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# Effects of Better Selection of Crops And Pastures on Farm Income In Missouri

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*University of Missouri, Agricultural Experiment Station, in cooperation with Bureau of Agricultural Economics, United States Department of Agriculture.*

COLUMBIA, MISSOURI

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## INTRODUCTION

Declining crop acreage, decreasing yields per acre, and serious losses by soil erosion make imperative the reorganization of many Missouri farms if a profitable agriculture is to be long maintained with any given price level. In the area north of the Missouri River, corn acreage has declined about 28 per cent in the last 25 years. Although the reduction in corn area has probably taken place on the least fertile acres, the average yield per acre of corn has also declined. In the same area, more than one-half of the total acreage has been classified as seriously eroded (more than one-half of the original surface soil washed away).

The College of Agriculture of the University of Missouri for several years has recommended changes in farming practices which would check the increasing damage from erosion and more nearly maintain the fertility of the soil. These recommendations have been very helpful to farmers where no extensive reorganization of the farm was involved and where the farmer has been able to foresee the probable effects of a given change on his entire farm business. The organization of different farms is so variable, however, that a specific recommendation will affect the returns from individual farms in a variety of ways. A change in the proportion of the various kinds of feed grains and roughages produced may have different effects on a hog farm than on a dairy or beef cattle farm. Farmers need help in tracing the influence of changed farm practices through the organization of the farm as a whole. Help is also needed in appraising long-time effects as well as temporary results.

The acreage of some newly recommended crops, such as winter barley and Korean lespedeza, has increased rapidly but knowledge of these crops is not widespread in some parts of the State. Use of these crops and other changes in farm practices will make important contributions to soil fertility maintenance and future returns

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from farming when the organization of the farm is so changed as to utilize them fully. Their use, however, will drastically change the cropping system and the pattern of feed utilization by livestock in some cases. Many farmers are interested in more information on how changes in kinds and proportions of crops grown will affect the organization of their farms and their income over a period of years.

With a view to helping farmers in an evaluation of the effect of specific recommended changes in farming practice on the organization and income of farms of widely varying types, the Department

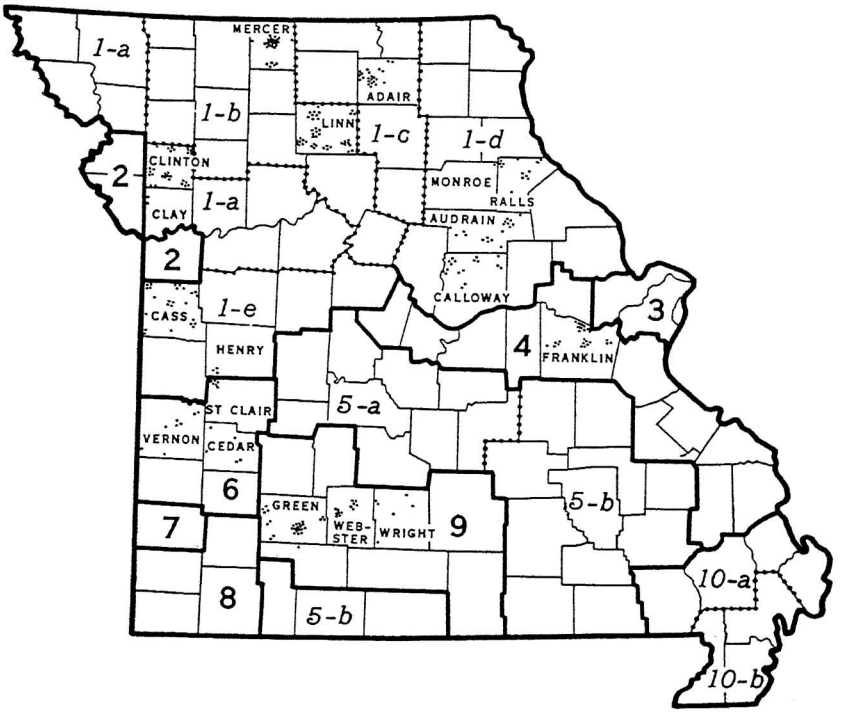


Fig. 1.—Type-of-farming areas in Missouri with location of farms studied:

1. Northern Meat Production
   a. Marshall-Wabash
   b. Grundy-Shelby
   c. Shelby-Lindley
   d. Putnam-Lindley
   e. Summit
2. Western Dairy Livestock, Truck Kansas City-St. Joseph
3. Eastern Dairy Truck, Wheat St. Louis City
4. Ozark Border Dairy, Wheat
5. Ozark Meat Production
   a. Clarksville-Lebanon
   b. Clarksville-Huntington
6. Western Corn, Small Grain
7. Jasper County Wheat
8. Southwest Fruit, Dairy
9. Ozark Plateau Dairy
10. Southeast Lowlands
    a. Southeast Corn, Cotton
    b. Southeast Cotton, Corn

of Agricultural Economics of the University of Missouri in cooperation with the Bureau of Agricultural Economics, United States Department of Agriculture, conducted in 1935 a survey of 294 farms, located in four farming-type areas in the State. Information was obtained concerning the utilization of crop and pasture land and the normal production of livestock and livestock products on typical farms in parts of each of these areas. The boundaries of the farming type areas (county line basis) and the location of farms on which records were obtained are shown in Figure 1.

The principal purpose of the survey was to obtain typical combinations of crops and livestock in most of the farming type areas and sub-type areas, and sufficient related information to be used as a basis for approximating the effect of erosion-preventive and fertility-maintaining practices on farm income. An effort was made to express the normal production of crops, livestock, and livestock products in physical terms so that normal price relationships could be considered in the analysis of the organization problems on typical farms in specified localities. A method of approach is used which may be useful to farmers in other areas or to farmers in the same area whose situation differs from the typical one considered.

Only the long time effect of the recommended changes is considered. No attempt is made to suggest means of overcoming the difficulties of putting a fertility maintenance program into effect on many farms. Many farmers have been unable to make the increased cash outlay necessary to initiate a program of this kind. Such a program often involves a decrease in the acreage of some important crop so that in addition to increased expenditures there may be temporarily decreased income. Already in stringent financial circumstances, some farmers have been unwilling to sacrifice present returns for enhanced future gains. A high percentage of tenancy in some areas has been a further difficulty in effecting a long-time farming program on many farms. This study, however, is particularly interested in what is a good long-time farming program for situations common to many parts of Missouri. It is also considered to be outside the scope of this study to conjecture as to the effects of changes in Missouri's agricultural production on the price relationships of specific products. The advantages of using the agricultural resources of the State most efficiently from the standpoint of normal price relationships for the country as a whole will far outweigh the effect of changed price relationships due to the shifts in production suggested for Missouri.

## PRODUCTION PROBLEMS OF LAND UTILIZATION IN MISSOURI

### Farming Type Areas in Missouri

The character of the agriculture in different parts of the State of Missouri varies widely on account of the variation in physical resources and economic factors. In Figure 1, ten farming type areas, having significant differences in soil types and farm organization, have been delineated. The type of soil with its characteristic topography has probably been the most important factor causing the differentiation between type of farming areas.

Some of the differences in farming to be found over the State are indicated by the names given to the type-of-farming areas in Figure 1. Thus, the Northern Meat Production Area (Type Area 1) is characterized by the importance of beef cattle and hogs although

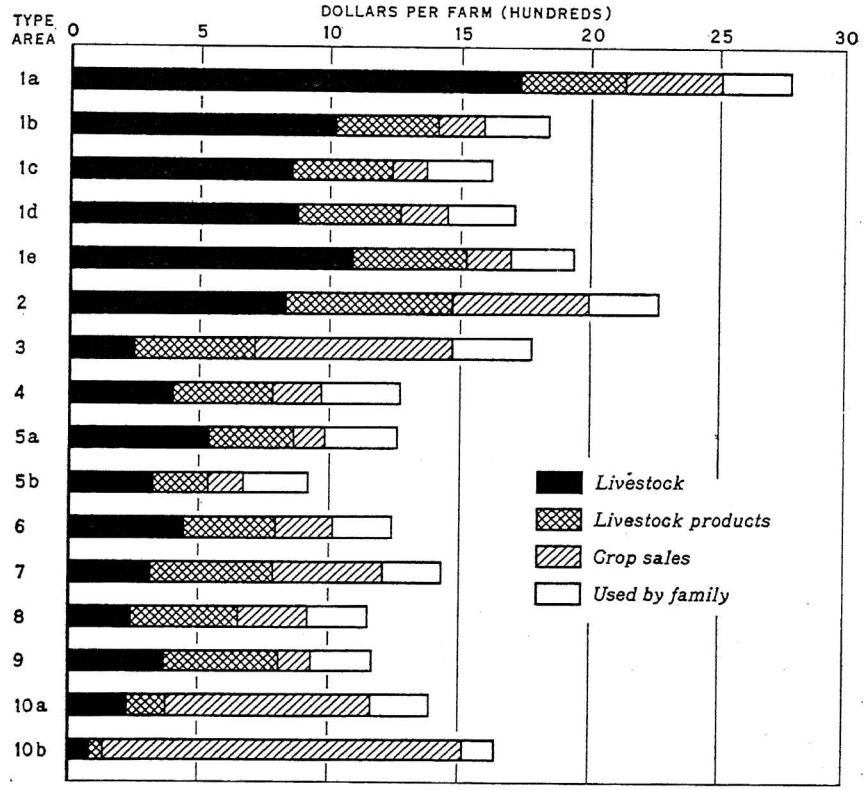


Fig. 2.—Value per farm of products sold or used by family, by type-of-farming areas in Missouri, 1930 census.

there are wide variations in the methods of handling cattle and in the proportion and yield per acre of crops grown. The sub-types (A, B, C, D, and E) are designated by the names of the principal soil series prevailing in the area. The variations in type of soil explain largely the differences in cropping systems and the livestock production based upon them.

Missouri is primarily a livestock State. The 1930 agricultural census indicates that four-fifths of the gross value of products sold or used in the home consists of livestock and livestock products. The average value of total production per farm in the northern part of the State (Type areas 1, 2, and 3) was at least $500 higher in 1929 than in the rest of the State (See Fig. 2). This is due partly to the larger size of farms and to higher crop yields per acre north of the Missouri River. The sale of livestock and livestock products made up a larger share of the total production in Type Area 1 than in any of the other nine areas.

