the nineteen farms having the least percentages of land in those crops. This yearly difference of 1.05 percent on the farm investment amounted to $537 more net income per farm for the farms growing the more profitable crops.

Crop yields were 7.9 percent above average on the farms having the most land in the more profitable crops, and 4.5 percent below average on the farms having the least land in those crops. This difference in yields was to be expected in view of the fact that there was twice as much alfalfa and sweet clover grown, and nearly 50 percent more feed fed, on the farms having the high percentage of land in the more profitable crops. There was a close relation between large acreages of alfalfa and sweet clover, efficient livestock, high crop yields, and high net incomes on these farms.

TABLE 65.—PERCENT OF TILLABLE LAND IN HIGHER-PROFIT CROPS AS RELATED TO RATE EARNED ON TOTAL FARM INVESTMENT

(Based on records of fifty-seven farms in Livingston, McLean, Tazewell, and Woodford counties, 1925-1934)

Items	19 farms with *highest* percent of higher-profit crops	19 farms with *medium* percent of higher-profit crops	19 farms with *lowest* percent of higher-profit crops
	perct.	*perct.*	*perct.*
Tillable land in higher-profit crops[a]	76.4	68.9	63.1
Tillable land in high-profit crops, total[b]	69.8	63.6	56.1
Corn	41.9	48.5	43.1
Winter wheat	9.5	3.5	4.8
Alfalfa	5.1	2.6	2.6
Sweet clover	7.9	7.9	4.0
Canning and miscellaneous	5.4	1.1	1.6
Tillable land in medium-profit crops, total[b]	13.4	10.8	13.9
Spring wheat	.7	1.7	.9
Barley	2.4	2.1	2.5
Soybeans	4.6	2.5	3.5
Clover	2.5	2.2	3.9
Clover and timothy mixed	1.7	2.1	2.5
Miscellaneous	1.5	.2	.6
Tillable land in low-profit crops, total[b]	16.8	25.6	30.0
Oats	13.8	24.0	22.2
Timothy	.7	.5	2.8
Bluegrass	2.0	1.0	4.1
Miscellaneous	.3	.1	.9
Rate earned on total farm investment	4.52	4.02	3.47
Percent of land tillable	87.5	91.3	93.8
Percent of tillable land in legumes	23.8	17.2	16.4
Crop-yield index	107.9	98.5	95.5
Livestock-efficiency index	101.4	99.1	99.4
Value of feed fed per acre	$ 11.72	$ 7.03	$ 7.99
Gross income per acre	$25.35	$20.83	$20.22
Total expense per acre	15.80	12.72	12.92
Net income per acre	9.55	8.11	7.30

[a]Percentage in high-profit crops plus one-half of the percentage in medium-profit crops.
[b]This separation of crops into high-profit, medium-profit, and low-profit groups is based largely on detailed cost studies conducted on farms in central Illinois. See Ill. Agr. Exp. Sta. Bul. 329, "Organizing the Corn-Belt Farm for Profitable Production."

One of the chief problems of a grain farmer is how to grow enough legumes to maintain nitrogen and organic matter in the soil and at the same time dispose of the legumes profitably. Some solve this problem partially by harvesting clover for seed. But clover seed crops are uncertain in north-central Illinois, and many farmers will not take the risk involved in letting clover stand a year in order to get a seed crop. Other grain farmers who have land on which sweet clover grows readily sow sweet clover with small grain and plow it under in the fall or spring for corn. This practice is a good one on land on which for any reason it is impractical to pasture livestock, but it does not appear to maintain fertility as well as when the sweet clover is allowed to stand over a full year and is pastured (Table 2, page 482). It is not

unlikely, however, that some of the stands of sweet clover plowed under for corn were not so uniform nor so heavy as those that were retained for pasture.

Not more than half of tillable land in corn. Growing corn on more than 50 percent of the tillable land is a practice of doubtful value unless the best care otherwise is given the soil. On farms having an average of about half the tillable land in corn the net income per acre was approximately the same as on farms having more land in corn (Table 66). As the percentage of tillable land in corn increased from about 35 percent to 40, to 45, to 50, to 55 percent, the net income per acre increased from $5.42 to $6.12, to $6.54, to $7.08, to $7.17. These figures are averages of data obtained in three three-year comparisons during 1925-1927, 1929-1931, and 1932-1934 in Livingston, McLean, Tazewell, and Woodford counties.

While the proportion of tillable land left down in soil-building legumes declined from 17.5 percent on farms having less than 37.5 percent of the tillable land in corn to 11.1 percent on farms having more than 52.4 percent of tillable land in corn, the productivity of the soil was apparently maintained by the feeding of more feed and the plowing under of more first-year sweet clover. As an average of two of the three-year studies, first-year sweet clover was plowed under for corn on 7 percent of the tillable land on farms where 52.5 percent or more of the tillable land was in corn (Table 66).

High proportion of legumes and plenty of livestock. Plenty of legumes in the cropping system, combined with enough livestock to make economic use of the legumes, proved profitable on the farms included in this study. Of the fifty-seven farms, the twenty that had the highest percentage of tillable land in soil-building legumes and that fed the most livestock proved to be slightly more profitable than the twenty that had the least legumes and least livestock (Table 67).

The twenty farms that had a ten-year average of 21.4 percent tillable land in soil-building legumes had an average of only 39.9 percent tillable land in corn and 16.8 percent in oats. In contrast, the twenty farms that had an average of only 11.1 percent of tillable land in legumes had 47.8 percent in corn and 23.2 percent in oats. *But with more livestock to use the larger acreage of legumes, the farms with 92 percent more legumes, 20 percent less corn, and 38 percent less oats produced the higher average net incomes during the ten years.*

Furthermore the productivity of the twenty farms with the most legumes and livestock *increased* during the ten years, while that of the twenty farms with the least legumes and livestock *declined* (Fig. 13).

TABLE 66.—PERCENT OF TILLABLE LAND IN CORN AS RELATED TO NET INCOME PER ACRE OF THE FARM

(Based on records of farms in Livingston, McLean, Tazewell, and Woodford counties during three three-year periods, 1925-1934. Only farms having good corn land, that were 90 percent or more tillable, and on which less than 5 percent of tillable land was in canning crops, were included)

Years represented, and basis for grouping farms: percent of tillable land in corn	Number of farms	Average percent of tillable land in—			Feed fed per acre	Yield of corn per acre	Average appraised value of land per acre	Net income per acre of entire farm
		Corn	Soil-building legumes	First-year sweet clover plowed under				
						bu.		
First comparison, 1925-1927								
Under 37.5	9	34.9	16.5	...	$7.37	52.3	$199	$7.16
37.5 to 42.4	17	40.5	13.6	...	8.65	50.7	199	7.39
42.5 to 47.4	21	45.1	10.4	...	7.98	47.3	201	8.16
47.5 to 52.4	31	49.3	12.2	...	8.41	49.9	203	9.59
52.5 or more	17	55.8	13.9	...	9.93	50.0	202	10.30
Second comparison, 1929-1931								
Under 37.5	9	34.5	16.0	3.2	8.64	47.1	186	3.08
37.5 to 42.4	27	40.7	15.1	1.3	8.57	44.1	189	4.21
42.5 to 47.4	42	44.6	14.6	3.1	9.22	44.3	196	4.88
47.5 to 52.4	61	49.8	13.9	3.0	8.86	44.0	195	4.49
52.5 or more	51	56.5	9.4	5.5	8.34	44.1	197	4.88
Third comparison, 1932-1934								
Under 37.5	9	34.0	20.1	.4	4.23	39.4	140	6.01
37.5 to 42.4	16	39.9	16.4	3.2	4.89	46.0	144	6.76
42.5 to 47.4	38	44.4	17.1	5.0	6.11	43.6	146	6.58
47.5 to 52.4	27	49.5	14.6	6.2	5.60	46.0	146	7.17
52.5 or more	15	54.9	10.0	8.5	4.43	41.5	141	6.32
Averages, all comparisons								
Under 37.5	9	34.5	17.5	1.8	6.75	46.3	175	5.42
37.5 to 42.4	20	40.4	15.0	2.2	7.37	46.9	177	6.12
42.5 to 47.4	34	44.7	14.0	4.0	7.77	45.1	181	6.54
47.5 to 52.4	40	49.5	13.6	4.6	7.62	46.6	181	7.08
52.5 or more	28	55.7	11.1	7.0	7.57	45.2	180	7.17

TABLE 67.—PERCENT OF TILLABLE LAND IN SOIL-BUILDING LEGUMES AND OF AMOUNT OF LIVESTOCK FED, AS RELATED TO NET INCOME PER ACRE OF THE FARM

(Based on records of fifty-seven farms in Livingston, McLean, Tazewell, and Woodford counties, 1925-1934)

Items	20 farms with *most* legumes and *most* livestock	20 farms with *least* legumes and *least* livestock
Percent of tillable land in soil-building legumes[a]	21.4	11.1
Percent of tillable land in corn	39.9	47.8
Percent of tillable land in oats	16.8	23.2
Feed fed per acre to all livestock	$13.55	$ 6.88
Net income per acre	$ 8.01	$ 7.80
Yield of corn, bushels per acre	49.5	45.0
Yield of oats, bushels per acre	37.8	35.8

[a]The legumes included were alfalfa and sweet clover, red clover, alsike clover, or mammoth clover left down for the second year.

During the three years 1925-1927, the twenty farms with the most legumes and livestock produced an average of 51.9 bushels of corn an acre—2.2 bushels an acre more than the average of 175 farms on good corn land in the four counties during these three years. The same twenty farms produced an average of 49.9 bushels of corn an acre during the three years 1932-1934,—which was 5.7 bushels more than the average of 150 farms on which records were kept during

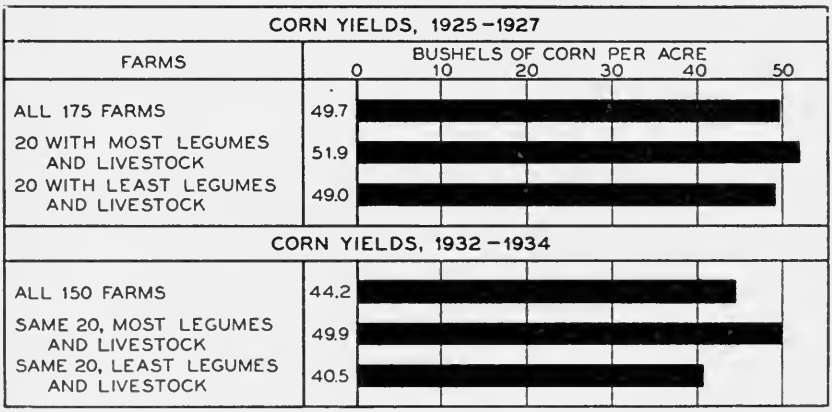

FIG 13.—CORN YIELDS IN RELATION TO AMOUNT OF LEGUMES AND LIVESTOCK

Tho the average corn yield was lower by 5½ bushels an acre during the second three-year period because of severe drouth and chinch bug damage, the farms with *most* legumes and livestock had yields only 2 bushels an acre lower than during the first period. On farms with *least* legumes and livestock corn yields dropped 8.5 bushels an acre.

those three years.[1] These twenty farms therefore increased their ability to produce corn by 3.5 bushels an acre more than the average of all farms on which records were kept.

On the other hand, the twenty farms having the least legumes and livestock during the ten years *reduced* their producing power by 3.0 bushels of corn an acre below the average of all the farms. There was thus a net difference of 6.5 bushels of corn an acre in favor of the farms having the most legumes and livestock.

These data, given in Table 67 and Fig. 13, might at first thought appear contradictory to those in Table 66, where the farms with the larger acreage of corn were shown to be the most profitable. However, on the farms for which data are given in Table 66, those having the larger acreages of legumes and the smaller acreage of corn had *less* livestock than the farms with the larger acreage of corn and smaller acreage of legumes. Thus it is evident that the most profitable combination was one where plenty of legumes were grown to help maintain soil fertility and enough well-handled livestock was kept to make economic use of the legumes. Furthermore, the data indicate that *as time goes on these differences may be expected to increase.*

Amount and Kind of Livestock Warrant Careful Consideration

The amount and the kind of livestock that may be kept most profitably on a corn-belt farm depend on such matters as the amount of untillable land that can be used only for pasture, the proportion of tillable land on which legumes or other soil-conserving crops need to be grown, the market for various farm products, and the ability and inclination of the operator. Farms that have comparatively large acreages of untillable pasture must necessarily be used as cattle or sheep farms in order to utilize the pasture land economically.

Relative profitableness of different types of farms.[2] In this study

[1] Average yields on all farms during the three years 1932-1934 were lower than during 1925-1927 because of drouth, chinch bug damage, and other unfavorable conditions.

[2] For the purposes of this study the farms enrolled in the accounting service thruout the ten years were classified into eight types according to the most important sources of income on each. The types and the proportions of income necessary to classify the farms were: hog farms, 40 percent or more of income from hogs; feeder-cattle farms, 40 percent or more of income from feeder cattle; dairy farms, 40 percent from dairy products; cattle-and-hog farms, 40 percent or more from hogs and cattle together; grain and mixed livestock farms, 40 percent or more from grain and another 40 percent or more from livestock of all sorts; grain farms, 70 percent or more from grain;

(Footnote concluded on following page.)

the farms on which the bulk of the income was from hogs appeared to have a slight advantage in income over other types of farms (Fig. 14). Too few feeder-cattle farms and dairy farms were included, however, for the records to be considered typical of the incomes to be expected from those types of farming. Nevertheless it is significant that the livestock farms (the four types on which hogs, or feeder cattle, or dairy cattle, or hogs and cattle together furnished the bulk of the income) produced ten-year incomes well above those of the farms on

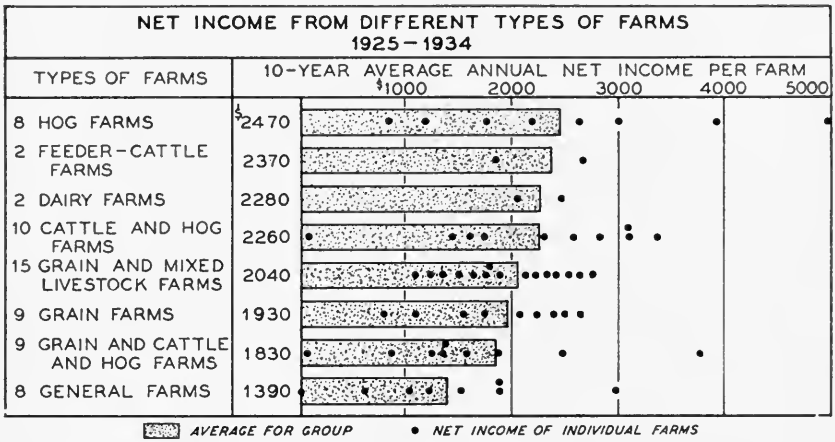

FIG. 14.—AVERAGE ANNUAL NET INCOMES FROM DIFFERENT TYPES OF FARMS, 1925-1934

Tho in general the livestock farms were somewhat more profitable than the grain farms, there was a wider spread in net income among the farms in the livestock groups than among the farms in the grain group. (For basis of classification of these farms, see footnote 2, page 563.)

which grain provided the larger share of the income. It is well to notice, tho, that some of the least profitable farms were livestock farms, and that there was less variation in the incomes from grain farms and from grain and mixed livestock farms than from farms of any other type. Larger variations in incomes among livestock farms might be expected, for such farms have two important places at which to gain or lose—crops in addition to livestock.

Only one of the eight general farms had an average net income for the ten years above the average of all of the farms. Had the

grain and cattle and hog farms, 40 percent or more from grain and another 40 percent or more from cattle and hogs together; and general farms, no one source contributing as much as 40 percent. The farms in any one class had less than 40 percent of their income from any source other than that indicated.

livestock of these general farms been well managed, the increased income from it would have placed the farms in one of the livestock groups. Poor livestock management, rather than lack of livestock, caused these farms to be classified as general farms.

Relative profitableness varies during changing prices. Relative earnings of different types of farms for any short period of years evidently depend largely on the relative prices of the products sold (Table 68, and Figs. 15 and 16).

Of the six types of farms studied (hog, beef-cattle, dairy, grain and mixed livestock, grain, and general farms), no one type proved to be more profitable than the average of all farms during all three three-year periods (1925-1927, 1929-1931, and 1932-34), and none showed poorer-than-average earnings during all three periods. Earnings from beef-cattle and from dairy farms varied more from period to period than earnings from the other types of farms, tho too few beef-cattle

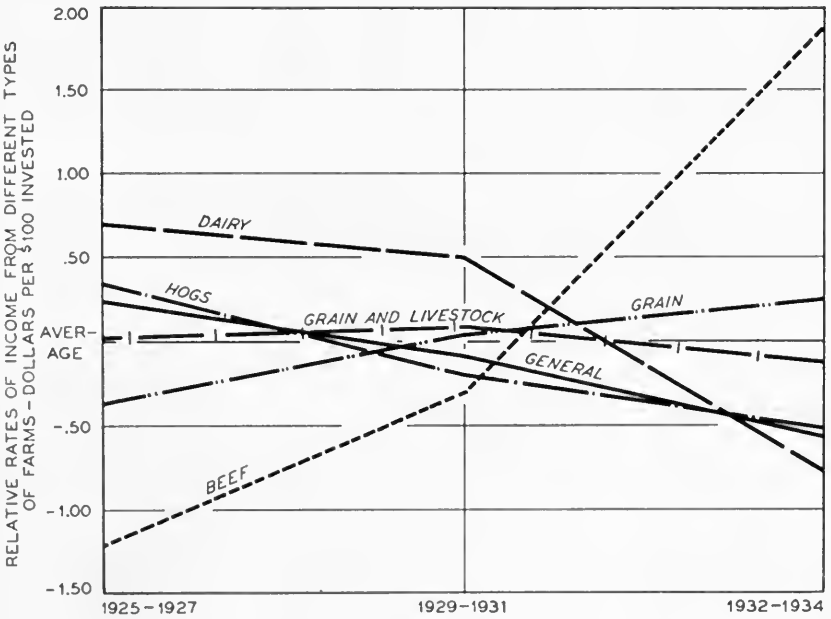

FIG. 15.—RELATIVE PROFITABLENESS OF DIFFERENT TYPES OF FARMS DURING THREE THREE-YEAR PERIODS

No one type of farm was most profitable thruout all three periods. The variations in relative profitableness are accounted for largely by changes in the price relations between grain and livestock (Fig. 16) and by changes in the efficiency of the organization and operation of these farms during the ten-year period. The numbers of farms of the different types are shown in Table 68.

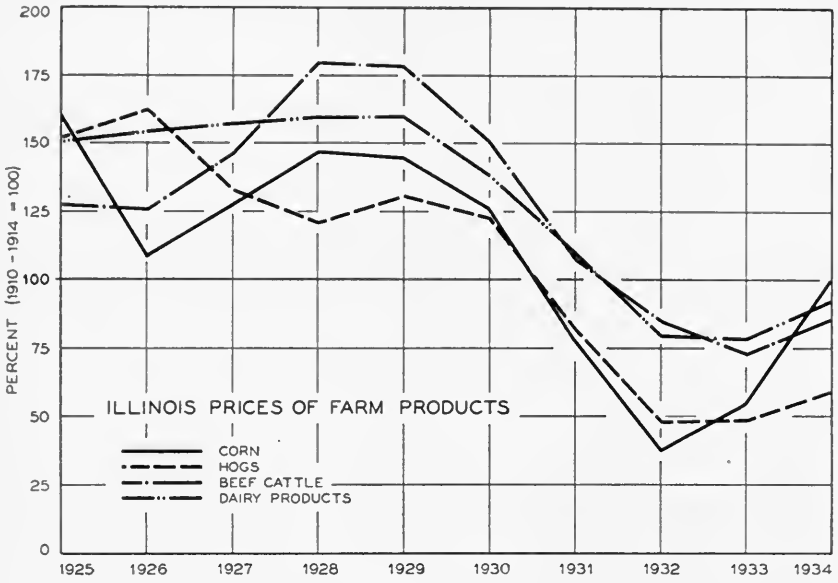

FIG. 16.—RELATIVE ILLINOIS PRICES OF HOGS, BEEF CATTLE, DAIRY PRODUCTS, AND CORN, 1925-1934

Tho price trends of corn, livestock, and livestock products followed the same general pattern during this period, the positions of these commodities in relation to each other changed frequently. (Based on prices reported in Circular 434, *Illinois Crop and Livestock Statistics.*)

and dairy farms were included to furnish dependable samples of those types of farming. Earnings from grain and mixed livestock farms varied the least from period to period, giving basis for the idea that during periods of varying prices farms with diversified incomes have more consistent earnings than more specialized farms.

Livestock farms having well-handled livestock most profitable. Livestock farms on which the livestock was most efficiently produced (or purchased), fed, and marketed proved more profitable than grain farms having the best crop yields. The superiority of the livestock farms that had well-managed livestock was evident in all four comparisons, each of which included only farms having good corn land and that were 90 percent or more tillable (Table 69 and Fig. 17). These farms could have been conducted either as livestock or as grain farms.

In each comparison the twenty or thirty farms on which the value of the feed fed per acre was highest were selected as the livestock farms; and an equal number of farms showing the smallest value of feed fed per acre were selected as the grain farms. As an average of

TABLE 68.—TYPE OF FARM AS RELATED TO RATE EARNED ON TOTAL FARM INVESTMENT
(Based on records of farms in Livingston, McLean, Tazewell, and Woodford counties during three three-year periods, 1925-1934)

Type of farm[a]	1925-1927		1929-1931		1932-1934		Average of three periods	
	Number of farms	Rate earned	Number of farms	Rate earned	Number of farms	Rate earned	Number of farms	Rate earned
		perct.		*perct.*		*perct.*		*perct.*
Hog	39	3.69	72	1.71	15	2.71	42	2.70
Beef cattle	3	2.12	2	1.60	6	5.09	4	2.94
Dairy	2	4.05	12	2.41	9	2.45	8	2.97
Grain and livestock	60	3.37	81	1.99	44	3.10	62	2.82
Grain	48	2.97	73	1.95	55	3.48	59	2.80
General	23	3.59	35	1.82	21	2.66	26	2.69
All types	175	3.34	280	1.90	150	3.23	202	2.82

[a]Farms were classified according to the relative amounts of income derived from different sources. For example, a farm was considered a "hog farm" if 40 percent or more of the income was derived from hogs and less than 40 percent from any other one source. A farm was considered a "general farm" if it did not receive at least 40 percent of its income from some one source.

TABLE 69.—RATE EARNED ON TOTAL FARM INVESTMENT BY LIVESTOCK FARMS CLASSIFIED ACCORDING TO LIVESTOCK EFFICIENCY AND BY GRAIN FARMS CLASSIFIED ACCORDING TO CROP YIELDS

(Based on records of farms in twelve counties in north-central Illinois, 1929-1934, having good corn land, 90 percent or more of which was tillable)

Type of farm and comparison[a]	Number of farms	Feed fed per acre	Livestock-efficiency index	Crop-yield index	Rate earned
Livestock farms with high livestock efficiency					*perct.*
Comparison 1	15	$20.92	104.5	112.6	2.76
Comparison 2	10	18.35	106.5	113.6	.63
Comparison 3	10	13.75	110.7	109.9	1.90
Comparison 4	10	14.90	118.0	114.0	6.10
Average	11	16.98	109.9	112.5	2.85
Livestock farms with low livestock efficiency					
Comparison 1	15	$20.03	87.2	107.7	1.10
Comparison 2	10	18.91	92.8	107.2	.05
Comparison 3	10	12.13	81.8	114.9	.08
Comparison 4	10	12.20	90.0	107.0	2.37
Average	11	15.82	87.9	109.2	.90
All livestock farms					
Comparison 1	30	$20.52	96.9	110.3	2.03
Comparison 2	20	18.66	98.8	110.1	.32
Comparison 3	20	12.95	97.2	112.3	1.02
Comparison 4	20	13.59	104.0	111.0	4.29
Average	22	16.43	99.2	110.9	1.91
Grain farms with high crop yields					
Comparison 1	15	$ 3.14	106.0	102.9	2.22
Comparison 2	10	6.36	96.8	105.6	.61
Comparison 3	10	2.45	105.4	109.7	1.79
Comparison 4	10	1.94	110.0	104.0	4.18
Average	11	3.47	104.5	105.5	2.20
Grain farms with low crop yields					
Comparison 1	15	$ 3.13	100.8	85.4	1.67
Comparison 2	10	5.98	99.7	86.2	.19
Comparison 3	10	2.59	107.5	87.7	.29
Comparison 4	10	2.33	104.0	72.0	2.42
Average	11	3.51	103.0	82.8	1.14
All grain farms					
Comparison 1	30	$ 3.13	103.3	93.7	1.95
Comparison 2	20	6.17	98.2	96.1	.41
Comparison 3	20	2.51	106.4	100.4	1.15
Comparison 4	20	2.15	107.0	88.0	3.28
Average	22	3.49	103.7	94.5	1.70

[a]Comparison No. 1, during the years 1929, 1930, and 1931, included farms in Livingston, McLean, Tazewell, and Woodford counties; Comparison No. 2, during 1930, 1931, and 1932 included farms in Henry, Knox, Peoria, and Stark counties; Comparison No. 3, during 1931, 1932, and 1933 included farms in Grundy, LaSalle, Marshall, and Putnam counties; and Comparison No. 4, during 1932, 1933, and 1934 included farms in Livingston, McLean, Tazewell, and Woodford counties.

the four comparisons, the value of the feed fed on the livestock farms was $16.43 an acre, that on the grain farms $3.49 an acre, or about one-fifth as much.