### Crop Yields Not Being Maintained

In spite of the greater potentialities for production in the northern part of the State, surveys have shown greater losses from erosion in parts of this area than in any other part of the State. The type of soil, per cent of slope and use of land have been factors responsible for bringing about this condition. This loss of top soil has been instrumental in reducing the acreage of crop land, especially for corn, and in reducing acre yields on the acreage remaining.

The trends in acreage and yield per acre of corn in the four principal type-of-farming areas in northern Missouri are shown in Figure 3. The acreage of corn has declined at an average rate of 0.87 per cent per year in Type Area 1-A in Northwest Missouri, and from 1.30 to 1.52 per cent per year in the other three type-areas which extend eastward across the northern part of the State. From 1910 to 1932 there have been wide yearly variations in acreage of corn due to weather conditions at, or previous to, planting time, and to changes in acreage of wheat or other crops. During this period, the acreage of oats has gradually increased. Except for a large increase from 1918 to 1923, the wheat acreage in northern Missouri has shown no decided trend except for a slight decline in type area 1-D. Most of the decline in corn acreage has been accounted for by an increased acreage of pasture.

If an average rate of change is obtained by fitting a line of least squares to the acreage of corn from 1910 to 1932, a reduction of 20 per cent is indicated in Type area 1-A, 34 per cent in 1-B, 35 per

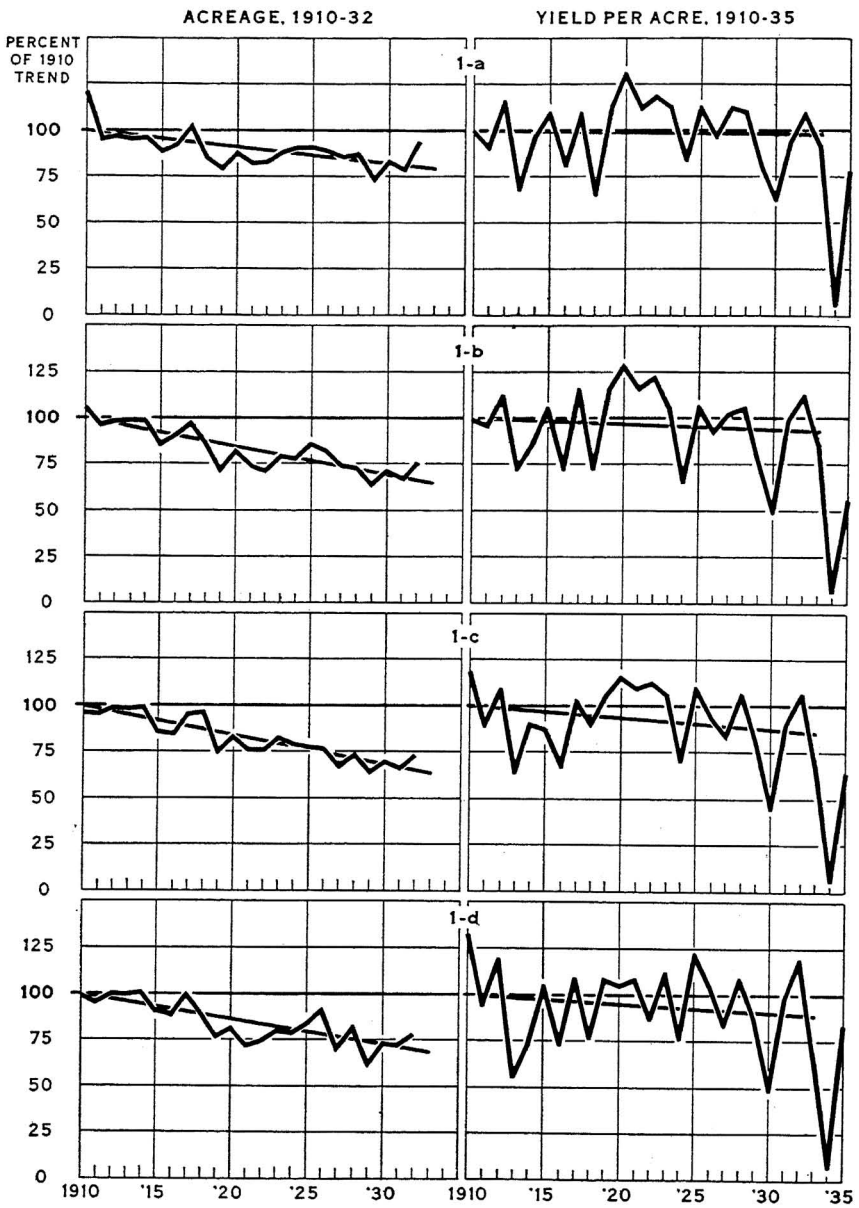


Fig. 3.—Trend in acreage and yield per acre of corn in Northern Missouri.

cent in 1-C, and 30 per cent in 1-D. In Figure 3 a similar calculation for per acre yields from 1910 to 1933 shows decline of 2 per cent in type area 1-A, 8 per cent in 1-B, 21 per cent in 1-C, and 15 per cent in 1-D. If yields for the abnormal years 1934 and 1935 were given consideration in this calculation, a much greater rate of decline in yields would be indicated.

The yield per acre of corn is highly variable from one year to another on account of the extreme variation in weather conditions. A period of even 25 years may not be sufficient to furnish an absolutely reliable indication of yield trends especially if the years of extreme variation are not evenly scattered throughout the period. The yield per acre of corn since 1910 for the four type of farming areas in northern Missouri has been so variable from year to year that little significance can be attached to the calculated trend shown in Fig. 3. There is little question however that there has been a decrease of 25 to 30 per cent in the production of corn in northern Missouri in the last 25 years even though no consideration is given to the abnormal years of 1934 to 1936.

### Factors Affecting Crop Yield Trends

An important explanation for declining acre yields is the low percentage of the rotated land that is ordinarily in legume sod crops. In most areas, the acreage of legume sod crops amounts to not more than ten per cent of the rotated land. The acreage of these crops would need to be increased to two or three times the present figure to maintain the proper nitrogen and humus turnover of the soil and to prevent excessive losses of fertility by soil erosion. Even with a good cropping system, some loss by erosion is inevitable. In addition, the available mineral content of the surface soil in many areas has been reduced to the point that a greatly increased application of mineral fertilizers will be necessary to maintain crop yields for any long period in the future.

The older agricultural experiment station plots furnish some information regarding crop yield trends for long periods of time with specific rotations. Between 1888 and 1926 the yield of corn grown continuously on the Morrow plots at the University of Illinois declined at the rate of 1.41 per cent per year.[1] Per acre yields on a plot with a corn, oats rotation declined at the rate of 0.95 per cent per year, and on a third plot on which a corn, oats, red clover rotation was followed, yields declined at the rate of 0.44 per cent during the same years. At Rothamsted, England, the yield per acre of wheat grown continuously without manure or fertilizer for 50 years

[1]Illinois Agricultural Experiment Station, Bulletin 300—"Lessons from the Morrow Plots".

declined at the rate of about 1.0 per cent per year, and barley grown continuously for 43 years yielded about 1.6 per cent less per year during that period.

At the University of Missouri, corn has been grown continuously on one plot since 1889. Figure 4 shows that while the yield per acre on the Sanborn Field plots has been highly variable from year to year there has been an unmistakable trend in the decline of more

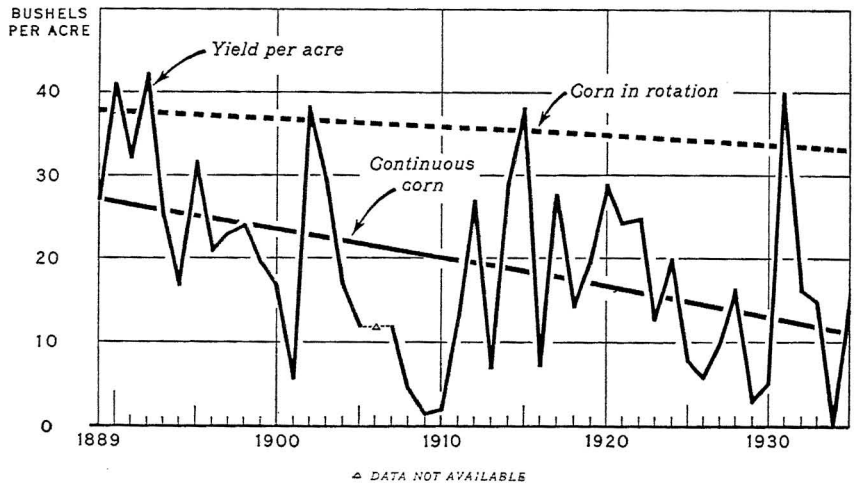


Fig. 4.—Corn yield trends on Sanborn plots, Columbia, Missouri, continuous corn vs. corn in rotation with small grain and clover.

than ten bushels per acre on the continuous corn plot. In comparison with the trend in yield of continuous corn on the Sanborn Field plots, Figure 4 also shows the trend in yields of corn grown in rotation with oats, wheat, red clover, and timothy. For the purpose of this comparison the corn yields on three plots, namely corn-wheat-clover, corn-oats-wheat-clover, and corn-oats-wheat-clover-timothy-timothy were averaged. Although these plots did not receive any application of manure or fertilizer the yield per acre of corn was much more nearly maintained, and at a much higher figure. Even the untreated rotation plots, however, showed an average decline of somewhat more than four bushels per acre for the 47 year period.

At Rothamsted, England, and at Urbana, Illinois, the experimental plots are nearly level and the plots at Columbia, Missouri, have a very slight slope. Consequently, there has been little or no erosion to affect the yield trends given above. With the same cropping systems used under average farm conditions on the rolling lands

of Missouri, yield declines would be much greater than was true at the three experiment stations named.

The effect of crop rotation with legumes in increasing soil organic matter and in decreasing water runoff and soil erosion is another important consideration. At the University of Missouri the soil loss per acre over a ten year period was more than seven times as great from a continuous corn plot as from one on which corn, wheat, and clover were rotated.[1] Even in the years in which corn was grown on both plots, more than twice as much soil was lost from the continuous corn plot as from the rotated corn plot. The water runoff from the continuous corn plot for the five month period May 1 to October 1 (3-year average) was almost twice as great as from the rotated corn plot. The decreased loss of soil and water from the rotated plot was largely due to the incorporation of organic matter in the soil by plowing under clover stubble.