Average annual earnings (averages of farms in all four comparisons) were for the livestock farms 1.91 percent, and for the grain farms 1.70 percent, on the total farm investment. The earnings on both groups of farms were low because all the comparisons included at least one of the years of severe depression, and for two of the com-

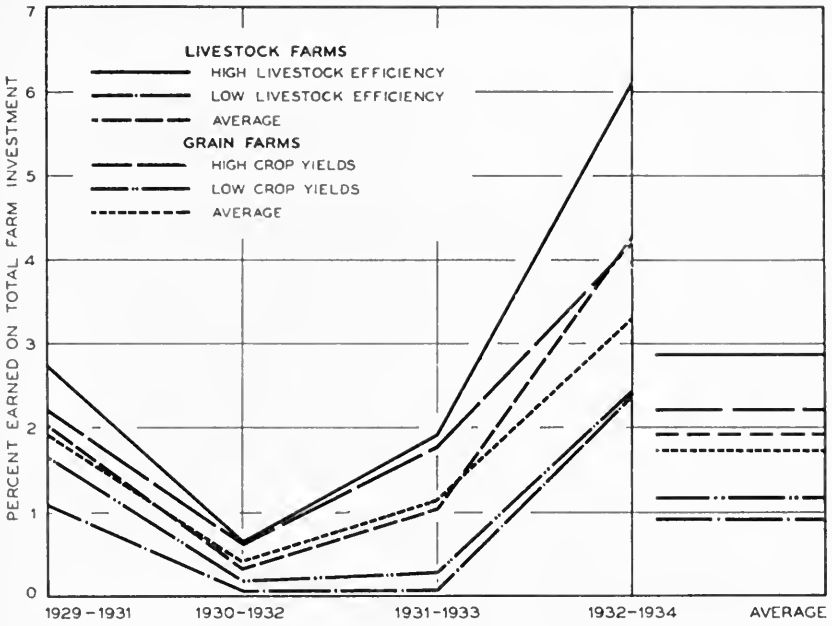

FIG. 17.—RATES EARNED ON LIVESTOCK FARMS WITH HIGH AND LOW LIVESTOCK EFFICIENCY AND ON GRAIN FARMS WITH HIGH AND LOW YIELDS

During all four periods the livestock farms with high livestock efficiency were the most profitable of all farms, and the livestock farms with low livestock efficiency were the least profitable. Efficient handling of livestock overshadows all other factors in determining the income on livestock farms. Similarly on grain farms crop yields are the most important factor. Among these farms not so much spread occurred between the good and the poor grain farms as between the good and the poor livestock farms.

parisons all the data were gathered during years of low prices for farm products. The small difference of only .21 percent of the investment was more than accounted for by the difference in yields of crops on the two groups of farms. Crop yields on the livestock farms averaged 10.9 percent higher, and on the grain farms 5.5 percent lower, than the average of all the record-keeping farms during these years.

Thus the livestock farms as a group were the more profitable because the manure from the livestock and the growing of legumes for feed enabled them to produce 17.3 percent higher yields than the grain farms (see also page 553). It is evident that the main reason for the higher average net incomes from the livestock farms was higher crop yields and not that the livestock enterprises *by themselves* were more profitable.

Livestock farms having poorly handled livestock least profitable. In each of the four comparisons, livestock farms on which the livestock brought the lowest returns for feed showed lower average net incomes than even the grain farms with the lowest crop yields (Table 69 and Fig. 17). Even tho the yields of grain and hay crops on the livestock farms with the poorly handled livestock were nearly one-third higher than on the low-yielding grain farms during these years, the grain farms were more profitable.

Between the earnings of the farms with well-handled livestock and the earnings of the farms with poorly handled livestock there was a much wider spread than between the earnings of the grain farms with high crop yields and those with low crop yields. The average spread between the well-handled and the poorly handled livestock farms was 1.95 percent of the investment as an average of all four comparisons; while the spread between the high-yielding and the low-yielding grain farms was only 1.06 percent of the investment.

These records show that in the operation of an all-tillable, good corn-land farm, the sale of grain is likely to assure about as much income for any one year as the sale of livestock. But if the farm is handled by an average operator for a period of years as a livestock farm, the fertility of the soil will be built up so that the farm will become more profitable than it would have been if it had been operated by an average operator during the same period as a grain farm. Where livestock is well handled, a livestock farm will not only improve in fertility as compared with a grain farm, but will bring a higher annual net income and thus provide for a higher standard of living for the farm family.

These studies show again that the livestock farm has two main chances to gain or lose, while the grain farm has only one.

High Crop Yields Essential to Higher Incomes

In the discussion of the several factors that determine farm earnings (pages 545 to 552), the yield of crops was shown to be the most effective on farms where slightly more than half the grain produced was sold as grain.

As a means of bringing out more clearly the close relation between high crop yields and high net incomes, the fifty-seven farms were regrouped according to crop yields (Table 70). Average annual net incomes of the one-third that produced the highest yields of all grain and hay crops were 4.77 percent of the total farm investment, and of the low-yielding one-third, 3.30 percent of the investment. The differ-

TABLE 70.—CROP YIELDS AS RELATED TO RATE EARNED ON TOTAL FARM INVESTMENT AND TO OTHER MEASURES OF THE FARM BUSINESS

(Based on records of fifty-seven farms in Livingston, McLean, Tazewell, and Woodford counties, 1925-1934)

Items	19 farms with *high* yields	19 farms with *medium* yields	19 farms with *low* yields
Crop-yield index[a]	112.2	101.7	89.9
Yield per acre, bushels			
Corn	54.0	47.8	42.8
Oats	42.1	37.9	34.1
Winter wheat	24.9	24.1	19.4
Spring wheat	22.5	22.2	20.6
Barley	34.3	26.6	25.2
Soybeans	23.9	26.3	19.8
Yield per acre, tons			
Timothy	1.19	1.03	.99
Clover	1.12	1.07	.90
Alfalfa	2.60	2.39	2.21
Clover and timothy	1.18	1.30	1.07
Soybeans	1.98	1.83	1.53
Rate earned on total farm investment	4.77%	3.97%	3.30%
Size of farm, acres	224.6	222.6	292.0
Total investment per acre	$218.53	$208.15	$198.69
Gross income per acre	26.15	22.27	18.50
Total expense per acre	15.73	14.00	11.93
Net income per acre	10.42	8.27	6.57
Value of crops per acre	$21.82	$18.98	$16.78
Value of feed fed per acre	10.69	8.90	7.18
Percent of land tillable	91.8	88.7	92.3
Percent of tillable land in higher-profit crops[b]	71.6	68.8	66.9
Percent of tillable land in legumes	21.6	18.3	17.0
Livestock-efficiency index	101.4	99.7	99.1
Total man-work-units per farm	399.4	375.1	441.1
Man-work-units on livestock per man-work-unit on crops	1.02	.95	.74
Labor cost per man-work-unit	$ 4.19	$ 4.00	$ 3.66
Horse and machinery cost per man-work-unit	$ 2.46	$ 2.32	$ 2.21
Price index for products sold	101.1	101.4	98.1

[a] A percentage measure of the relative yields of all hay and grain crops.
[b] Percentage in high-profit crops plus one-half of the percentage in medium-profit crops.

ence in net income amounted to $3.85 an acre, or $949 for an average-sized farm of 246.4 acres. This difference in income is approximately accounted for by the average differences in yields of crops on the two groups of farms: 11.2 bushels of corn per acre, 8.0 bushels of oats, and the differences in yields of other grain and hay crops shown in Table 70.

The close relation existing between the acre-yields of crops, the amount of livestock fed, and the acreages of legumes grown is shown in Table 70. The high-yielding one-third of the farms produced 12.2 percent higher-than-average yields, fed $10.69 worth of feed per acre, and had 21.6 percent of their tillable land in legumes. On the other hand, the low-yielding one-third produced 10.1 percent *less*-than-

average yields, fed only $7.18 worth of feed per acre, and had only 17 percent of tillable land in legumes.

On pages 552 to 555 crop yields on livestock farms were shown to be relatively less important than efficiency of livestock production in placing the farms in high- or low-earning groups. This relationship occurs only because poor management of livestock may result in losses large enough to offset high crop yields. As a matter of fact the effect of good crop yields on the net farm income is just as important on livestock farms as on grain farms.

Efficiency With Livestock Highly Important

When the records from the fifty-seven farms were grouped on the basis of average returns for feed fed to productive livestock during the ten-year period, the one-third of the farms on which the average returns were highest earned 4.75 percent on the total farm investment, whereas the one-third on which the average returns were lowest earned only 2.71 percent on the total investment (Table 71). On an average total farm investment of $51,147 (Table 57, page 539) this difference of 2.04 percent would amount to $1,043 a year.

Returns per hundred dollars' worth of feed fed to different classes of livestock on the nineteen farms where livestock was produced most efficiently, in comparison with the nineteen farms where it was produced least efficiently, were: cattle, $149 and $110; hogs, $161 and $127; sheep, $115 and $83; and poultry, $259 and $206. Returns from all classes of productive livestock on the two groups of farms were $161 and $122 respectively.

The inefficient handling of livestock causes a greater reduction in net farm incomes than do low crop yields, as shown by a comparison of Tables 70 and 71. The nineteen farms with lowest livestock efficiency (livestock-efficiency index of 90.5 and crop-yield index of 97.9) earned average net incomes equivalent to 2.71 percent of the total farm investment. On the other hand, the nineteen farms with lowest crop yields (crop-yield index 89.9 and livestock-efficiency index 99.1), had average net incomes equal to 3.30 percent of the total investment.

Even on farms that feed only part of the crops produced, the efficient handling of livestock increases net incomes. Many capable record-keeping grain farmers have been surprised to learn how large a portion of their farm income comes from a relatively small amount of well-handled livestock.

The importance of handling livestock efficiently, even on farms where not much livestock is kept, was studied in two three-year com-

TABLE 71.—LIVESTOCK EFFICIENCY AS RELATED TO RATE EARNED ON TOTAL FARM INVESTMENT

(Based on records of fifty-seven farms in Livingston, McLean, Tazewell and Woodford counties, 1925-1934)

Items	19 farms with *high* efficiency	19 farms with *medium* efficiency	19 farms with *low* efficiency
Livestock-efficiency index[a]	113.2	99.2	90.5
Returns per $100 fed to—			
Cattle	$149	$121	$110
Hogs	161	146	127
Sheep	115	112	83
Poultry	259	233	206
All productive livestock	161	139	122
Rate earned on total farm investment	4.75%	4.48%	2.71%
Size of farm, acres	244.9	244.0	250.4
Total investment per acre	$201.99	$215.67	$205.13
Gross income per acre	22.37	24.59	18.98
Total expense per acre	12.78	14.93	13.43
Net income per acre	9.59	9.66	5.55
Value of crops per acre	$ 18.75	$ 20.41	$ 17.79
Value of feed fed per acre	6.89	10.78	8.64
Crop-yield index	99.6	102.5	97.9
Percent of land tillable	89.4	91.5	92.2
Percent of tillable land in higher-profit crops[b]	67.5	71.3	67.9
Percent of tillable land in legumes	16.8	20.3	19.3
Total man-work-units per farm	397.6	430.1	387.8
Man-work-units on livestock per man-work-unit on crops	.91	.95	.81
Labor cost per man-work-unit	$ 3.93	$ 3.79	$ 4.11
Horse and machinery cost per man-work-unit	$ 2.03	$ 2.44	$ 2.50
Price index for products sold	99.9	101.9	98.2

[a]A percentage figure which measures the returns for feed fed weighted according to the amount fed to each kind of livestock.

[b]Percentage in high-profit crops plus one-half of the percentage in medium-profit crops.

parisons involving 150 farms each during the years 1931-1933 and 1932-1934. The records of each group of 150 farms were subdivided into three groups according to the amount of feed fed per acre, and each of these three groups was further divided into three subgroups according to the livestock-efficiency index, which is a measure weighted according to the amount of feed fed to each kind of livestock kept on the farm. In Table 72 are shown the averages of the data obtained from the two studies. The relative rates earned on the farm investments were almost identical for the livestock, grain and mixed livestock, and grain farms.

Farms with small amounts of exceptionally well-handled livestock produced annual net incomes averaging 3.04 percent on the farm investment, almost half again as much as the 2.08-percent average for all farms considered in the study. *It pays to take good care of livestock even tho there is not much of it on the farm.*

TABLE 72.—AMOUNT AND EFFICIENCY OF LIVESTOCK AS RELATED TO RATE EARNED ON TOTAL FARM INVESTMENT

(Averages of two three-year comparisons: one in Grundy, LaSalle, Marshall, and Putnam counties in 1931-1933; and the other in Livingston, McLean, Tazewell, and Woodford counties in 1932-1934)

Classification of farms	Total number of farms	Value of feed fed per acre	Livestock-efficiency index	Crop-yield index	Rate earned
					perct.
Farms with most livestock					
High livestock efficiency	34	$12.62	115	110	3.86
Medium livestock efficiency	32	11.28	99	106	1.51
Low livestock efficiency	34	9.86	82	110	.82
All three groups	100	11.23	99	109	2.06
Farms with some livestock					
High livestock efficiency	34	5.87	117	97	2.72
Medium livestock efficiency	32	5.64	97	102	2.18
Low livestock efficiency	34	5.63	82	100	1.43
All three groups	100	5.71	99	100	2.11
Farms with least livestock					
High livestock efficiency	34	2.80	129	98	3.04
Medium livestock efficiency	32	3.17	103	92	1.95
Low livestock efficiency	34	3.06	83	94	1.20
All three groups	100	3.01	105	95	2.10
All farms	300	6.52	100	100	2.08

Livestock farms on which livestock is well handled are the most profitable of all groups of corn-belt farms (see also page 566). The farms with the most livestock and the most efficiently handled livestock brought an average annual net return of 3.86 percent on the farm investment even during these years of very low prices for farm products.

On the other hand, livestock farms on which livestock is poorly handled earn lower net returns than grain farms with poorly handled livestock (Table 72). Such livestock farms in this study produced net incomes averaging only .82 percent on the total farm investment; while on the same number of grain farms where the livestock was poorly handled, net incomes averaged 1.20 percent on the investment even tho the crop index on the grain farms was much lower than on the livestock farms.

Practices Affecting Prices Received

Practices which enable a farmer to obtain the best possible prices for his products are of course an important factor in farm earnings. Some of these practices are production practices that determine the quality of the product, for high-quality produce usually brings the better prices. Others also are production practices which determine the time when certain products will be ready for market and enable a farmer to take advantage of normal seasonal variations in prices. Furthermore, during periods of very low prices farmers who are in a

position to withhold from marketing such products as can be stored, principally grain, usually profit therefrom. In the present study the farmers who followed these practices had the higher incomes.

In order to show how differences in prices received affected farm earnings, the farms on which corn, oats, wheat, and hogs made up 50 percent or more of the income during the ten years were classified into three groups (Table 73) according to the *price index,* or the total amount realized from the four products expressed as a percentage of the total amount the same products would have brought if sold at the average prices received on all farms. Had all the farms been the same in size and had the same amounts of crops and livestock been sold from them, the prices obtained by the operators who sold their corn, oats, wheat, and hogs at the highest average prices were sufficiently higher than the prices received by the operators who sold these

TABLE 73.—PRICES RECEIVED FOR CORN, OATS, WHEAT, AND HOGS AS RELATED TO RATE EARNED ON TOTAL FARM INVESTMENT

(Based on records of forty farms in north-central Illinois on which the combined sales of corn, oats, wheat, and hogs amounted to 50 percent or more of the total farm sales, 1925-1934)

Items	13 farms with *high* index	14 farms with *medium* index	13 farms with *low* index
Price index[a]	105.5	99.3	92.3
Average price received for—			
Corn	$ .67	$ .63	$ .58
Oats	.36	.34	.32
Wheat	1.05	.95	.84
Hogs	7.96	7.56	7.17
Rate earned on total farm investment	4.55%	3.95%	2.97%
Size of farm, acres	276.6	251.0	236.1
Total investment per acre	$214.86	$205.05	$193.63
Gross income per acre	23.25	21.19	17.99
Total expense per acre	13.47	13.07	12.23
Net income per acre	9.78	8.12	5.76
Value of crops per acre	$ 19.86	$ 18.75	$ 16.80
Value of feed fed per acre	8.33	6.97	7.39
Crop-yield index	102.0	97.1	95.7
Percent of land tillable	94.1	95.4	89.0
Percent of tillable land in higher-profit crops[b]	66.9	67.1	68.4
Percent of tillable land in legumes	18.2	16.8	17.3
Livestock-efficiency index	103.1	98.6	98.5
Total man-work-units per farm	433.9	388.5	344.4
Man-work-units on livestock per man-work-unit on crops	.76	.70	.77
Labor cost per man-work-unit	$ 3.91	$ 4.02	$ 4.17
Horse and machinery cost per man-work-unit	2.31	2.35	2.30

[a]Total receipts from sales of corn, oats, wheat, and hogs expressed as a percentage of the amount the same would have brought if sold at average prices during the same period.

[b]Percentage in high-profit crops plus one-half of the percentage in medium-profit crops.

products at the lowest average prices, to bring in about $800[1] more net income. While some of this difference was due to better yields and more and better-handled livestock on the one group of farms, about $500 of the difference was directly due to differences in prices received for the four products named above.

Part of the differences in average prices received for products sold from the two groups of farms (9 cents a bushel of corn, 4 cents a bushel of oats, and 21 cents a bushel of wheat) was due to differences in the quality of the products sold. More of the difference was probably due to the holding of grain during low-price years and selling when prices were better. The advantage in holding grain from years of low prices to years of high prices is brought out clearly in Table 74.

The variation in average prices received for products sold from different farms during the three years 1932-1934 was unusually wide (Table 74). Prices obtained by one-fifth of the operators averaged 16 percent above the average prices received by the operators of all 150 farms in the comparison, while another one-fifth received prices 14 percent below the general average.

Prices for grain. Farmers who were financially able to hold their grain during the low-price period of 1932-1933 until the higher prices in 1934 profited greatly by doing so. On the other hand, those who were forced by lack of credit to sell when prices were low were at a serious disadvantage. This fact is clearly shown in the data on average prices received and amounts of grain sold during these years (Table 74).

Corn.—Of the operators who sold an average of 300 or more bushels of corn a year, one-fifth received an average price of 51 cents a bushel and another one-fifth only 31 cents. This difference was due in part to difference in quality of corn, but mostly to difference in time of selling. The twenty-six farmers who received the highest average prices sold about four times as much corn during 1934, when prices were high, as during 1932, when prices were low. On the other hand, the twenty-six receiving the low average prices sold two and one-half times as much in 1932 as in 1934.

Oats.—Of the farmers selling an average of 200 or more bushels of oats a year, one-fifth received an average of 30 cents a bushel and another one-fifth only 16 cents. This difference also was due largely to time of selling. The farmers receiving the low average prices sold nearly six and one-half times as many oats in 1932 as in 1934.

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[1]Difference in rate earned (1.58 percent, Table 73) applied to the average capital investment on all farms ($51,147, Table 57).

TABLE 74.—PRICES RECEIVED FOR PRODUCTS SOLD, AS RELATED TO NET FARM INCOMES

(Based on records of 150 farms in Livingston, McLean, Tazewell, and Woodford counties, 1932-1934)

Product and item	Average of all farms	One-fifth of farms receiving *highest* prices	One-fifth of farms receiving *lowest* prices
Corn			
Number of farms selling 300 bushels or more	(131)	(26)	(26)
Average price received	$ .39	$ .51	$ .31
Rate earned on total farm investment	3.29%	3.82%	2.70%
Bushels sold, average of 3 years	3 099	2 215	2 980
1932	3 341	937	4 392
1933	2 809	1 957	2 763
1934	2 658	3 751	1 785
Oats			
Farms selling 200 bushels or more	(117)	(24)	(24)
Average price received	$ .22	$ .30	$ .16
Bushels sold, average of 3 years	1 076	931	924
1932	1 339	768	1 629
1933	1 247	1 114	892
1934	643	912	253
Wheat			
Farms selling 100 bushels or more	(68)	(14)	(14)
Average price received	$ .65	$ .80	$ .48
Bushels sold, average of 3 years	398	446	317
1932	467	237	696
1933	354	422	133
1934	374	680	123
Beef, all farms having cattle			
Price per 100 pounds sold from—			
Beef-cow herd	$ 4.96	$	$ ....
Dairy-cow herd	3.47	....	....
Dual-purpose herd	3.77	....	....
Feeders bought	6.30	....	....
Pork			
Farms selling 10,000 pounds or more	(92)	(18)	(18)
Pounds sold, average of 3 years	27 277	35 838	26 083
Average price received	$ 3.78	$ 4.13	$ 3.39
Proportion of hogs on hand January 1	47.8%	40.4%	54.6%
Rate earned	3.11%	3.92%	2.22%
Eggs, all flocks			
Dozens sold, average of 3 years	736	945	460
Average price received	$ .16	$ .19	$ .13
Milk, all farms			
Pounds produced, average of 3 years	49 515	58 919	45 087
Average returns per 100 pounds milk	$ 1.04	$ 1.52	$ .75
All farms and products			
Number of farms	150	30	30
Value of all products sold	$3 800	$4 442	$2 241
Value of same products at average price for all farms	$3 800	$3 827	$2 594
Price index,[a] average of group	100	116	86
Rate earned on investment	3.23%	4.56%	2.07%

[a]For any farm the price index is the total value of all products sold expressed as a percentage of the amount the same products would have brought if sold at average prices during the same period.

Wheat.—An average price of 80 cents a bushel was obtained for wheat by the operators of fourteen farms from which an average of 100 or more bushels of wheat was sold per year, whereas the operators of fourteen other farms with similar wheat sales received an average of only 48 cents. This difference likewise was due largely to the

carrying over of wheat thru the low-price period by one group of operators and heavy sales during the low-price period by the second group.

Prices for livestock and livestock products. Tho there is not, of course, the same opportunity to hold livestock and livestock products for better prices as for holding grain, it is nevertheless possible to

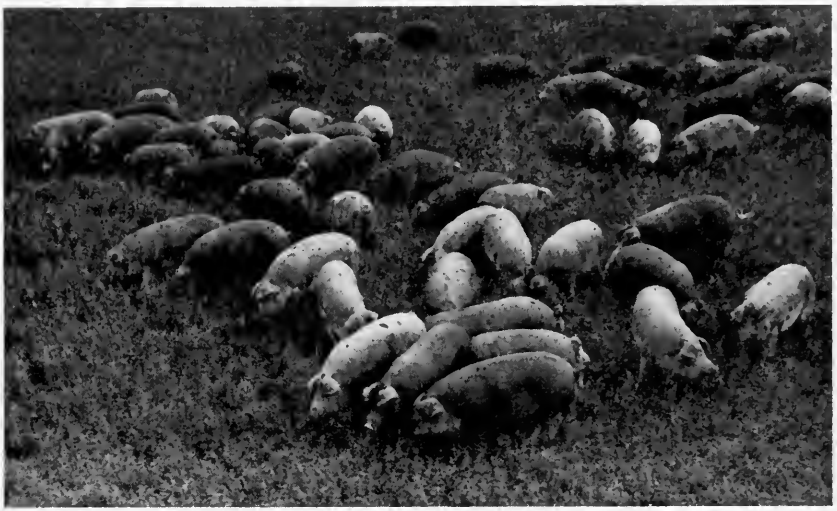

FIG. 18.—EARLY MARKETED HOGS HAVE PRICE ADVANTAGE

Under the more efficient management early spring pigs raised on clean ground with access to legume pasture, fed liberal amounts of protein feeds with corn, and marketed in early fall, returned a profit each year of this study.

take advantage of normal seasonal fluctuations in prices by making adjustments in production. Quality of product looms high in determining prices of livestock.

Beef.—Comparison of prices received for beef sold from different kinds of enterprises (Table 74) emphasizes the fact, brought out on pages 511 to 513, that the beef being sold from herds of beef cows and of dual-purpose cows in north-central Illinois is poor in quality. Some of the farmers included in the study produced beef from beef-cow herds as high in quality as that produced by others from range calves, but in most of the herds there was opportunity for considerable improvement.

Pork.—Of the farmers in this study producing 10,000 pounds or more of pork per year, eighteen received an average of 74 cents per hundredweight more than eighteen others (Table 74). A part of this

advantage was apparently due to the more opportune time of selling, as shown by the smaller proportion of hogs on hand January 1. The effect of the time of selling hogs on the returns from them is discussed on pages 520 to 524.

Eggs.—One-fifth of the farmers received an average of 6 cents a dozen more for all eggs sold than another one-fifth. On the average farm this difference in price of eggs sold would amount to $42 annually. Much of the difference in price was due to differences in the time of year when the eggs were produced, a point that is discussed further on page 532.