Crop yield trends on farms will vary with practices used, such as manuring, use of commercial fertilizer and lime, kind of crops grown, drainage, seed selection, and tillage methods. The fertility of the soil, topography, physical characteristics of the surface soil and subsoil, and the quantity and distribution of rainfall are other factors causing variation in the rate of change in yields. On some farms, yields have been materially increased by modifying some of these factors. On others the decline in yield due to declining fertility has been minimized by the influence of other factors tending to increase yields. Declining per acre yields for an area as a whole have often remained unnoticed because some of the poorer acres have been retired from cultivation. The typical trend in crop yields due to declining fertility on farms is greatly influenced by the erosion to which the land is subjected.

Oftentimes yields are limited by a deficiency or excess of one of the elements or conditions necessary for optimum plant growth. Thus, if the plant food elements available in the soil are in proper proportions, rainfall, temperature, or drainage may be the only factors limiting yield. On some soils the supply of nitrogen or organic matter may be the limiting factors. In regions of abundant rainfall lime has been extracted from the soil in many areas by leaching and long-continued cropping. This condition may have made it impossible in some areas to obtain a stand of some legumes. While lime might not be a directly limiting factor in the yield of corn, yet it might be responsible for a dearth of organic matter. The lack of phosphate may limit yields both directly and indirectly.

[1]See Missouri Bulletin 271 by R. E. Uhland and J. C. Wooley.

On livestock farms one would not expect yields to decline so rapidly as on farms where a larger proportion of the land is in harvested crops, especially if the crops are hauled off of the farm. Enough manure accumulated at the feedlots on the farms studied to cover the crop land about once in eleven years. In addition, many farmers feed a considerable part of the crop on the fields. There is a smaller loss of fertility, of course, if the crops are fed on the fields or are grazed off than if they are fed in the feed lot, for even the careful handling of manure involves some loss.

## NATURE OF STUDY

### Areas Surveyed

Farm records were obtained in four of the ten major type-of-farming areas in Missouri. Two hundred of the farms visited were located in the five sub-type areas of Type Area 1 (See Fig. 1). The other 94 farms were located in Type Areas 4, 6, and 9. Two localities were studied in each of the Type Areas 9 and 1-b because of significant differences in the types of farming in different parts of those areas. The information obtained from farmers consisted of the normal acreage and yield per acre of crops and the normal numbers and production of livestock together with significant items of cash cost for equipment, fertilizer, hired labor, threshing, repairs, and other items.

There was some selection of farms on the basis of whether the individual could give information concerning normal production for his farm. Usually the farmer interviewed was one who had been on the same farm for a number of years. The farms on which records were obtained averaged larger in size than the census average for all farms in these areas. The yields given as normal were also about 10 to 20 per cent greater than a ten-year average yield for farms in these areas. This is probably due to the tendency to interview better than average farmers in a survey of this kind. There is probably a tendency also for the farmer to give insufficient weighting to years of very low yields and failures when estimating long-time average yields for his farm.

It would seem that the farms studied had much more livestock, even in proportion to the size of farm, than if they were a more nearly representative sample of all farms in these areas. The importance of cattle is probably exaggerated somewhat more than other classes of livestock by using these farms as a sample of all farms in these areas. The average livestock production per farm on the 294 farms consisted of 14,060 pounds of hogs, 11,200 pounds of cattle and

TABLE 1.—FARM ORGANIZATION FACTORS IN 10 AREAS STUDIED (ESTIMATED NORMAL, 1935 SURVEY)*

| Item | | Northern Meat Production Area | | | | | | Western Corn and Small Grain | Ozark Plateau Dairy | | Ozark Border Dairy Wheat | Average Ten Areas |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | a | b | | c | d | e | | | | | |
| Counties in which farms were located | | Clinton | Linn | Mercer | Adair | Audrain Callaway Ralls | Cass | St. Clair Vernon Cedar | Greene | Webster Wright | Franklin | |
| Number of farms | | 31 | 44 | 25 | 27 | 48 | 25 | 22 | 24 | 22 | 26 | 294 |
| Total acres per farm | | 325 | 261 | 252 | 265 | 276 | 204 | 304 | 177 | 234 | 182 | 252 |
| Harvested crops | Pct. | 56 | 44 | 38 | 34 | 52 | 56 | 57 | 55 | 34 | 46 | 48 |
| Rotated land | " | 61 | 50 | 38 | 36 | 60 | 57 | 61 | 70 | 38 | 52 | 53 |
| Harvested crops in | | | | | | | | | | | | |
| Corn | Pct. | 43 | 35 | 31 | 25 | 40 | 45 | 39 | 29 | 26 | 25 | 36 |
| Oats | " | 21 | 14 | 12 | 11 | 16 | 21 | 21 | 19 | 10 | 7 | 16 |
| Wheat | " | 9 | 4 | 2 | 2 | 8 | 13 | 16 | 21 | 17 | 37 | 12 |
| Soybeans | " | 4 | 9 | 2 | 4 | 15 | 6 | 6 | 6 | 4 | 3 | 7 |
| Other hay | " | 22 | 38 | 51 | 58 | 20 | 11 | 14 | 15 | 42 | 23 | 27 |
| Other crops | " | 1 | — | 2 | — | 1 | 4 | 4 | 10 | 1 | 5 | 2 |
| Livestock per farm | | | | | | | | | | | | |
| Cows | No. | 11.9 | 17.8 | 17.8 | 21.9 | 15.4 | 15.6 | 16.0 | 18.6 | 20.9 | 12.1 | 16.6 |
| Sheep | " | 8.1 | 18.8 | 17.2 | 15.7 | 21.5 | 6.7 | 10.5 | 4.6 | 5.5 | 1.5 | 12.7 |
| Brood sows | " | 22.0 | 4 8 | 3.3 | 3.1 | 6.5 | 4.3 | 5.7 | 2.2 | 1.5 | 1.4 | 5.9 |
| Feeder cattle bought | " | 24 | 3 | 5 | 4 | 5 | — | 10 | 3 | 1 | 4 | 6 |
| Fat cattle sold | " | 30 | 9 | 11 | 2 | 10 | 6 | 18 | 4 | 4 | 6 | 10 |
| Fat beef of total beef | Pct. | 89 | 54 | 56 | 13 | 54 | 58 | 75 | 26 | 34 | 48 | 55 |
| Cows milked | " | 56 | 36 | 20 | 48 | 47 | 37 | 32 | 97 | 72 | 88 | 52 |
| Farms with tractor | " | 32 | 16 | — | — | 33 | 16 | 18 | 4 | 18 | 35 | 19 |
| Commercial fertilizer on | | | | | | | | | | | | |
| Corn | Pct. of acres | 6 | 38 | 4 | — | 20 | 6 | 3 | 26 | 22 | — | 14 |
| Wheat | " " | 38 | 95 | 80 | 4 | 72 | 79 | 35 | 65 | 61 | 74 | 53 |
| Oats | " " | — | 5 | — | 6 | 2 | — | — | 3 | 25 | 1 | 4 |
| Persons per farm family | No. | 3.73 | 3.75 | 3.28 | 3.81 | 3.50 | 4.00 | 3.72 | 4.29 | 4.00 | 4.80 | 3.85 |
| Hired labor per farm | Man Years | .86 | .28 | .17 | .26 | .55 | .61 | .82 | .71 | .33 | .28 | .48 |

*More detailed per farm figures concerning acreage of crops and pasture, livestock numbers and production, feed per unit of livestock by classes, information concerning buildings and equipment, manure, lime, and fertilizer use, and quantities of farm products used in the household in each of the 10 areas studied are given in Tables 10 to 22 in the appendix.

calves, 1,150 pounds of butterfat, 1,250 dozen eggs, 490 pounds of chickens, 1,020 pounds of sheep and lambs, and 100 pounds of wool.

The factors of farm organization shown in Table 1 illustrate some of the major differences in farm organization between the ten areas studied. In three of the ten areas studied (Clinton, Cass, and Audrain-Callaway-Ralls) an average of more than 40 per cent of the harvested crop land was in corn. Three other areas (Adair, Franklin, and Webster-Wright) had an average of about one-fourth of the harvested crop acreage in corn. The Greene and Franklin areas were the only ones with more than 20 per cent of the harvested crop land in wheat. The Adair county farms averaged only 1 per cent in wheat.

The proportion of oats was more nearly uniform between areas with an average for the 294 farms of 16 per cent of the harvested crop land in this crop. The average proportion of crop land in soybeans was also rather uniform in all areas except for the Audrain-Callaway-Ralls area where soybeans made up twice the average proportion of the crop land (15 per cent). The Mercer and Adair county farms had a larger proportion of their crop land in hay other than soybean hay than the farms in any of the other areas studied.

The harvested crop land averaged just under one-half of the total farm area for all farms visited (48 per cent). There was an average of five per cent of the farm area in year-long rotation pasture and 47 per cent in permanent pasture, woodland, farmstead, and waste land. The areas having the smallest proportion of harvested crop land were the Webster-Wright, Adair, and Mercer areas where only slightly more than one-third of the farm area was in harvested crops.

Wide variation in livestock production per farm accompanied the variations in the proportion of crops grown in the areas studied. There was a greater difference in the purpose for which cows were kept than in the average number of cows per farm from one area to another. Only 20 per cent of the cows in the Mercer county records were milked as compared with 97 per cent in the Greene county area (See Table 1). In Adair county only 13 per cent of the total meat production of cattle and calves was classified as fat beef as compared with 89 per cent in Clinton county. The Clinton county farms had from 3 to 15 times as many brood sows per farm as the average of any of the other nine areas studied. More detailed

figures concerning average livestock numbers and production in the areas studied are given in Table 11 in the Appendix.

Less than one-fifth of the farms in the ten areas had a tractor. In three of the areas (Audrain-Callaway-Ralls, Clinton, Franklin) tractors were found on about one-third of the farms while in Mercer and Adair counties there were no tractors on any of the farms studied. On the 294 farms in the ten areas commercial fertilizer was normally applied to 14 per cent of the corn land, 53 per cent of the wheat land, and 4 per cent of the oats acreage. The 12 acres per farm which was annually covered with manure included 17 per cent of the corn land, 11 per cent of the wheat, and 2 per cent of the hay and pasture area.