Milk.—Prices received for milk by one group of farmers were less than half as much as those obtained by another group. One-fifth realized an average price of $1.52 per hundred pounds for all milk produced during the three years, whereas another one-fifth received an average of only 75 cents a hundred. The difference was due largely to the fact that some had a relatively good market for whole milk, while others had to depend on a butterfat market or on a whole-milk market paying a very low price.

Effect of Labor Costs on Income

On some farms labor costs may be too low and on others too high for net incomes to be as high as the farm business might otherwise warrant. The effects of both of these conditions are indicated in Table 75.

Effect of inefficient labor. Average labor costs of $5.02 per man-work-unit[1] were apparently too high on nineteen farms during the ten-year period, for these farms earned an average of only $3.53 for each $100 invested, or only $7.46 an acre, whereas nineteen other farms had average labor costs of only $3.26 per man-work-unit and produced net incomes of $4.73 for each $100 invested, or $9.67 an acre. Of the $2.21 difference in net income per acre earned on the two groups of farms, $1.53 was accounted for by the difference in labor costs per acre.

Effect of insufficient labor. The effects of too little labor being used on some farms for net incomes to be at their best may be brought out by another type of comparison. The nineteen farms with the lowest labor cost per man-work-unit produced crop yields only 98.1 percent as high as the average on all fifty-seven farms. But since about 65

[1]The average amount of work on crops or livestock accomplished by one farm worker in one ten-hour day.

TABLE 75.—LABOR COST PER MAN-WORK-UNIT,[a] AS RELATED TO RATE EARNED ON TOTAL FARM INVESTMENT

(Based on records of fifty-seven farms in Livingston, McLean, Tazewell, and Woodford counties, 1925-1934)

Items	19 farms with *low* labor cost per M-W-U[b]	19 farms with *medium* labor cost per M-W-U	19 farms with *high* labor cost per M-W-U
Labor cost per man-work-unit	$ 3.26	$ 3.99	$ 5.02
Horse-and-machinery cost per man-work-unit	2.10	2.39	2.63
Labor cost per acre	5.83	6.48	7.36
Labor cost per crop acre	7.25	8.04	9.15
Rate earned on total farm investment	4.73%	3.49%	3.53%
Size of farm, acres	286.8	247.4	205.0
Total investment per acre	$ 204.37	$ 208.01	$ 211.50
Gross income per acre	22.64	20.98	22.17
Total expense per acre	12.97	13.73	14.71
Net income per acre	9.67	7.25	7.46
Value of crops per acre	$ 18.74	$ 18.43	$ 19.95
Value of feed fed per acre	10.54	8.69	6.38
Crop-yield index	98.1	97.7	105.3
Percent of land tillable	91.2	90.9	91.0
Percent of tillable land in higher-profit crops[c]	68.8	68.8	69.2
Percent of tillable land in legumes	19.4	17.8	19.2
Livestock-efficiency index	100.5	98.9	101.2
Total man-work-units per farm	513.0	402.0	300.5
Man-work-units on livestock per man-work-unit on crops	1.06	.86	.69
Price index for products sold	100.6	99.0	100.4
Percent of farm years with tractor	91.1	80.5	68.4
Percent of farm years with truck	43.2	36.8	34.2
Percent of farm years with tractor cultivator	7.9	10.5	6.6
Number of horses per farm	7.11	6.47	6.52

[a]One man-work-unit is the average amount of work on crops or livestock accomplished by one farm worker in a 10-hour day. Standards for use in these studies were obtained from complete-cost and enterprise studies conducted by the Department of Agricultural Economics, University of Illinois.

[b]Abbreviation for man-work-unit.

[c]Percentage in high-profit crops plus one-half of the percentage in medium-profit crops.

percent more livestock per acre was fed on these farms than was fed on the nineteen farms with high labor costs, the yields should have been considerably greater (page 562). The inference is clear that because of insufficient labor, yields were considerably reduced. On the other hand, the data show that the nineteen farms with the high labor costs had yields equivalent to 105.3 percent of the average yields produced on all of the farms, altho with the smaller amounts of livestock on the nineteen farms lower yields would normally be expected.

This relation of crop yields and labor costs is shown also in the discussion of the relation of crop yields to net farm incomes (Table 75), where it was pointed out that the labor costs per man-work-unit were higher on the nineteen farms producing the largest crop yields than on the nineteen low-producing farms, and where it was shown also that the farms with the high yields had the higher incomes.

The effect of the use of tractors on labor costs, and consequently on incomes, is shown in Table 75 by the fact that on the average the nineteen farms with low labor costs had tractors on them 91.1 percent of the ten-year period, while the nineteen farms with high labor costs had tractors only 68.4 percent of the period.

Variation in unit labor costs with size of farm and amount of livestock. It is a well-known fact that acre-costs for labor are normally less on large farms than on small farms. Since the man-work-unit is a measure of the acreage of crops and the amounts of livestock that an average farmer cares for in a ten-hour day, it is to be expected that labor costs per man-work-unit would vary greatly with the size of the farm and the amount of livestock. The nineteen farms with the low labor costs per man-work-unit averaged 286.8 acres and fed $10.54 worth of feed per acre; whereas the nineteen farms with high labor costs contained only 205 acres per farm and used only $6.38 worth of feed per acre.

FIG. 19.—BIG TEAMS REDUCE AMOUNT AND COST OF MAN LABOR

The nineteen farms that had the lowest costs for horses and machinery per man-work-unit during the ten years of this study returned an average of $2.29 more net income an acre than the nineteen farms that had the highest costs for these items.

Variations in labor costs according to amounts of crops raised and livestock handled are shown in Table 76. For example, on an average farm where 60.0 to 99.9 man-work-units were expended on crops, and .20 to .59 man-work-units were expended on livestock for each man-work-unit on crops, the labor cost was $5.10 for ten hours of work on crops plus 2 to 5.9 hours of work on livestock. But with the same amount of work on livestock for each man-work-unit on crops, the unit cost for labor declined as the amount of work on crops increased, until, on farms where 340 to 379.9 man-work-units were

TABLE 76.—LABOR COST PER MAN-WORK-UNIT ON CROPS PLUS COST FOR PROPORTIONATE MAN-WORK-UNITS ON LIVESTOCK, ON FARMS WHERE DIFFERENT AMOUNTS OF WORK WERE PUT INTO CROPS AND LIVESTOCK

(Averages of three three-year comparisons: one in 1930-1932, one in 1931-1933, and one in 1932-1934)

M-W-U[a] on livestock per M-W-U on crops	Labor cost per M-W-U on crops plus proportionate M-W-U on livestock when total M-W-U on crops per farm were—							
	60.0 to 99.9	100.0 to 139.9	140.0 to 179.9	180.0 to 219.9	220.0 to 259.9	260.0 to 299.9	300.0 to 339.9	340.0 to 379.9
.20 to .59	$5.10	$4.66	$4.13	$3.76	$3.55	$3.39	$3.27	$3.16
.60 to .99	5.86	5.43	4.89	4.52	4.31	4.16	4.03	3.93
1.00 to 1.39	6.62	6.19	5.65	5.28	5.07	4.91	4.79	4.69
1.40 to 1.79	7.37	6.94	6.41	6.05	5.83	5.68	5.56	5.45
1.80 to 2.19	8.14	7.70	7.16	6.80	6.59	6.43	6.31	6.21
2.20 to 2.59	8.89	8.46	7.91	7.55	7.33	7.19	7.07	6.96
2.60 to 2.99	9.65	9.21	8.68	8.31	8.10	7.95	7.83	7.71
3.00 to 3.39	10.40	9.98	9.44	9.07	8.86	8.70	8.58	8.46
3.40 to 3.79	11.17	10.74	10.20	9.93	9.62	9.47	9.35	9.23

[a]Abbreviation for man-work-unit.

expended on crops, the cost was only $3.16 for ten hours of work on crops plus 2 to 5.9 hours work on livestock. Again where the amount of work on crops remained the same (60.0 to 99.9 man-work-units), the unit cost for labor declined as the relative amount of work on livestock increased, until, on farms where 3.40 to 3.79 man-work-units were expended on livestock for each man-work-unit on crops, the cost for 10 hours of work on crops plus 34 to 37.9 hours of work on livestock was $11.17. And when both the amount of work on crops and the amount of work on livestock increased, the unit cost for labor declined still more. On farms where 340 to 379.9 man-work-units were expended on crops and 3.40 to 3.79 man-work-units were expended on livestock for each man-work-unit on crops, the cost for 10 hours of work on crops plus 34 to 37.9 hours of work on livestock was only $9.23.

Horse and Machinery Costs

Closely related to farm incomes. On some farms extremely high costs for horses and machinery are chiefly responsible for low net incomes. On the other hand, some farms with rather low yields show profits because the costs for power and machinery are kept low (Table 77). Of the fifty-seven farms having ten-year records, the nineteen that had the lowest horse-and-machinery costs per man-work-unit had average net incomes $2.29 an acre higher than the nineteen farms that had the highest costs for horses and machinery. Most of this difference in net income may be accounted for by the $1.50 higher acre-cost for horses and machinery on the nineteen farms with the high horse-and-machinery costs.

Crop yields may suffer if the use of power and machinery in the

TABLE 77.—HORSE-AND-MACHINERY COST PER MAN-WORK-UNIT AS RELATED TO RATE EARNED ON TOTAL FARM INVESTMENT

(Based on records of fifty-seven farms in Livingston, McLean, Tazewell, and Woodford counties, 1925-1934)

Items	19 farms with *low* cost per M-W-U[a]	19 farms with *medium* cost per M-W-U	19 farms with *high* cost per M-W-U
Horse-and-machinery cost per man-work-unit	$ 1.76	$ 2.27	$ 3.03
Horse-and-machinery cost per acre	3.20	3.61	4.70
Rate earned on total farm investment	4.39%	4.26%	3.22%
Size of farm, acres	215.4	297.1	226.8
Total investment per acre	$ 206.11	$ 206.93	$ 209.79
Gross income per acre	22.28	21.61	22.11
Total expense per acre	13.24	12.79	15.36
Net income per acre	9.04	8.82	6.75
Value of crops per acre	17.66	19.36	19.71
Value of feed fed per acre	9.49	8.59	8.31
Crop-yield index	95.6	101.5	102.2
Percent of land tillable	91.9	90.4	91.1
Percent of tillable land in higher-profit crops[b]	66.5	69.2	70.7
Percent of tillable land in legumes	18.7	18.3	19.6
Livestock-efficiency index	104.2	100.2	95.4
Total man-work-units per farm	391.2	472.2	352.1
Man-work-units on livestock per man-work-unit on crops	1.14	.83	.74
Labor cost per man-work-unit	$ 3.60	$ 3.86	$ 4.42
Price index for products sold	99.5	99.2	101.7
Percent of farm years with tractor	70.5	86.8	82.6
Percent of farm years with truck	31.6	50.0	32.6
Percent of farm years with tractor cultivator	6.6	10.5	7.9
Number of work horses per farm	5.99	7.61	6.51
Feed cost per work horse[c]	$ 57	$ 62	$ 63
Net increase from horses	15	—2	—19
Net decrease from machinery	361	598	639
Income from use of machinery	59	30	27

[a]Abbreviation for man-work-unit.
[b]Percentage in high-profit crops plus one-half of the percentage in medium-profit crops.
[c]Cost of all feed fed to horses, divided by the number of work horses.

production of crops is skimped too much (Table 77), just as they do when too little labor is used (Table 75). On the nineteen farms with low horse-and-machinery costs the yields of grain and hay were only 95.6 percent of the average for all fifty-seven farms, while on the nineteen farms with the highest horse-and-machinery costs the yields were 102.2 percent of average.

FIG. 20.—LARGE-SCALE MACHINES WERE USED ON MANY OF THE FARMS IN THIS STUDY

On large farms where power and machinery were well adjusted to the needs of the farm, large-scale machinery reduced unit costs of production. Cooperative ownership and operation provide for economic use of such machines on small and medium-sized farms.

Some farmers in these studies reduced their power costs by raising a few colts. As an average, on the nineteen farms with low horse-and-machinery costs, the value of horses increased $15 per farm annually while on the nineteen farms with high horse-and-machinery costs there was an annual net decrease of $19 per farm in the horse account (Table 77). On the farms with the low costs for horses and machinery the horses were kept with $6 less feed per work horse than on the high-cost farms. Custom work also served to reduce costs. The farmers with the low horse-and-machinery costs did an average of $59 worth of custom work annually, while the farmers with the high costs received only $27 a year from custom work. Also the farmers with the high horse-and-machinery costs used tractors to a greater extent

(82.6 percent of the ten-year period) than the farmers with the low costs (70.5 percent of the ten-year period). These differences are small, but they indicate means used by some farmers to reduce net costs.

Costs varied with size of farm and amount of livestock. Horse and machinery costs per man-work-unit expended on crops declined as the amount of work on crops increased (Table 78). However, the unit cost for horses and machinery did not decline so rapidly with the

TABLE 78.—COSTS FOR HORSES, MACHINERY, AND EQUIPMENT PER MAN-WORK-UNIT ON CROPS, PLUS COST FOR PROPORTIONATE MAN-WORK-UNITS ON LIVESTOCK, ON FARMS WHERE DIFFERENT AMOUNTS OF WORK WERE PUT INTO CROPS AND LIVESTOCK

(Averages of three three-year comparisons: one in 1930-1932, one in 1931-1933, and one in 1932-1934)

M-W-U[a] on livestock per M-W-U on crops	Costs for horses, machinery, and equipment per M-W-U on crops plus proportionate M-W-U on livestock when total M-W-U on crops per farm were—							
	60.0 to 99.0	100.0 to 139.9	140.0 to 179.9	180.0 to 219.9	220.0 to 259.9	260.0 to 299.9	300.0 to 339.9	340.0 to 379.9
.20 to .59	$3.44	$3.25	$3.08	$2.91	$2.74	$2.64	$2.53	$2.43
.60 to .99	3.77	3.58	3.41	3.23	3.07	2.96	2.85	2.75
1.00 to 1.39	4.11	3.92	3.75	3.58	3.40	3.30	3.19	3.09
1.40 to 1.79	4.46	4.27	4.10	3.92	3.75	3.65	3.54	3.44
1.80 to 2.19	4.75	4.56	4.37	4.21	4.05	3.94	3.83	3.73
2.20 to 2.59	5.02	4.84	4.67	4.49	4.32	4.22	4.11	4.01
2.60 to 2.99	5.29	5.11	4.94	4.75	4.59	4.48	4.37	4.27
3.00 to 3.39	5.55	5.37	5.20	5.02	4.85	4.75	4.64	4.54
3.40 to 3.79	5.82	5.64	5.47	5.29	5.12	5.01	4.90	4.80

[a]Abbreviation for man-work-unit.

increase in the amount of work on crops as did the unit cost of labor (Tables 78 and 76).

On the other hand, the cost of horses, machinery, and equipment increased as the amount of livestock increased (Table 78). The increase is accounted for by the larger amount of haying machinery included on the livestock farms and the additional feed grinders, feeders, and waterers, movable hog and poultry houses, feed bunks, and other equipment needed on livestock farms but not on grain farms.

Horse and tractor farms had about same total costs for labor, horses, and machinery. Among the fifty-seven farms included in the ten-year study, only six were operated with horses alone during all the ten years. In *total* costs for labor, horses, and machinery there was no appreciable difference between these six farms and six others of the same size which had tractors on them all ten years (Table 79). There was, however, a marked difference in the *amounts paid out in*

TABLE 79.—RELATIVE COSTS OF LABOR, POWER, AND MACHINERY ON FARMS OPERATED ONLY WITH HORSES AND ON FARMS OPERATED WITH TRACTORS AND HORSES[a]

(Based on ten-year records on six horse-operated farms and six farms of about same size and same amounts of livestock operated with tractors and horses all ten years, 1925-1934)

Items	Six farms operated with horses only	Six farms operated with tractors and horses
Average size of farms	163	171
Value of feed fed per acre	$ 7.26	$ 9.22
Annual labor cost	$ 920	$ 896
Annual cost of horse feed and depreciation	270	210
Annual cost of machinery, including depreciation	172	293
Total annual cost of labor, horses, and machinery	$ 1 362	$ 1 399
Annual cost per acre	8.36	8.18
Annual cash cost of horses and machinery	$ 119	$ 285

[a]This subject is discussed fully in Ill. Agr. Exp. Sta. Bul. 395, "A Study of the Cost of Horse and Tractor Power on Illinois Farms."

cash during the ten years. On farms operated with horses an average of only $1,190 per farm was spent for horses and machinery; whereas on the farms where tractors were used an average of $2,850 was spent per farm for these items. The difference in total cash outlay thus amounted to $1,660.

GENERAL SUMMARY AND CONCLUSIONS

Practices used in the production of corn, oats, beef cattle, dairy cattle, hogs, and poultry on farms in north-central Illinois are evaluated in Part I of the present bulletin; and in Part II the effects on farm income of such factors as crop yields, livestock efficiency, amounts of livestock, cropping systems, prices received, and costs for power, machinery, and labor are discussed.

The evaluation of specific practices is based on records from approximately 1,000 farms. The discussion of factors influencing earnings is based on records from a selected group of fifty-seven of these farms extending over the ten-year period from 1925 to 1934 as well as on the records of the 1,000 farms for shorter periods of time. The operators of all the farms included in both parts of the study were members of the Illinois Farm Bureau Farm Management Service, a cooperative farm-accounting service conducted by the Illinois Agricultural Experiment Station and the farm bureaus in north-central Illinois.

Following are some of the important facts brought out with respect to the effects of the better practices on the success of certain enterprises, and of the influence of various factors on total farm earnings.

1. *Corn.*—Average gains in yield of corn resulting from the use of the better practices in growing this crop totaled 31.4 bushels an acre. Of this total, soil-treatment practices accounted for 11.7 bushels an acre. The use of deep-rooted soil-building legumes (mainly sweet clover and alfalfa) in the rotation had greater effect than the use of either manure or rock phosphate. On well-treated soils good cultivation practices accounted for 9.9 bushels an acre; and practices having to do with the kind, selection, storage, and preparation of seed brought about gains of 9.8 bushels an acre. The use of high-yielding, well-adapted varieties, the planting of enough seed to secure a good stand, and cultivating so as to maintain the stand were outstanding seed and cultivation practices.

2. *Oats.*—Superior practices in growing oats resulted in total average gains of 39.7 bushels an acre on well-treated land, 25.2 bushels an acre on fairly well-treated land, and 17.5 bushels an acre on poorly treated land. The superior practices were the early seeding of an early variety, the use of seed that has been carefully fanned and treated with a good dust treatment to prevent smut; the inclusion of clover in the rotation at least one year in four; the application of

manure; and the application of rock phosphate on land deficient in phosphorus.

3. *Beef Cattle.*—Beef sold from herds of beef or dual-purpose cows brought considerably lower returns for feed fed than purchased feeder cattle, when a fair farm value was assigned to the roughage consumed by the cow herds, including the roughage ordinarily considered unsalable. To a considerable extent the lower returns were due to the poorer quality of the home-raised beef. By keeping good quality cows and good beef-type sires, by feeding the cows almost entirely on pasture and roughage and by full-feeding the calves on grain from weaning time (or earlier) onward, many corn-belt farmers could increase their profits.

4. *Dairy Cattle.*—Returns for feed fed to dairy herds were influenced about equally by the proportion of the herd consisting of cows being milked and the amount of milk produced per cow. Fourteen herds in which 71.1 percent of all cattle were milked and which produced an average of 8,815 pounds of milk per cow, returned an average of $168 per hundred dollars' worth of feed fed. Fourteen other herds, in which only 43.5 percent of the cattle were cows being milked and which produced an average of only 6,107 pounds of milk per cow, returned an average during the same period of only $107 per hundred dollars' worth of feed fed—$61 less than the former herds.

5. *Hogs.*—The farmers who followed the better practices in producing, feeding, and marketing their hogs had $33 (32 percent) higher average return per hundred dollars' worth of feed fed than did the other farmers,—the difference between $135 and $102. They kept sows that produced large litters, by skilful handling of sows and pigs they brought a large proportion of the pigs thru to weaning time, they fed liberal amounts of protein feed, and they had the spring crop of pigs ready for market in the fall.

6. *Poultry.*—Where the pullets were hatched in February or March and a laying mash was fed thruout the year, poultry brought an average return $119 greater (80 percent greater) per hundred dollars invested in the flock than where the pullets were not hatched until May or June and where laying mash was fed only part of the year or not at all. The returns in the first instance were $267, in the second, $148. An average of 117 eggs per hen per year was the record of the better managed flocks; 81 eggs, or 70 percent as many as in the better managed flocks, was the record of the less profitable flocks.

7. *Sources of Differences in Income.*—Differences of $2,000 to $3,000 a year in net incomes were common, even on farms the same

in size and having equal opportunities as regards natural soil fertility, topography, weather, and market facilities. Between the nineteen most profitable and the nineteen least profitable of fifty-seven farms over the period from 1925 to 1934, $1,673 average annual difference in net income could be accounted for by the relative effectiveness of the two groups with respect to seven different factors. These factors and the extent to which each accounted for differences in income were: crop yields, 28 percent; efficiency of livestock, 23 percent; amount of livestock, 15 percent; cropping system, 11 percent; prices received for grain, 10 percent (about 55 percent of the grain produced was sold); miscellaneous expenses, 8 percent (farm improvements, limestone, taxes, and miscellaneous crop and livestock expenses); acre-cost for horses, machinery, and equipment, 4 percent; and acre-cost for labor (including labor of operator and family) 1 percent.

8. *Improvement Resulting From Changed Practices.*—Of the fifty-seven farmers, the ten who made most improvement in earnings compared with the average of the group during the ten years from 1925 to 1934, earned approximately $1,500 a year more at the end of the period than they would have earned had they continued to farm thruout the period as they did during the first three years of the period. These improvements in earnings were due very largely to changes in the organization and operation of the farms as a result of membership in the Farm Bureau Farm Management Service.

9. *Cropping System.*—Farms having a high percentage of tillable land in the higher-profit crops (corn, winter wheat, alfalfa, sweet clover) produced much better average annual net incomes than neighboring farms having a relatively high percentage of tillable land in the low-profit crops (oats, timothy, bluegrass). All-tillable farms obtaining practically all of their pasture and hay from rotated soil-building legumes produced higher yields of grain and better net incomes than neighboring all-tillable farms which depended upon timothy and bluegrass for a considerable part of their hay and pasture.

10. *Livestock Efficiency.*—Livestock farms on which the livestock was efficiently produced, fed, and marketed were more profitable than grain farms on which the best crop yields were secured. On the other hand, the least profitable farms of all were livestock farms on which the livestock was poorly handled. This situation might be expected because the livestock farms have two main opportunities (grain and livestock) for success or failure, where the grain farms have but one.

11. *Legumes, Livestock, and Crop Yields.*—While there was very little difference between the average annual income of livestock farms and that of the grain farms, the crop yields on the farms having the most livestock and the most legumes showed a marked increase during the ten years, whereas on the farms having least legumes and least livestock the yields declined. Twenty livestock farms having an average of 21.4 percent of their tillable land in soil-building legumes increased their annual corn yields by 3.5 bushels an acre compared with the average of all record-keeping farms. On the other hand, on the 20 grain farms having only 11.1 percent of their tillable land in soil-building legumes, annual corn yields declined 3 bushels per acre compared with the average of all record-keeping farms.

12. *Crop Yields.*—Differences in crop yields had more to do with causing differences in net incomes than any other factor on the farms where half or more of the grain or other crops produced was sold. But on farms where half or more of the crops produced was fed on the farm, the influence of crop yields on farm earnings was overshadowed by the efficiency with which livestock was produced.

13. *Prices Received.*—Management practices influenced materially the prices received for certain farm products, particularly hogs and eggs. Having spring pigs ready to be marketed in the fall, and managing laying flocks so that a substantial percentage of the eggs produced annually were produced during October, November, and December were important practices in enabling farmers to obtain highest average prices for those products.

14. *Successful Farmers Used Combinations of Best Practices.*—Methods used by individual farmers who excelled in particular enterprises, such as in the production of corn or of hogs, were for the most part combinations of those practices that separately brought the best returns (see *Appendix* for account of practices followed by the most successful farmers). When a certain practice leads to better yields or earnings on farms in general and at the same time is followed by farmers who excel in the particular enterprise to which it applies, one may feel doubly sure of the worth of the practice.

Thruout this study, as was perhaps to be expected, marked variation was evident in the effectiveness with which different farmers applied some of the practices studied. No data are presented on this point, but it was clear from close observation of these farms and farmers that differences in the *timeliness* and *thoroness* of applying some of the practices were largely responsible for the variations in their

effectiveness. A practice that is ordinarily considered superior may in reality bring little advantage unless it is put into operation skilfully, thoroly, and at the right time.

Farmers who are striving to bring back to a profitable state farms that have been poorly organized over a period of years, and on which inferior practices have been followed, should not be unduly discouraged if their efforts are not rewarded fully and immediately. Such farms cannot be transformed in a year or two, but over a period of a decade much can be done. One reason why progress is slow is that it is seldom possible to put into effect all the better practices at once—the complete reorganization of a farm usually requires several years. Another reason is that the effects of some of the best practices are cumulative—they tend to become more pronounced from year to year.