### Method of Analysis

The average figures mentioned so far indicate only the broad differences that are to be found in the farm organization in specific areas. They portray a general picture of the area but may not accurately represent any farms found within the area. To obtain a more homogeneous sample for further study those farms within an area having similar sources of income were grouped together. Within each group the variation in size of farm was shown by arraying them according to acres operated. From this grouping it is easier to pick out a farm organization more nearly representative of the farm types in the area. In this way one can be more nearly specific in making recommendations and will not go so far astray in applying them to farm conditions.

The number of farms of specified types in the areas studied and the average proportion of the value of the gross production made up by seven kinds of farm products are shown in Table 2. The principal factors determining the type classification into which a farm was placed were the quantity of feed consumed, quantity of labor necessary, and the value of product from the various enterprises. The type name designates the most important enterprises on farms of a specified group.

The enterprise named first did not always furnish the largest gross value of product. The value of the final product is not the best index of the importance of an enterprise to the farm organization. The poultry enterprise might be an important source of income and yet utilize only a small proportion of the available feed. Using the value of feed consumed as a measure of importance of enterprises exaggerates the importance of hogs as compared with other classes of livestock. The greater utilization of man labor by dairy cows should also receive some consideration in this connection.

TABLE 2.—NUMBER OF FARMS OF SPECIFIED TYPES AND IMPORTANCE OF SPECIFIED SOURCES OF INCOME, 294 MISSOURI FARMS SURVEYED IN 1935

| | Dairy | Dairy Hog | Beef breeding | Beef breeding and fattening | Hog Dairy | Hog-beef breeding | Hog-beef breeding and fattening | Hog-beef fattening | Hog | General | Cash grain | Miscel-laneous | Total or average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Area Studied: | | | | | | NUMBER OF FARMS | | | | | | | |
| Clinton | — | 2 | — | 6 | 2 | — | 9 | 9 | 2 | — | 1 | — | 31 |
| Linn | 3 | 4 | 10 | 14 | 4 | 1 | 1 | 2 | 2 | 3 | — | — | 44 |
| Mercer | — | 5 | 6 | 9 | 1 | 3 | — | 1 | — | — | — | — | 25 |
| Adair | 3 | 7 | 15 | 1 | — | — | — | — | — | — | — | 1 | 27 |
| Audrain, Callaway, Ralls | 4 | 7 | 1 | 9 | 1 | 3 | 8 | 3 | 2 | 6 | 4 | — | 48 |
| Cass | 1 | 1 | 3 | 5 | 3 | 2 | 2 | — | — | 5 | 3 | — | 25 |
| St. Clair, Vernon, Cedar | 2 | 2 | 2 | 4 | — | — | 6 | 3 | — | — | 3 | — | 22 |
| Greene | 9 | 7 | — | 2 | 2 | — | — | 1 | — | — | — | 3 | 24 |
| Webster, Wright | 9 | 5 | 4 | 4 | — | — | — | — | — | — | — | — | 22 |
| Franklin | 11 | 4 | 1 | 5 | 1 | — | — | 1 | — | — | 3 | — | 26 |
| Total | 42 | 44 | 42 | 59 | 14 | 9 | 26 | 20 | 6 | 14 | 14 | 4 | 294 |
| Sources of income: | | | | | | PERCENTAGE OF GROSS PRODUCT VALUE* | | | | | | | |
| Crops | 5 | 7 | 6 | 6 | 4 | 12 | 7 | 2 | 9 | 22 | 48 | 37 | 10 |
| Hogs | 9 | 34 | 28 | 27 | 55 | 49 | 59 | 45 | 81 | 28 | 22 | 7 | 35 |
| Fat beef | ** | ** | 1 | 37 | ** | 2 | 20 | 41 | ** | 12 | 7 | ** | 16 |
| Other beef | 20 | 14 | 37 | 11 | 7 | 16 | 3 | 1 | 2 | 6 | 8 | 7 | 12 |
| Milk products | 41 | 25 | 8 | 5 | 13 | 5 | 2 | 2 | 2 | 6 | 6 | 5 | 10 |
| Sheep and wool | 7 | 3 | 8 | 3 | 6 | 4 | 2 | 2 | 2 | 7 | 1 | 1 | 4 |
| Chickens and eggs | 18 | 17 | 12 | 11 | 15 | 12 | 7 | 7 | 4 | 19 | 8 | 43 | 13 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

*In determining gross product value the following prices per unit were used: corn $0.60 per bushel, wheat $0.65 per bu., oats $0.35 per bu., soybeans $1.00 per bu., hay $8.00 per ton, hogs $0.07 per pound, fat beef $0.075 per pound, other beef $0.065 per pound, sheep and lambs $0.07 per pound, wool $0.24 per pound, chickens $0.14 per pound, eggs $0.20 per doz., butterfat $0.25 per pound. Only the final product available for sale or use in the household was considered. In the case of purchased feeder pigs or cattle, the gain in weight only was considered as production.

**Less than one-half of one per cent.

Consequently, all three factors, namely, quantity of feed consumed, quantity of labor necessary, and the farm value of the final product of specific enterprises were used in the determination of the farm type names and in the classification of individual farms under one type or another.

The beef-breeding and fattening farms, most common in Linn, Clinton, and Mercer counties, were more numerous than any other one type of farm in the ten areas as a whole. Dairy-hog, dairy, and beef-breeding farms were next most common. While there were very few hog farms where hogs were the only important source of income yet the hog enterprise was important in combination with other kinds of livestock. Hogs constituted the most important enterprise on fully one-fourth of the farms. The dairy farms were most important in the Greene, Webster, and Franklin areas. The beef-breeding farms were more numerous in Adair, Mercer, and northern Linn counties. In Clinton county the hog-beef breeding and fattening and the hog-beef-fattening (without a breeding herd) types were the most common in the group of farms surveyed in that area. Cash grain farms made up less than 5 per cent of the 294 farms studied.

In making suggestions for recommended changes in organization typical systems of farming were set up in each area studied. In some cases two or three plans for the important types of farms were set up to show variations in size of farm and other factors. With information concerning variable and fixed expenses, and a basis for estimating changes in physical production with changed methods, it is possible to approximate the effect of recommended practices on farm income.

In budgeting the result of specific changes in cropping practices it is necessary to estimate their effect on crop yields, production of livestock, cash income, and cash expenses. The same prices per unit of product sold were used for comparing the present system of farming with the proposed alternative. Long-time relationships between the prices of grains, livestock and livestock products were

TABLE 3.—PRICES USED FOR PRODUCTS SOLD

| Product | Unit | Cents | Produce | Unit | Cents |
|---|---|---|---|---|---|
| Corn | Bushel | 60 | Thin cows | Pound | 4 |
| Wheat | Bushel | 65 | Fat cows | Pound | 5 |
| Oats | Bushel | 35 | Other fat cattle | Pound | 7½ |
| Barley | Bushel | 50 | Feeder cattle | Pound | 6 |
| Soybeans | Bushel | 100 | Brood sows | Pound | 6 |
| Butterfat | Pound | 25 | Other hogs | Pound | 7 |
| Milk | 100 lbs. | 140-150 | Cull ewes | Pound | 5 |
| Eggs | Dozen | 20 | Lambs | Pound | 7 |
| Wool | Pound | 24 | Chickens | Pound | 14 |

considered in arriving at the actual prices used (See Table 3). The same prices were used in the budgets for farms in all of the areas. The relationship between prices of different products is probably more important in measuring the effect of changed practices than the actual level of prices used. No great significance is attached to the calculated returns for the operator's labor and capital. The relative returns from the compared systems are considered to be most significant.

### How Soil Conservation Affects Farm Income

The returns from the proposed alternatives in the budgets for each area are the estimated returns after the plan has been in operation for enough years to have its full effect on crop yields and livestock production. To compare this return with the return from present production does not represent the full advantage of a system of management which comes nearer to maintaining the fertility of the soil. If all factors could be taken into account, a fairer comparison would be to compare the estimated future income from the two systems rather than to compare the future income of a proposed recommendation with the present income from the present plan. If past trends are continued, the income now received from present methods cannot be maintained.

In Figure 5 the returns from two plans of organization have been projected 20 years into the future. This kind of comparison illustrates two things that are not shown in the budget comparisons for specific areas. First, it shows a net income comparison for the first year of operation without any increased production to match the increased expenditure. Secondly, it illustrates the effect of declining fertility on income several years in the future.

Farm income has been obtained in the past by not calculating any deduction for impaired soil resources. In many cases what was called income was really a deduction from capital. This method of soil accounting cannot be continued long in the future without realizing greatly increased costs due to past cropping practices or the impossibility of continued crop production on account of soil erosion.

Figure 5 is not meant to apply to a particular type of farm or a specific plan of reorganization but to be typical of many farms as now operated in comparison with most programs of soil conservation and permanent systems of agriculture. For purposes of easy illustration, it was assumed that yields from the present system would decline at the rate of one per cent per year. Expenses for the