Thus the process of reorganizing a farm for profit is one of careful planning for the future as well as for the present. Over a period of ten or a dozen years a relatively unprofitable farm that is carefully reorganized and more skilfully operated will show a definite improvement, as has been demonstrated by the experiences of a number of the farmers enrolled in the Farm Bureau Farm Management Service.

APPENDIX

PRACTICES FOLLOWED ON BEST-OPERATED FARMS

In the main body of this bulletin the practices used on a large number of farms in north-central Illinois have been evaluated and discussed, mostly from the standpoint of the individual practices themselves. Thus the yields of corn obtained on all the farms following the practice of working fall-plowed ground early in the spring have been compared with yields obtained where that practice was not followed; and yields or returns from other practices have been similarly compared. In order to gain an accurate idea of the value of any one practice, the results obtained from following that practice on many farms have been averaged. The attempt has been all the way thru to get away from the purely personal and instead to show general or average values.

But farmers are interested not only in the way one practice works on a great many farms, but also in the way the many practices that enter into the production of one crop or one kind of livestock are selected and fitted together by the best farmers. Several brief accounts are therefore included here, showing how the most successful growers of corn and of oats, the most successful dairymen, poultry raisers, and other stockmen have conducted their businesses. The practices they have actually followed, and that have seemed the most important *to them,* are the ones listed here. Very naturally some of the practices were not, perhaps, the best that might have been followed. However, they happened to be the ones actually followed by those who got the best *total* results.

Corn Practices on Farm With Highest Corn Yields

Corn yields on one farm averaged 63.5 bushels an acre during the ten years from 1925 to 1934, whereas the average on fifty-seven farms, most of which had similar soil, was only 47.6 bushels. The methods which enabled this farmer to produce 4 bushels of corn where most men produced only 3 were outlined by him as follows:

Rotation. Grows sweet clover and alfalfa on one-fourth of the land each year in a four-year rotation of corn, corn, oats, and sweet clover and alfalfa.

Manure. Hauls out all manure from week to week, winter and summer. Spreads 12 to 15 loads per acre on thinner parts of fields.

Spreads winter manure on stalk fields ahead of second-year corn. Spreads summer manure on pasture ahead of first year corn.

Seedbed preparation. Considers thoro working of the seedbed very important.

Fall plowing.—Whenever possible, fall-plows fields having black clay loam soil.

Disks fall-plowed land as early as possible in the spring—that is, immediately after sowing oats. Disks plowed land again and again, whenever weeds start, if the condition of soil permits.

Double-disks and harrows ahead of the corn planter. Uses roller and harrow ahead of planter if the ground is loose.

Never works the soil when it is too wet to crumble when pressed in the hand.

Spring plowing.—Plows all ground as early as possible. Plows only deep enough to do a good job of covering residues.

Double-disks *as deep as possible* before plowing. Usually double-disks twice where manure has been applied and stalks are not removed.

Keeps a section of harrow on the plow so that all soil is harrowed twice as it is plowed.

Disks whenever weeds start.

Double-disks and harrows ahead of the planter. Uses roller and harrow ahead of the planter if ground is cloddy or loose.

Cultivation. Usually does not work ground at all after the corn is planted until it is up and large enough for row cultivation. Sometimes —not often—uses rotary hoe to break a crust before regular cultivation begins.

Cultivates shallow with sweep type of cultivator shovels.

Cultivates only often enough to kill weeds, usually three times.

Has used a power cultivator for four years. Enables him to get over the corn rapidly and kill weeds when they are in the stage to be killed most readily.

Seed. Uses Krug corn of his own selection from seed purchased several years ago. (Since this study closed he has changed to hybrid corn.)

Picks seed in field before frost, stores on racks in a furnace-heated house, and culls as it is placed on racks.

Tests seed for germination and disease, culling the seed as it is taken from racks to test, and again after testing eight or ten kernels from each ear.

Plants so as to get a stand averaging 2½ to 3 stalks per hill. Plants in rows 3 feet 4 inches each way.

Corn Practices on Ten Farms With Highest Corn Yields

A summary of the corn-growing practices followed by ten of the farmers who produced the highest yields of corn during the ten-year period 1925-1934 is given in the following outline. The average yield from all the 8,348 acres of corn grown on these ten farms during the ten years was 55.9 bushels an acre. A considerable amount of the

acreage was rented land on which no soil-improvement practices had been followed.

Rotations. All ten of these farmers follow on their home farms regular rotations that include sweet clover or alfalfa one year in three to five years. Several have used three-year rotations to build up soil fertility rapidly, then after one or two rounds with sweet clover have adopted four-year rotations. Pasturing sweet clover one year in four by cattle or sheep has practically eliminated vines on these and other farms.

Manure. Most of these ten farmers keep manure hauled out winter and summer, and most of the manure is put on fields that will be in corn the following year. Some spread the manure rather heavily on the thinner parts of the fields, others spread only five or six loads per acre on all of each field once in the rotation.

Limestone and phosphate. Limestone has been used wherever needed in order to grow sweet clover and alfalfa.

Rock phosphate has been used on about half of the total acreage of these farms. On some of the farms none has been used; on others all of the rotated land has been covered.

Seedbed preparation. Fall-plowed ground is harrowed or disked as soon as possible after oat sowing on nearly all the farms. Both fall-plowed and spring-plowed ground is disked by most of these farmers whenever weeds start.

Spring plowing is done as early as possible on most farms. Ground to be spring-plowed is disked before plowing on nearly every farm. Where manure has been spread on stalk ground, the manure and stalks are thoroly disked into the soil before plowing.

In spring plowing most of the ten farmers drag a section of harrow behind the plow. Some prefer instead to follow with the harrow from two to four hours after plowing.

Several use a roller and a harrow ahead of the planter if the ground is cloddy or loose. A few are beginning to use a spring-tooth harrow ahead of the planter, especially where first-year sweet clover has been plowed in the fall.

Cultivation. While about two-thirds of these ten farmers harrow corn ground after planting, the two who produced the highest yields during the ten years do not harrow corn either before or after it is up.

Five of the ten farmers use only straight or spear-point shovels. One uses shovels the first two times and lays by with blades. Three use blades. One uses sweep shovels.

Several make a practice of going thru fields with hoes after cultivation to cut out any weeds missed by cultivators.

Seed. Krug corn, developed in this area and well adapted to local conditions, was used almost exclusively on these ten farms during the ten years covered by this study. One of the farmers, however, used Sommer Yellow Dent for part of his crop. And at the end of the ten-year period (1934) several were trying hybrids. Several of the farmers made a practice of buying, every one to three years, half a bushel or

more of seed grown from George Krug's own selection, and then of selecting seed from the crop grown from this new seed.

All ten farmers are particular about seed selection, storage, and careful culling.

About half test each ear for germination and disease. About half treat seed with one of the dust treatments for the control of seedling diseases.

Oat Practices on Four Farms With Highest Oat Yields

Of the fifty-seven farmers who were in the accounting service thruout the ten years, the four who produced the highest yields of oats during the ten years had average yields of 50 bushels an acre. The more important practices followed by these four farmers were the following:

Rotations. All four follow regular rotations which include legumes at least one year in four.

Fertilizer. Three of the four feed most of the grain they produce, and make careful use of manure. All four have applied more than the average amount of rock phosphate applied on the farms in the Farm Bureau Farm Management Service.

Seed. All four insist on early seeding. Gopher variety was used the last few years of the study on all four farms, tho Iowar yielded better on several other farms in 1934.

Three of the four stress thoro cleaning of seed by screening and fanning.

All four treat seed for smut at least every other year. Dust treatment was the most common treatment during the last five years of the study.

Dairy Practices on Four Farms With Most Profitable Dairy Herds

The four most profitable dairy herds during the ten-year period studied returned $192 per hundred dollars' worth of feed fed, which is $43 more than the average dairy herd returned. Only a small part of this advantage was due to better prices for dairy products from these four farms.

In accounting for their success all four of the owners of these herds emphasized the following points:

Herd improvement. All four herds were in dairy herd improvement associations during most of the ten years. Low-producing cows are sold and replaced by heifers from high-producing cows. During the last three years of the period milk production in these herds averaged 8,380 pounds per cow per year—about 1,140 pounds above the average of all dairy herds. One herd of ten purebred cows averaged 417 pounds of butterfat per cow during the last four years of the study.

All four farmers used purebred sires with known production records back of them. All four are careful to select sires that have better records back of them than the cows with which they are to be mated.

Feed. All feed carefully balanced grain rations and feed in proportion to milk production. During the last few years of this study the prices of dairy products were low, and the tendency was to feed only a light grain ration while the cows were on good legume pastures.

Comfort of cows. Quiet handling and regular milking and care of all cattle is emphasized about as much by these men as the matter of good stock and careful feeding. The comfort of the cows is given special attention on these farms.

Practices Followed by Two Farmers Successful With Beef-Cow Herds

According to the experiences of a few farmers who have been successful with beef-cow herds, there is good opportunity for many corn-belt farmers to increase their net incomes by putting a few good-quality beef cows on their farms and then giving them careful attention. Beef-cow herds must be well handled in order to be profitable.

During the ten-year period covered by this study, one herd of Angus cattle returned an average of $110 for each hundred dollars' worth of pasture, hay, silage and grain fed, whereas the average return from beef-cow herds was only $91. The methods used in handling this particular herd of Angus cattle were as follows:

Quality. The 32-cow herd was started with good purebred stock—three cows, a heifer and a heifer calf— about fifteen years ago. The sire has *always* been of the best type from a good breeding herd.

Calving. Cows are bred so that calves will come during March and April. About 90-percent calf crops are obtained. Nonproducing cows are sold. Calves are castrated just before going on pasture with the cows the last of May.

Feed. Cows and calves are summered on untillable bluegrass pasture and on rotated sweet-clover pasture. Cows are wintered in stalk fields with no protection except some timber pasture and a high railroad grade that serves as a windbreak. In late winter and during calving time cows are fed some corn fodder or silage.

Calves run with cows on pasture without grain during the summer and fall. They are weaned in November, and full-fed in drylot until finished in June, July, or August. They are fed shelled corn, oats, soybean oil meal, and alfalfa hay.

Marketing. Some of the calves are sold to 4-H club members, but most are fed for market. One year seventeen head of steers and heifers were sold at an average weight of 933 pounds.

In regard to length of feed and time of selling, this farmer confers with the cattle salesmen for a farmers' livestock commission company.

Quiet handling. The quiet handling of cows and calves is very apparent on this farm.

Another farmer who did well with his beef cows had a small herd

of about ten cows on a 240-acre grain farm. This herd returned $134 per hundred dollars' worth of feed fed during the ten-year period, which was $43 (47 percent) more than the average beef-cow herds paid for their feed. During the ten years this herd returned for the same amount of feed $2,610 more than the average beef-cow herd. The owner emphasized the following practices:

Quality. The cows in this herd are large, good beef-type cows, and the sire is purebred and always well selected.

Feed. The cows are summered on clover pastures and carried thru most of the winter in the clover fields and the stalk fields. After March 1 until grass comes, clover hay and usually a little grain are fed. Some winters no grain was needed. Calves come in April, run with the cows without grain, and usually are sold in November at weights of 500 to 600 pounds. Some years the calves are fed in drylot during the winter and sold the following summer.

Calving. The herd is kept healthy and about 90-percent calf crops are obtained. Nonproducing cows are sold.

Practices Used by Four Stockmen Who Purchased Feeder Cattle

Purchased feeder cattle paid an average of $131 for each hundred dollars' worth of feed fed on four farms where cattle were fed consistently thru the ten-year period studied.

One feeder obtained $158, or $27 above the average, for each hundred dollars' worth of feed fed. He summarized his methods in these words: "I do not produce crops to feed cattle, but feed cattle to market crops more profitably and to carry out an efficient plan of farm management."

Some practices that he considers most important are the following:

Buying. Buys and sells thru a farmers' livestock marketing agency, which he has patronized since it was started. Buys light-weight calves of good quality in the fall while prices are relatively low and there is a large assortment from which to choose.

Feeding. Feeds calves according to the amount or kind of feed on hand. Alfalfa hay is the foundation of all rations. Feeds green corn direct from the field, cut with a field silage cutter. This method eliminates much labor, waste, and storage costs, and provides a ready-made seedbed for wheat. The silo is filled for winter feeding.

Marketing. Time of selling varies with the market situation. He prefers to sell a few calves at a time as they are ready for market.

Another feeder who has fed consistently and profitably summarizes his methods as follows:

Buying. Purchases extra-quality calves, and sticks to the same breeding from year to year. Usually gets the calves about October 20 to 30, fills them with grass and hay, and begins to feed.