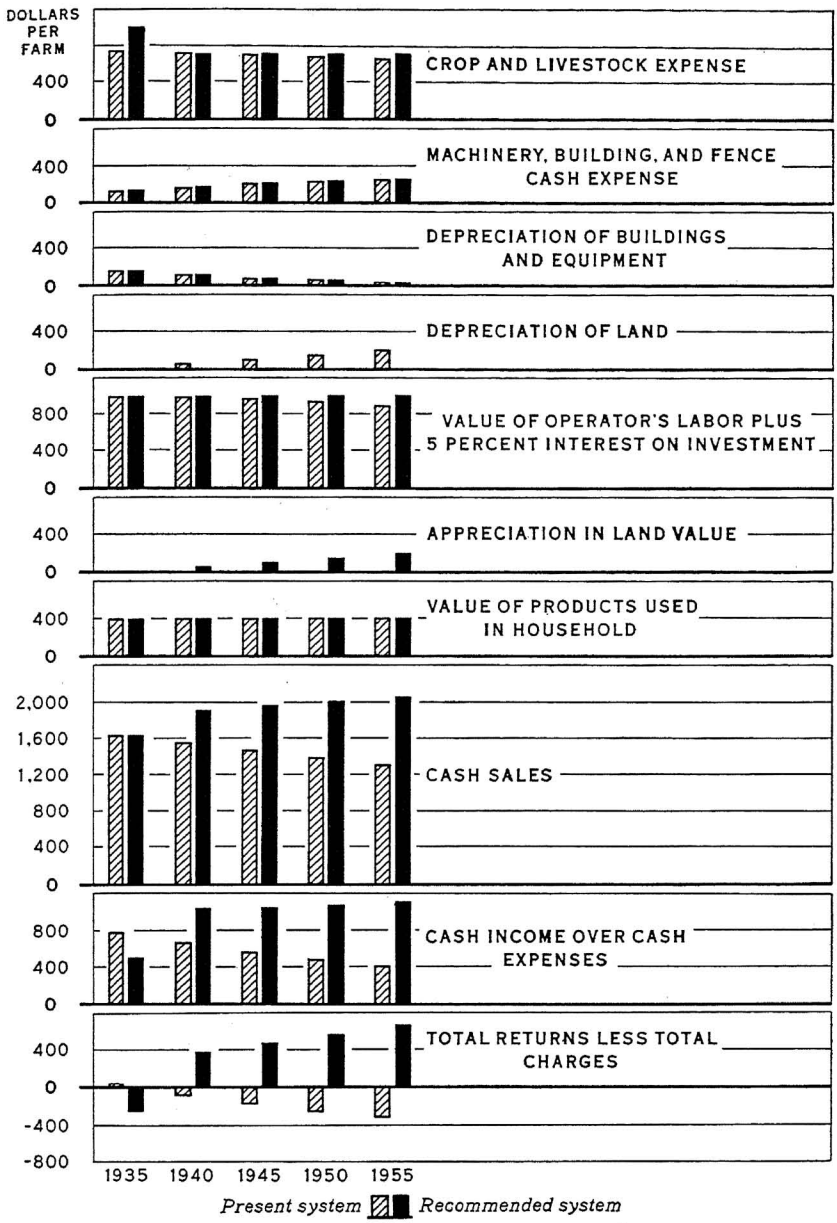


Fig. 5.—Estimate of income and expenses 1935-55 for a 200-acre farm in Northern Missouri, present versus recommended systems of farming.

soil conserving plan, especially for limestone, commercial fertilizer and grass seed, were assumed to be $269 higher in the initial year without any increase in income as compared with the present plan. In some cases there might be an actual decrease in gross income in the first year of operation. Most of the effects of the proposed reorganization were assumed to be attained within five years with very slight increases in returns during the next fifteen years.

After five years have elapsed it was expected that the crop and livestock expense for the recommended system would increase gradually with increased yields of crops and numbers of livestock. The cash expense for machinery, buildings, and fences for both systems would increase and the depreciation charges for the same items would decline as the present equipment becomes worn out. The increased productivity of the land in the proposed plan is reflected by an appreciation of land value as compared with a charge for depreciation of land under the present system. The value of products used in the household and the value of the operator's labor were considered constant throughout the period. Five per cent interest on investment was deducted in computing total returns less total charges.

This comparison shows an advantage of more than $1,000 for the recommended plan some fifteen to twenty years hence instead of the $300 advantage obtained in the ordinary budgeting procedure of comparing the future returns from the proposed plan with the present returns from the present plan. The decline in production of one per cent per year is probably somewhat extreme in representing conditions on farms with an almost level topography. On the other hand, an even greater rate of decline would be justified in erosive areas. The assumption of constant price relationships and a fixed physical organization over such a long period, of course, could not be used without regard to price level and changing market demands if one's primary purpose were to estimate income. Some such method is useful, however, in illustrating what has been happening to our soils and in emphasizing the results to be expected from a continuance of present farming methods in the future.

## RECOMMENDATIONS FOR TYPE-OF-FARMING AREAS

### Grundy Silt Loam—Linn County

The Grundy silt loam is a prairie soil of north Missouri found on the broad interstream divides. It makes up about one-fourth of the area of Linn county and is commonly found in proximity to Shelby loam in type-of-farming area 1-b (See Figure 1). Its topography

is almost level to gently sloping. It is a fairly well drained soil, easily tilled, and originaly contained a large amount of organic matter. At one time red clover did very well on this soil but due to years of cropping, the application of lime or phosphate, or both, are now usually necessary to insure a stand of clover. A large proportion of farmers now sow more timothy than clover seed and apparently have given up in their attempt to get stands of clover regularly.

The proportion of the tillable land in corn has trended downward with a compensating increase in pasture. A large part of the pasture is bluegrass but there is also a large share of timothy pasture. There is not now a high percentage of land in corn (probably not more than 20 to 25 per cent of the tillable acreage). A typical cropping system seems to be corn for about three years, small grain one or two years and seeded to a mixture heavy with timothy which remains five or six years. At about the time that bluegrass should be getting well established it is generally broken up again for corn.

There is an impression that corn yield per acre is trending downward and that erosion of the surface soil is becoming accentuated. The use of soybeans to obtain a high-protein hay for cattle is increasing. This also aggravates the erosion problem. The use of Korean lespedeza[1] has increased considerably in the last few years but few stands have yet become fully established in this area and very little has been cut for hay or seed. It is a good pasture crop for supplementing bluegrass in July and August and for sowing in gullies and washes but there is some question as to whether it should take the place of red clover or sweetclover on a soil with the potentialities of the Grundy silt loam. Considering the financial difficulty of most farmers to make a large outlay for lime, the growing of lespedeza has a considerable advantage over the present exclusive use of timothy and soybean hay for roughage.

**Beef-Breeding and Fattening Farms.**—The beef-breeding and fattening farms made up about one-third of all farms surveyed in Linn county (See Table 2). About 37 per cent of the income on farms of this type came from the sale of fat cattle, 11 per cent from other cattle, 27 per cent from hogs, 11 per cent from chickens and eggs, 5 per cent from milk products, 3 per cent from sheep and wool and 6 per cent from crop sales. The beef-breeding farms without any important fattening enterprise of either cattle or hogs

[1]See Missouri Bulletin 360—"Korean Lespedeza in Rotations of Crops and Pastures"—Etheridge, W. C. and Helm, C. A.

were the next most common type of organization in this area. There was some tendency, however, for these farms to be located in the northern and eastern parts of the county where Shelby loam is the prevailing soil type.

A typical organization for beef-breeding and fattening farms in Linn county is shown in Table 4. On this 200 acre farm there are approximately 25 acres of corn, 15 acres of oats, 6 acres of wheat, 6 acres of soybean hay, and about 32 acres of mixed hay, mostly timothy. The usual rotation is corn two or three years, then oats or soybean hay, oftentimes wheat following oats, and then timothy and clover left several years. More than one-half the farm is usually in pasture. Most of it is reported as tillable although the proportion of land used for harvested crops has been declining.

The livestock on this farm consists of approximately 4 head of work stock, 13 cows, 1 bull, 2 two-year-old heifers, 3 yearling heifers, 9 fat calves, 4 brood sows raising about 40 pigs annually, and 150 hens raising about 225 chickens. The calves usually receive some grain while on pasture and are fattened to a weight somewhat over 600 pounds per head. Some corn was bought on about one-half of the farms of this type. All of the crops raised are usually fed to livestock excepting part of the wheat. Most of the cows were milked and the product sold as sour cream. With the prices used for products sold (See Table 3) the gross income for such a farm would be $1,638. After deducting estimated expense items for farms of this type, the net return to the operator for his labor and capital would be $625 in addition to the value of products used by the farm family.

*Corn, Oats, Red Clover Rotation.*—In connection with the present organization of a typical beef-breeding and fattening farm in Linn county (Table 4) are given two proposed alternatives which could well be considered in this area. The rotated acreage was not changed from that in the present organization in either of the proposed plans. The first proposed plan involves a three year rotation of corn, oats, and clover with the application of superphosphate on the oats and two tons of ground limestone per acre on the rotated acreage every 9 years. This would mean that 12 acres would be limed each year or about 35 acres every 3 years. If a part of the corn is cut for fodder, wheat might be substituted for a part of the oats.

Shortening the rotation means some increase in corn acreage at the expense of timothy hay and pasture. The estimated per acre

TABLE 4.—BEEF BREEDING AND FATTENING FARM IN LINN COUNTY, PRESENT AND PROPOSED ORGANIZATION

| Item | | Present Plan | Corn, Oats, Red Clover Rotation | Corn, Oats, Wheat with Korean Lespedeza |
|---|---|---|---|---|
| **Land Use** | | | | |
| Size of farm | Acres | 200 | 200 | 200 |
| Harvested crop land | " | 84 | 90 | 105 |
| Rotation pasture | " | 20 | 15 | — |
| Permanent pasture | " | 80 | 79 | 79 |
| Woods pasture | " | 8 | 8 | 8 |
| Farmstead | " | 8 | 8 | 8 |
| **Crop Acreage** | | | | |
| Corn | " | 25 | 35 | 35 |
| Oats | " | 15 | 25 | 20 |
| Wheat | " | 6 | — | 35 |
| Oat hay | " | — | 10 | 15 |
| Soybean hay | " | 6 | — | — |
| Mixed hay | " | 32 | 20 | — |
| Korean lespedeza hay | " | — | — | 50* |
| Korean lespedeza pasture | " | — | — | 20* |
| **Crop Yield per Acre** | | | | |
| Corn | Bu. | 36 | 43 | 36 |
| Oats | " | 27 | 28 | 27 |
| Wheat | " | 14 | — | 14 |
| Oat hay | Tons | — | 0.9 | 0.9 |
| Soybean hay | " | 1.6 | — | — |
| Mixed hay | " | 0.9 | 1.5 | — |
| Korean lespedeza hay | " | — | — | 0.5 |
| **Livestock** | | | | |
| Cows kept | No. | 13 | 13 | 13 |
| Cows milked | " | 10 | 10 | 10 |
| Brood sows | " | 4 | 6 | 4 |
| Hens | " | 150 | 150 | 150 |
| **Livestock Production** | | | | |
| Cattle and calves | Lbs. | 7800 | 7800 | 7800 |
| Hogs | " | 8670 | 13005 | 8670 |
| Chickens | " | 750 | 750 | 750 |
| Butterfat | " | 1400 | 1400 | 1400 |
| Eggs | Doz. | 1050 | 1050 | 1050 |

| Item | | Present Plan | Corn, Oats, Red Clover Rotation | Corn, Oats, Wheat with Korean Lespedeza |
|---|---|---|---|---|
| **Products Sold** | | | | |
| Wheat | Bu. | 52 | — | 416 |
| Fat cows | No. | 2 | 2 | 2 |
| Fat calves | " | 8 | 8 | 8 |
| Hogs | " | 38 | 38 | 38 |
| Butterfat | Lbs. | 1115 | 1115 | 1115 |
| Chickens | " | 600 | 600 | 600 |
| Eggs | Doz. | 875 | 875 | 875 |
| **Value of Sales** | | | | |
| Crop sales | | $34 | $22 | $306 |
| Cattle and calves | | 492 | 492 | 492 |
| Hogs | | 574 | 875 | 574 |
| Chickens and eggs | | 259 | 259 | 259 |
| Butterfat | | 279 | 279 | 279 |
| Total | | 1638 | 1927 | 1910 |
| **Cash Expenses** | | | | |
| Hired labor | | 150 | 170 | 170 |
| Feed bought | | 258 | 61 | 45 |
| Seed | | 25 | 55 | 24 |
| Twine and threshing | | 27 | 34 | 65 |
| Fertilizer and lime | | 10 | 88 | 131 |
| Livestock expense | | 118 | 127 | 118 |
| Bldg. and fence expense | | 165 | 170 | 170 |
| Machinery expense | | 130 | 141 | 135 |
| Taxes and insurance | | 130 | 130 | 130 |
| Total | | 1013 | 976 | 988 |
| Net Cash Returns | | 625 | 951 | 922 |
| Capital Investment | | 10950 | 10950 | 10950 |