Feeding. Feeds calves all they will eat from the start and *never* roughs them thru the winter. For the first four months he feeds all the grain the calves will clean up in fifteen to twenty minutes. He feeds much roughage in addition, preferably corn fodder, for it develops capacity for a large amount of feed. He always feeds a balanced ration. Prefers linseed oil meal at the rate of about 2 pounds a day.

He *feeds calves regularly* at the same hours each day, and *sees that each calf is at the bunk getting its share.* This extra care leads to uniformity in finish and in dressing percentage.

Grows barley and soybeans in the crop rotation, but sells them and buys corn, whenever the price relations make the exchange profitable. Buys concentrates and some corn in quantities when they seem cheapest.

Marketing. Puts cattle on market when the class and quality of beef he has is wanted more than other classes, usually during July and August. Always markets the same quality of beef; a practice which has given him a reputation that helps sales.

A third feeder who has been particularly successful and has missed feeding cattle only one year in eighteen, lays emphasis on quality of feeders bought, good feed, comfortable quarters in winter, and guidance in buying and selling thru a farmers' livestock commission company. In general he follows two plans of feeding, depending on feed supplies. One plan is to buy calves in the fall, get them on full feed by November, and sell in late spring or early summer. The second plan is to buy yearlings in May and carry them thru the summer and fall on grass alone if the pasture is good. If the pasture is a little short, some grain is fed. In either case they are put on feed the last of December after cleaning the stalk fields and are sold as heavy well-finished cattle in August or September.

A fourth feeder who fed cattle nine of the ten years covered by this study has developed a rather definite program which differs in some respects from the others recorded. "In the first place," he explains, "I like cattle." This he regards as particularly important. His methods are in general the following:

Buying. Feeds the same class of cattle in the same way year after year, following the rule that "practice makes perfect." He prefers good to choice heavy calves or light yearlings rather than light calves. Buys in August or early September.

Feeding. Feeds the driest hay on the farm for a day or two. On the second day he turns the calves into pasture for an hour, and thereafter increases the time on pasture a little each day until they are on pasture all the time. Keeps the cattle on grass until about November.

Full-feeds on self-feeder from about November until July or August. Feeds ground corn-and-cob meal mixed with protein concentrate at the rate of 1:10 or 1:12 in the self-feeder. Uses pea-size oil meal mostly.

Changes to shelled corn about the first of May for finishing the cattle. Feeds silage and a light feed of hay once a day.

Marketing. Depends on a farmers' livestock commission company for advice in buying and selling.

Practices Followed by Successful Pork Producers

One of the most successful producers of pork during the ten-year study, who has raised an average of about 500 hogs a year, has been unusually successful in raising large litters and in keeping down costs for feed, equipment, and labor. His methods are approximately as follows:

Breeding stock. Selects brood sows from large (but not excessively large) litters having good mothers. Marks the pigs at birth and keeps records so that selections can be made after the pigs are weaned. Prefers litters of 8 to 10 rather than more.

Selects sows of intermediate type rather than those that are rangy or chuffy.

Selects purebred boars from large litters from good breeding herds. Selects vigorous boars of intermediate type.

Provides for exercise of brood sows by feeding at some distance from sleeping quarters.

Farrowing and raising pigs. Spring pigs are farrowed about March 1, so that they may be put on the market at six to eight months of age during August or September when prices are usually best.

Fall pigs are farrowed during August, and are pushed along for the March market, which is usually good.

Both spring and fall pigs are farrowed in two six-pen brooder houses. One is a stationary hen house converted into a farrowing house; the other is movable. The movable one is made in two sections, each section narrow enough to be dragged thru an ordinary gate.

Before sows go to the farrowing pens they are confined closely and sprinkled with a mixture of crankcase oil, fuel oil and a little dip.

Sows are placed in farrowing pens a day or two before time to farrow. As pigs are farrowed they are placed in small pens under the brooder-stove hover. There is a separate small pen for each of the six litters. Pigs are put with sow to nurse every two or three hours. They are returned to their pens when thru nursing.

When pigs are three or four days old the sows and pigs are taken to an alfalfa or clover field and placed in individual houses. Boars are castrated when only three or four days old, at the time they are taken to the field. Pigs are vaccinated before weaning when four or five weeks old.

For spring pigs the alfalfa or clover field is divided into temporary inclosures about 150 by 250 feet in size, each inclosure accommodating four sows and litters in individual houses. In the summer a few more litters per lot are put in lots of about two acres each.

Feeding hogs. Keeps hogs on good alfalfa, clover, or rape as many months as possible. Self-feeds ear corn, or throws it out on ground or feeding floor. Self-feeds tankage and oil-meal; includes alfalfa meal in winter.

Pipes or hauls water to field. Uses automatic waterers on platforms with drains to take wasted water out of lot, so as to avoid mudholes.

For winter feeding he houses 150 to 200 fall pigs in a deep shed open on the east all the way to the eaves. The shed, built for the purpose, is 28 feet wide, 36 feet long and 7 feet to the eaves. It has a dirt floor, and opens to the east onto a large concrete feeding floor. The corncrib is on the north side of the feeding floor. An automatic waterer and self-feeders for protein supplements are inside the shed. For bedding, corn fodder is used because it does not work up as dusty as straw. Corn fodder is cut as the corn is husked and is shocked outside of the shed for bedding. A shed of this size is ample for about 150 to 200 pigs. Flu has never developed among the hogs on this farm in this type of shed.

This feeder handles his hogs quietly and does all he can to make them comfortable. His neighbors are surprised to notice how quiet several hundred hogs on one farm can be. He never calls them. He says that it would scare his hogs to call them, and that he would not have a dog on the place.

Comfort, regular care, kindness, sanitation, legume pastures, ear corn, simple protein supplements, plenty of clean water, and production of good quality hogs in time for the best markets all work together for economical pork production on this farm.

Other pork producers whose ten-year records show especially economical production all emphasize good quality of breeding stock of the intermediate type, sanitation, clean water at all times, protein supplements, timely production for good markets, exercise and care of brood sows, and full feed from birth to market.

One successful producer marks pigs in all medium-sized litters (seven or eight pigs) having good mothers. When the pigs weigh from 100 to 150 pounds he pens the pigs of each marked litter by themselves. With several such litters penned up side by side, he selects sows from the litters that have made the most uniformly good growth and are of the best marketable types. He places more importance on finish than on size, and he prefers a blocky type of boar in order to get an early finish on the hogs. He puts a maximum of ten sows in one field of five acres of clover or alfalfa. For early hog pasture he likes rye.

Practices Followed by Successful Poultrymen

One of the most successful poultrymen among the fifty-seven farmers who were in the accounting service during the ten years emphasized the fact that he had "always been interested in poultry." He listed his methods as follows:

Breeding. Uses the best breeding available within reasonable price limits. Hatches eggs from his own flock in his own incubator.

Housing. Confines hens thruout the year. Lets them out about 4 o'clock each day when weather permits. Thus he always knows what they eat and where to get the eggs. Keeps pullets and year-old hens in separate houses.

Sanitation. Plows runs in fall and plants to annual crops. Keeps houses clean and dry. Cleans houses regularly about once a month. Keeps dropping boards screened. Provides at least three square feet of floor space for each bird.

Has clean water in fountains at all times. Warms water in winter. Worms pullets when they go to laying house.

Feeding. Balances feeds, mostly home grown, for all poultry. Holds pullets back by cutting down on protein feed a month before placing them in laying house. Feeds pullets cracked corn only, during this period.

Feeds pullets laying mash in hoppers and grain in hoppers from the time they are put in laying house until spring. Feeds hens laying mash in hoppers and grain in litter at night.

Culling. Culls rigidly at all times. When a hen shows that she has stopped laying, she is sold. Toe punches all pullets and keeps hens only one year.

Eggs. Produces good quality eggs, clean, and free from obnoxious odors.

A few of the practices emphasized by other farmers who were more successful with poultry than the average are included here also. No attempt is made to list all the practices followed by these men, but only to indicate what each considered most important. One, for example, says that regularity in care of chickens and thoro cleanliness about the poultry houses are important items in his wife's program for poultry. Another, who feeds green feed or sprouted oats during the fall and winter and keeps his flock confined the year around, emphasizes sanitation and cleanliness.

One farmer separates the pullets from the cockerels when they are old enough to get along without heat, and puts them in a brooder house in an alfalfa field or cornfield. He feeds the following mash summer and winter: 500 pounds yellow corn free from mold; 250 pounds hull-less oats; 50 pounds soybean oil meal; 50 pounds meat scrap; 50 pounds bran; and (in winter) 50 pounds alfalfa meal.

Another farmer keeps hens confined all but two months. He says, "Egg production goes down when hens go out." He feeds a home-mixed mash the year round, consisting of 100 pounds clean yellow corn; 100 pounds oats; 100 pounds bran; 100 pounds middlings; 100 pounds meat scrap; 25 pounds alfalfa meal; 5 pounds salt. In winter one pint of cod-liver oil is added to each 100 pounds of the mash.

One of the farmers insists on sanitation, regular culling, and good feed. He uses a year-round mash consisting of 100 pounds clean yellow corn and 100 pounds of a 26 percent commercial protein feed.

One of the most successful is unusually particular about cleanliness and regularity in the care of poultry. The chickens get all the milk they will eat in the form of cottage cheese. Peat moss is used in brooder houses because it absorbs so much moisture.

One farmer culls by using trap nests three or four times a year. He says, "Raising poultry is an every-day chore and not a rainy-day job." He uses a home-mixed chick starter consisting of 52 pounds clean yellow corn, 25 pounds middlings, 20 pounds dried buttermilk, 1 pound ground oystershell, 1 pound salt and 1 pint of cod-liver oil.

Still another is particular about sanitation. He says, "We avoid walking from the old hens to the young stock as much as possible." Hens are confined to a range of about half an acre. Two ranges are alternated, one being farmed each year.

Practices Used to Keep Down Labor, Power, and Machinery Costs

One of the ten-year cooperators whose farm excelled in all seven of the major factors responsible for differences in incomes during the ten years 1925-1934 (page 549), listed his "rules" as follows:

Labor. Plans work so as to use labor to advantage. Uses no more hired labor than is necessary. Keeps one man the year round on the 280 acres that he farms. Hires day labor from time to time as needed. All grain produced is fed on the farm.

Power. Uses a tractor for plowing and disking and horses for harrowing and cultivating. Keeps only as many horses as necessary—six work horses.

Keeps horses in good condition. When not at work they are pastured on legume pasture. When working they are fed good grain and hay. In winter they run in stalk fields and are fed straw.

Machinery. Keeps only the necessary amount of equipment. Buys some used machinery. He says, "It pays to shop around." Keeps machinery repaired. Buys repairs when work for season is finished. Overhauls machines in spring. Houses machines when not in use.

Another farmer who has been successful in keeping down operating costs has operated his 120 acres with six horses. He says that his four-year rotation of corn, corn, oats, and alfalfa distributes labor and power needs. He repairs machinery during the winter. Horses harvest their own feed in good legume pastures and stalk fields when not working. Each year he raises one or two colts from mares that do their share of the work. Uses a multiple hitch. Has boys in school haul manure on Saturdays.

One of the most successful farmers buys medium-priced nine- or ten-year old horses that are good workers and gentle. He has enough machinery and horses to do good work, but none extra. During rush seasons he runs his tractor day and night. He carries a small notebook and pencil and writes down things that need to be done whenever he notices them. He says, "If a rainy day comes and I wonder just what to do, I look over my notebook. I have always done this." His heavy repair work he hires done. He either repairs machines before they are put away or makes note of needed repairs and puts the note into the tool box or ties it to the machine. He said, "I had a boxing go out on a cultivator the last day we used it. I got a new boxing and tied it to the wheel before I put the cultivator away."

Another of the very best farmers says, "Labor efficiency depends directly upon having and following some well-thought-out plan." As the need for repairs appears he makes note of the need on a card and hangs the card on a hook in the shop. Then he gets parts well ahead of the time needed. He keeps machines well oiled and greased.

One man emphasized the use of plenty of the best oil and grease that he can buy. He changes engine oil "religiously," and uses a force oil can. He replaces parts as soon as they become badly worn, and before they break.

Another has a more complete shop than is found on most farms. It has room for overhauling machines in winter. Bolts are bought in dozen lots and kept in boxes in assorted sizes. He cooperates with his brother in the ownership of large machines.

One farmer boils his wagon wheels in oil and paints them every other year. He has reduced the labor cost for fighting weeds by adopting a rotation of corn, corn, oats, and sweet-clover pasture. "Pasturing the land one year in four has cut out my weed troubles," he said.

One man who farms with horses has lost but one mature horse during the whole time he has been farming. Perhaps one reason is that he takes water to the field during hot weather.

Several of those whose costs for labor and for horses and machinery are low stated that they did not put in as long hours in the field as some, but that they tried to be regular with their work. Some said that they worked with their hired men whenever possible.

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