*The 50 acres of Korean lespedeza hay and 20 acres of Korean lespedeza pasture are double cropped with wheat and oats.

yields are increased by 7 bushels of corn, 1 bushel of oats, and 0.6 tons of hay. Fifteen acres of clover pasture is assumed to be equivalent to 20 acres of the present rotation pasture. The acreage and carrying capacity of the permanent pasture is assumed to remain unchanged.

The estimated increased grain production not only obviates the necessity of buying 350 bu. of corn as in the present organization but will enable the operator to keep two additional brood sows. In addition to increasing the yields of corn, oats and hay, the clover made possible by the application of limestone and phosphate would provide a better quality of hay, and by increasing the organic matter and humus in the soil would go far towards controlling the erosion which is now becoming disastrous even on this gently undulating topography. Soil fertility would be more nearly maintained whereas declining yields are characteristic of the present system.

With the assumptions made, the average annual return to the operator would be increased by $326. This would be true after enough time had elapsed for the plan to be in regular operation. If limestone were spread on all of the rotated land in the first three years the net income for that period would be less than that of the present organization.

In addition to the changes recommended for the rotated land, the permanent pastures could be improved in a variety of ways. Reseeding, the use of manure and commercial fertilizer, timely weed clipping and rotated grazing all have a place in the improvement of permanent pastures. The use of an annual rotation of small grain and Korean lespedeza on a part of the tillable permanent pasture would be a distinct benefit in the way of better seasonal distribution of grazing and increased soil fertility, especially if superphosphate were applied with the small grain.

*Corn, Oats, Wheat Rotation With Korean Lespedeza.*—A second proposed plan for a beef-breeding and fattening farm in Linn county is based on a corn, oats, wheat rotation with Korean lespedeza in the small grain (See Table 4). On this typical farm there would be 70 acres of Korean lespedeza each year following the small grain. This should furnish at least 25 tons of hay annually in addition to as much pasturage as is now obtained from the 20 acres of timothy and clover. The yield of hay might be somewhat more variable from year to year than the mixed hay now grown but the cutting of more than 25 tons in favorable years would insure the availability of this quantity of hay of good quality each year. The

use of a part of the oats for hay is not a new practice from the feeding standpoint and would allow for a greater early growth of Korean lespedeza. The use of this rotation more than doubles the acreage of corn, oats and wheat because all of the hay and rotation pasture is obtained by double cropping. It was assumed that the oats would be fertilized with 20 per cent superphosphate at the rate of 125 pounds per acre and the wheat at 200 pounds per acre. It was contemplated that the wheat would be sown after the Korean lespedeza in the oats had matured and without any seedbed preparation other than disking. Although the seeding of oats and wheat might be somewhat lighter than at present and corn would be grown on a larger proportion of the rotated land, the same yield per acre for these crops as at present is probably a conservative estimate of crop returns.

Enough finely ground limestone would be applied in the proposed plan to replace what would be removed by the crops grown, especially by the lespedeza. Two hundred pounds per acre applied every three years would somewhat more than meet this requirement. This would not, however, replace the lime that would be lost by leaching or help to correct the present lime deficiency. A charge was made for enough lespedeza seed to sow 35 acres every other rotation or once in six years. It was assumed that the remainder of the seed necessary would be harvested on the farm or would come from volunteer seeding of the previous crop.

The estimated livestock production for the recommended alternative organization was left the same as under the present plan. This is probably a conservative judgment because although the acreage of permanent pasture was left the same, the hay would undoubtedly be of better quality and the livestock would probably obtain more feed from the rotation pasture than at present. The seasonal distribution of pasturage during July and August would be improved so that one might be safe in assuming a somewhat higher milk production, a somewhat greater gain on calves, or by sparing the permanent pasture until later in the fall, a somewhat smaller winter feed requirement.

Using the same prices per unit for sales and expense items as in the present plan, the gross income for the lespedeza rotation would be $1,910, and the net returns to operator's labor and investment would be $922, or an increase of $297 as compared with the estimated income from the present organization. The sales of wheat and reduction in quantity of feed bought would much more than make up for the increased crop expense. This advantage would

be increased somewhat if an expected slight increase in livestock production were calculated.

Inasmuch as the returns from the two proposed rotations are subject to errors in estimation, the differences between them cannot be considered significant. Both should exceed the calculated expectations as related to the present method of management. The heavier lime application requires a much higher initial expenditure than the Korean lespedeza alternative and one would still have to face the greater risk of red clover failure from other causes. The red clover, lime, and fertilizer program does approach more closely, however, a permanent system of maintaining soil fertility. On the other hand the ability of Korean lespedeza to add nitrates to soils of low lime content is temporarily very useful even if it is planned to apply lime later to promote the growth of red clover, sweet clover and alfalfa. The relative certainty of getting a stand of Korean lespedeza, reduced labor and power in seedbed preparation of the nurse crop, and its capacity for growth during July and August when most other pastures are very short, promise this valuable crop an important place in the farming system in most parts of Missouri. Variations in both of these rotations may be necessary to meet the needs of an individual farm that may have unusual circumstances with respect to soil fertility or livestock organization.

**Putnam Silt Loam—Audrain County**

Putnam silt loam is a level to gently sloping prairie soil comprising a large area in northeastern Missouri. It is most commonly found in the Southern part of type-of-farming area 1-d shown in Figure 1. The drainage in this area is poor, the subsoil being too nearly impervious to permit the water to settle away and in places the topography being too nearly level to provide surface drainage. As a result, yields are adversely affected by even a light excess or deficiency in rainfall during the crop season. The soil of the entire area is extremely acid, this condition being most extreme in the more nearly level parts. This soil erodes very easily even on the least slope.

Clover has not been grown successfully in this region in recent years due to the extreme acidity of the soil. Very little lime has been used because of the expense for application, especially on farms not located close to a crusher. A heavier lime application would be necessary to promote the growth of red clover in this area than in most other parts of the State. In the last ten years soybeans have become the principal hay crop on account of the need

for a high-protein roughage for cattle. This crop has intensified the need to control erosion and maintain soil fertility. Korean lespedeza has been grown for several years and is becoming popular on account of the certainty of getting a stand practically every season. Thus far it has been used almost exclusively for pasture, however.

Corn, corn, oats, and soybeans make up a typical rotation over much of the area. Hogs are the leading source of income. The 48 farm records obtained in Audrain, Callaway, and Ralls counties showed an average of 38 per cent of the gross income from hogs, 36 per cent from cattle, 12 per cent from chickens, 8 per cent from crop sales, and 6 per cent from sheep. The distribution of farms by types shows a wide diversity of dominant enterprises on the farms of the area. Dairy cattle are important especially in the eastern part of the Putnam area, and on slightly more than one-half of the farms the fattening of hogs or cattle received the principal emphasis (See Table 2).

**Hogs, Beef-Breeding and Fattening Farms.**—One-sixth of the records obtained in the Audrain-Callaway-Ralls area were classified as hog, beef-breeding and fattening farms. A summarized budget to represent this kind of farm is shown in Table 5. The present organization of this type of farm has about two-thirds of the farm acreage in rotated crops. (Corn occupies about one-third of the crop land.) Other crops in order of importance are oats, soybeans, wheat, and mixed hay. Most of the wheat is fertilized. A part of the soybeans is cut for grain. Some of the oats are fed as hay.

Livestock for a 240-acre farm of this type consists of approximately 12 beef cows, 8 brood sows raising about 96 pigs in two litters each, and 125 hens with 200 chickens raised. Usually only enough cows are milked to furnish dairy products for the household. The calves raised are sold as fat calves or yearlings. In spite of the rather high proportion of crop land in grain crops it has been customary to buy about 800 bushels of corn on farms of this size and type.

Four horses and a tractor are a common power unit for farms of this size. The limited time available for seedbed preparation on account of unfavorable soil moisture conditions, together with the level topography and absence of rocks and stumps furnishes a somewhat greater advantage for a tractor in this area than in some others.

TABLE 5.—HOGS, BEEF BREEDING AND FATTENING FARM IN AUDRAIN COUNTY, PRESENT AND PROPOSED ORGANIZATION

| Item | | Present Plan | Proposed Plan |
|---|---|---|---|
| **Land Use** | | | |
| Size of farm | Acres | 240 | 240 |
| Harvested crop land | " | 128 | 140 |
| Rotation pasture | " | 12 | —* |
| Permanent pasture | " | 85 | 85 |
| Woods pasture | " | 8 | 8 |
| Farmstead | " | 7 | 7 |
| **Crop Acreage** | | | |
| Corn | " | 45 | 35 |
| Wheat | " | 10 | 17 |
| Oats | " | 30 | 18 |
| Soybeans | " | 8 | — |
| Winter barley | " | — | 35 |
| Soybean hay | " | 10 | 35 |
| Mixed hay | " | 15 | — |
| Oat hay | " | 10 | — |
| Korean lespedeza hay | " | — | 18* |
| Korean lespedeza pasture | " | — | 52* |
| Barley pasture | " | — | 35* |
| **Crop Yield per Acre** | | | |
| Corn | Bu. | 30 | 33 |
| Wheat | " | 19 | 17 |
| Oats | " | 28 | 28 |
| Soybeans | " | 12 | — |
| Winter barley | " | — | 30 |
| Soybean hay | Tons | 1.4 | 1.2 |
| Mixed hay | " | .6 | — |
| Oat hay | " | 1.0 | — |
| Korean lespedeza hay | " | — | 0.5 |
| **Livestock** | | | |
| Beef cows | No. | 12 | 28 |
| Brood sows | " | 8 | 6 |
| Hens, Jan. 1 | " | 125 | 125 |
| **Livestock Production** | | | |
| Cattle and calves | Lbs. | 8850 | 21500 |
| Hogs | " | 21240 | 15155 |
| Chickens | " | 600 | 600 |
| Eggs | Doz. | 1125 | 1125 |
| Butterfat | Lbs. | 200 | 200 |

| Item | | Present Plan | Proposed Plan |
|---|---|---|---|
| **Products Sold** | | | |
| Wheat | Bu. | 91 | — |
| Soybeans | " | 64 | — |
| Barley | " | — | 175 |
| Fat cows | No. | 2 | 4 |
| Fat calves | " | 4 | — |
| Fat yearlings | " | 5 | 19 |
| Hogs | " | 92 | 66 |
| Chickens | Lbs. | 450 | 450 |
| Eggs | Doz. | 900 | 900 |
| **Products Used in Home** | | | |
| Hogs | Lbs. | 900 | 900 |
| Chickens | " | 150 | 150 |
| Eggs | Doz. | 200 | 200 |
| Butterfat | Lbs. | 200 | 200 |
| **Value of Sales** | | | |
| Wheat | | $59 | $— |
| Soybeans | | 64 | — |
| Barley | | — | 88 |
| Cattle | | 609 | 1502 |
| Hogs | | 1414 | 990 |
| Chickens and eggs | | 243 | 243 |
| Total | | $2389 | $2823 |
| **Cash Expenses** | | | |
| Hired labor | | $180 | $225 |
| Feed bought | | 560 | 200 |
| Seed | | 12 | 101 |
| Twine and threshing | | 54 | 97 |
| Fertilizer and Lime | | 14 | 148 |
| Tractor fuel and oil | | 50 | 60 |
| Livestock expense | | 124 | 204 |
| Bldg. & fence expense | | 165 | 185 |
| Machinery expense | | 225 | 230 |
| Taxes and insurance | | 158 | 180 |
| Total | | $1542 | $1630 |
| Net Cash Returns | | 847 | 1193 |
| Capital Investment | | 14230 | 16300 |

*The 18 acres of Korean lespedeza hay and 52 acres of Korean lespedeza pasture would be double cropped following the winter barley, wheat, and oats.

The recommended organization for this type of farm (Table 5) suggests a change in the cropping system to a four-year rotation of corn, soybeans, winter barley, and Korean lespedeza, followed by oats or wheat with a volunteer seeding of Korean lespedeza. The winter barley[1] would provide about 45 animal unit days per acre of fall pasture, and a winter cover on soybean land. The 70 acres of lespedeza would add nitrates to a soil badly in need of them, increase greatly the pasturage available, and improve considerably the seasonal distribution of forage for grazing.

The barley, oats and wheat would be sown without plowing the seedbed. Disking or disking and harrowing should be sufficient preparation even for the wheat if the weeds have been kept clipped

[1]See University of Missouri Bulletin 353—"Winter Barley, A New Factor in Missouri Agriculture"—Etheridge, W. C.; Helm, C. A. and Brown, E. Marion.

and the lespedeza has been closely pastured. The wheat should not be sown until the lespedeza seed has matured so that it will not be necessary to reseed the lespedeza in the spring.

While the proposed plan reduces the acreage of corn by 22 per cent, the extent of double cropping allows for an increase of 30 acres of harvested crops and 75 acres of rotated pasture without changing the acreage of permanent pasture. It is planned that superphosphate should be applied to the small grain at the rate of 125 pounds per acre of oats, 150 pounds per acre of wheat, and 200 pounds per acre of winter barley. The estimated yield of wheat was reduced about 10 per cent below the present yield per acre because of the greater difficulty in preparing as good a seedbed. The estimated yield of corn per acre was increased about 10 per cent.

Korean lespedeza may be expected to produce 90 pasture unit days per acre, and winter barley 45 pasture unit days per acre. Thus, there will be sufficient forage to carry 16 additional cows and their offspring until marketed as fat yearlings. Fall pasturing of the barley and the greater use of bluegrass during the winter by virtue of its being grazed less during the summer and fall makes possible a longer grazing season than is now available. This makes it possible also to reduce the winter feed requirement per head.

The total grain requirement for cattle under the proposed plan will be 75 per cent greater than under the present plan. The increased acreage of small grain, however, more than makes up for the decreased supply of corn. The total production of grain will be about one-fourth greater than at present. Allowance for the sale of some barley for seed, the greater grain requirement for the increased number of cattle, and the purchase of 600 bushels less corn than is now bought, will require a decrease in hog production of about 25 per cent.

The proposed plan would involve increased expenditures especially for seed, threshing, fertilizer, feed grinding, and some increase in hired labor for harvesting small grain. There is also a calculated reduction of $424 in hog income. These items are more than counterbalanced, however, by $893 increased income from cattle and $360 less purchased feed. The estimated annual return for the operator's labor and capital is increased by $346 for a capital investment $2,070 greater than under the present farm organization. If it is possible to harvest some lespedeza seed in favorable seasons or if crop yield expectations prove to have been estimated too conservatively the advantage of proposed changes might be increased con-

siderably. The principal advantage, however, is that the depletion of soil fertility would be lessened and the erosive tendencies of present farm practices would be checked. The practice of strip cropping and contour farming would be very helpful in further prevention of soil erosion.

For farms or parts of farms which have already been depleted to a greater extent than is indicated by the estimated returns on farms on which records were taken, the proposed plan can be modified by leaving corn out of the rotation and reducing hog production still further until such time as the supply of organic matter and plant food in the soil has been increased to the point at which it is feasible to raise corn one year out of four. For the treatment of certain fields of very low fertility it is probably still better to use a one-year rotation of small grain (oats, wheat or rye) with fertilizer and Korean lespedeza continuously. Winter barley also can be used in this way but it will not furnish as much fall pasture as when following soybeans because it cannot be sown until the lespedeza seed has matured in October unless one desires to reseed it in the spring.

Whether corn should be left entirely out of the long-time cropping system depends on the expected yield per acre of corn as compared with other crops, the advantage of eliminating intertilled crops on account of lessening soil erosion, and the comparative incidence of several factors of cash expense. The answer will vary with type of soil, size of farm, and the internal organization of the farm.

In practically all parts of the State corn yields more than twice as many pounds of grain per acre as oats and wheat. No comparable series of acre yields for winter barley is available, but in the southern two-thirds of the State the yield of barley probably approaches the average yield per acre of corn more closely than does the yield of wheat or oats.

The growing of winter barley instead of corn would, however, make possible the use of the land for Korean lespedeza or soybeans in the same year. On the other hand, a higher proportion of the costs of growing barley are variable cash costs than is the case with corn.

Seed is a much larger item of cost in the production of barley than it is in the growing of corn. Threshing and twine are cash expenses for barley which are not incidental to corn production. Moreover, if the barley is to be fed, it should be ground for practically all classes of livestock. This is not true for corn. On the other hand, the

machinery cost per acre is slightly higher for corn than for barley. Barley has an advantage also in power and fuel cost per acre but this advantage does not offset the increased costs for seed, threshing, twine and grinding.

The hired labor cost comparison for growing small grain only versus the growing of corn and small grain would give a variety of answers depending on different farm situations. For the small farm on which no labor is now hired except for haying, shocking, and threshing, the shift to an increased acreage of small grain would undoubtedly increase the cost for hired labor. On a somewhat larger farm where seasonal month labor is hired, the corn-to-barley shift might make it possible to reduce the hired labor requirement. On farms having a hired man for twelve months there probably would be no saving in the cost of hired labor.

Any assumptions regarding the relative costs of fertilizer would be tied up with the assumed yield per acre of corn and winter barley. If the cost per acre of corn for hired labor and fertilizer are considered to be equal to those for barley, a comparison of other variable costs would be as follows:

Increase in Cash Cost Per Acre

| | Corn | Barley |
|---|---|---|
| Seed | — | $ .90 |
| Threshing | — | 1.16 |
| Twine | — | .25 |
| Grinding | — | 1.40 |
| Machinery | $ .10 | — |
| Power and fuel | $ .60 | — |
| Total | .70 | 3.71 |
| Net additional cost per acre of barley | | 3.01 |

This comparison assumes that winter barley would yield as many pounds of grain per acre as corn. With an average yield per acre of corn of 25 bushels, winter barley would be expected to yield 29 bushels. It also assumes that barley and shelled corn would be of equal value per pound. Seed was calculated at one cent per pound, threshing at four cents per bushel and grinding at ten cents per hundred pounds. The saving in power and fuel cost is based on the amount of grain feed saved by working the horses a smaller number of hours per year. It was estimated that there would be no saving in number of horses per farm. The estimated saving in horse feed

was increased somewhat to include the greater fuel saving on tractor farms.

If the above assumptions are representative of conditions on an individual farm the additional cash cost of growing barley to replace all of the corn grown would amount to $3.00 per acre. In addition weed control may be more of a factor in a system of farming in which the ground is never plowed. Moreover, very wet seasons may interfere with the harvest of the barley crop quite as much as with the seedbed preparation for corn. However, an increased acreage of Korean lespedeza or soybeans for hay might easily be worth more than $3.00 per acre to the farm organization. Decreased erosion due to the elimination of an intertilled crop is another important advantage of barley over corn that should be considered. The difficult evaluation of erosion control may oftentimes be a more important consideration than current cash expenses.

If acre yields in pounds of winter barley are obtained equal to the yield in pounds of shelled corn, there is no doubt that barley will replace even more of the corn acreage than is here recommended as a first step. Further experience by farmers will give more information concerning expected yield per acre, percentage of abandonment on account of winter killing, and the effects of weeds, disease, and insect damage.

As cropping practices are improved with respect to the acreage of small grain and legumes, it is expected that the yield per acre of corn will be increased relatively more than barley on land where the average yields of the two crops may now be assumed to be equal. As a general rule, where corn yields less than 20 bushels per acre, winter barley will usually return more than corn. Where corn yields average more than 30 bushels per acre it is doubtful if any of the small grains can entirely replace corn in the rotation.

### Lindley Loam—Adair County

Lindley loam is a very rolling soil type of glacial origin, occurring in large areas principally along the larger streams in northeastern Missouri. This soil was originally covered with timber and it is commonly known as white oak land. It is one of the less fertile soils of northern Missouri, being comparatively low in nitrogen, phosphorus, lime, and potassium. Erosion is a very serious problem due to the extreme steepness of the slopes. The surface soil is shallow, light in color, and often not greatly different from the subsoil.

The most important crops grown are corn, oats, and hay. The hay is timothy almost without exception, with occasionally some

red clover. A large part of the land in this area has been farmed continuously with exhaustive crops. Much of the land formerly culivated has been abandoned and is growing up to weeds and oak sprouts.

This soil type is not well adapted to grain farming and should be utilized largely for grazing. Very good grass will grow on much of this land although a constant fight must be carried on to prevent brush and sprouts from taking it. On farms that lie partly in the bottoms and on some of the broader ridges, general farming can still be successfully practiced if a good rotation is used. On the hilly land, however, the farms should be large with a very high percentage or all of the land in grass. The main enterprise should be beef cattle combined with sheep or goats. Dairying might be emphasized on farms not too far from marketing facilities. It would probably be cheaper to buy part of the corn used for feeding than to raise it.

On the 27 farms visited in Adair county, 53 per cent of the average value of production was from cattle, 27 per cent from hogs, 10 per cent from chickens, 5 per cent from sheep, and 5 per cent from crop sales. On only one of the farms were any cattle fattened. About one-half of the farms had an average of 33 ewes per farm. Thirty-five per cent of the cows on these farms were in dairy herds, 20 per cent in dual purpose herds, and 45 per cent in beef herds. About one-half of the cows were milked.

**Beef Breeding Farms.**—Fifteen of the 27 farms studied in this area were classified as beef breeding farms, 7 as dairy-hog farms, and 3 as dairy farms. On two-thirds of the beef breeding farms the cattle were sold as feeder calves. On the rest of the farms they were sold as yearlings. On six of the fifteen farms less than 20 cows were kept. Seven farms had from 20 to 30 cows and on two farms more than 30 cows were kept.

A representative organization of a beef breeding farm in Adair county is given in Table 6. On this 300 acre farm there are normally 25 acres of corn, 12 acres of oats, and 68 acres of mixed hay. Only 12 per cent of the farm area is in grain crops.

The yield per acre of corn on the Adair county farms included in Table 10 is higher than the average obtained on Lindley loam. This is because these farms included more Wabash silt loam bottom land than is typical of the area. Crops grown entirely on Lindley loam would not be expected to have so high an average yield per acre.

TABLE 6.—BEEF-BREEDING FARM IN ADAIR COUNTY, PRESENT AND PROPOSED ORGANIZATION

| Item | | Present Plan | Proposed Plan |
|---|---|---|---|
| **Land Use** | | | |
| Size of farm | Acres | 300 | 300 |
| Harvested crops | " | 105 | 80 |
| Rye and lespedeza pasture | " | — | 25 |
| Permanent pasture | " | 140 | 140 |
| Woods pasture | " | 40 | 40 |
| Farmstead and wasteland | " | 15 | 15 |
| **Crop Acreage** | | | |
| Corn | " | 25 | 18 |
| Oats | " | 12 | 18 |
| Rye | " | — | 9 |
| Wheat | " | — | 9 |
| Mixed hay | " | 68 | — |
| Oat hay-lespedeza | " | — | 26 |
| Korean lespedeza hay | " | — | 50* |
| Korean lespedeza pasture | " | — | 37* |
| **Crop Yield per Acre** | | | |
| Corn | Bu. | 28 | 31 |
| Oats | " | 26 | 28 |
| Rye | " | — | 15 |
| Wheat | " | — | 16 |
| Mixed hay | Tons | .78 | — |
| Oat hay-lespedeza | " | — | 1.0 |
| Korean lespedeza hay | " | — | 0.5 |
| **Livestock** | | | |
| Beef cows | No. | 25 | 30 |
| Ewes | " | 25 | 50 |
| Brood sows | " | 2 | 2 |
| Hens | " | 150 | 150 |
| Chickens raised | " | 225 | 225 |
| **Livestock Production** | | | |
| Cattle and calves | Lbs. | 10200 | 13975 |
| Sheep and lambs | " | 1700 | 3300 |
| Wool | " | 200 | 400 |
| Hogs | " | 4120 | 4120 |
| Chickens | " | 750 | 750 |
| Eggs | " | 1200 | 1200 |
| Butterfat | " | 200 | 200 |

| Item | | Present Plan | Proposed Plan |
|---|---|---|---|
| **Products Sold** | | | |
| Wheat | Bu. | — | 131 |
| Rye | " | — | 92 |
| Cull cows | No. | 3 | 4 |
| Feeder calves | " | 16 | 21 |
| Sheep and lambs | " | 24 | 47 |
| Hogs | " | 16 | 16 |
| Chickens | Lbs. | 600 | 600 |
| Eggs | Doz. | 1025 | 1025 |
| **Products Used in Home** | | | |
| Hogs | Lbs. | 700 | 700 |
| Chickens | " | 150 | 150 |
| Eggs | Doz. | 150 | 150 |
| Butterfat | Lbs. | 200 | 200 |
| **Value of Sales** | | | |
| Grain | | $— | $140 |
| Cattle and calves | | 582 | 798 |
| Hogs | | 237 | 237 |
| Sheep and lambs | | 104 | 204 |
| Wool | | 48 | 96 |
| Chickens and eggs | | 289 | 289 |
| Total | | 1260 | 1764 |
| **Cash Expenses** | | | |
| Hired labor | | 80 | 100 |
| Feed bought | | 62 | 48 |
| Seed | | 13 | 25 |
| Twine and threshing | | 17 | 48 |
| Fertilizer and lime | | — | 135 |
| Livestock expense | | 130 | 157 |
| Bldg. & fence expense | | 165 | 185 |
| Machinery expense | | 120 | 124 |
| Taxes and insurance | | 155 | 163 |
| Total | | 742 | 985 |
| Net Cash Returns | | 518 | 779 |
| Capital Investment | | 12550 | 13380 |

*The 50 acres of Korean lespedeza hay and 37 acres of Korean lespedeza pasture would be double cropped with small grain. Forty-four acres of the Korean lespedeza would be grown in connection with oats, 34 acres with rye, and 9 acres with wheat.

The breeding stock on this typical farm consists of 25 beef cows, 25 ewes, 2 brood sows, and 150 hens. One to two cows are milked for home use. Approximately 3 cull cows, 16 feeder calves at 450 pounds each, 24 sheep and lambs, and 17 hogs are sold annually. At the prices used (see Table 3) the gross income in addition to the value of products used in the home would be $1,260. After deducting $742 for expenses, $518 is left as the return to the operator for his labor and his capital investment of $12,550 at present valuation.

The proposed recommendation for this type of farm in Adair county involves the use of a three-year rotation of corn, oats, and wheat or rye, with Korean lespedeza in all of the small grain. This cropping system would be used on the best one-half of the present rotated land. This proportion would vary with the percentage of

very steep land and the present state of soil fertility. On the other one-half of the present rotated land no corn would be grown and the ground would not be plowed. On this part oat hay and Korean lespedeza, or rye and Korean lespedeza both pastured off, would be grown continuously.

By reducing the acreage of cultivated land, erosion should be considerably diminished. The application of superphosphate on the oats, wheat, and rye together with the beneficial effects of the lespedeza, should go far towards maintaining soil fertility. If the rye and lespedeza pasture will furnish 150 pasture unit days per acre and the lespedeza following the other small grain 90 unit days of grazing per acre, sufficient roughage and pasture will be available to keep an additional 5 cows and 25 ewes. The number of hogs and chickens in the proposed plan are the same as in the present organization.

Wheat, cattle, sheep and wool account for an increase in gross sales of $504. Increased expenditures especially for seed, threshing and fertilizer reduce the advantage of the proposed plan in net return to the operator for his labor and capital to $261. The capital investment would be increased by $830 by the recommended changes. Again the principal advantage of the proposed crop and livestock system is to avoid the loss of income and capital that is sure to accompany the continuation of present farm practices.

The steepest land that is now in rotation should eventually be in permanent pasture. The growing of Korean lespedeza in connection with small grain fertilized with superphosphate for a number of years is a valuable intermediate step in this direction. This practice will increase the available nitrates in the soil and make it much easier to get a permanent pasture started.

For farms on this soil type that are now being cropped more heavily than the one shown in Table 6 or for farms in this area below 200 acres in size it is important to consider an increase in the acreage operated per farm if farm incomes are to be maintained. On farms with a higher than average percentage of bottom land or where a large amount of feed is bought, satisfactory incomes may be earned on less than 200 acres. If the farm is entirely on the Lindley loam soil type and if the raising of beef cattle and sheep are to be the important enterprises, it should be no smaller than the one shown in Table 6. Even in the proposed organization it would be difficult to pay interest on the invested capital. If 5 per cent interest on the $13,380 capital were deducted from the opera-

tor's return, he would have only $167 for the labor of himself and his family in addition to the value of farm products used in the home.

### Summit Silt Loam—Cass County

Summit silt loam is a prairie soil covering a large area in west central Missouri (See Figure 1, type-of-farming area 1-e). The soil material is derived chiefly from limestone and shale. It is a relatively fertile soil, comparing favorably with the better glacial and loessial soils of northern Missouri. In topography the Summit silt loam is level to gently undulating except for the rolling phase which usually occurs along streams. The surface soil is typically acid although there are lime concretions and calcareous streaks at various depths in the subsoil. The rolling phase has limestone outcroppings which make it fully as valuable agriculturally as the more nearly level type except where erosion has taken place.

The principal grain crops are corn, oats and wheat. Small grain yields in this area compare very favorably with those on other agricultural soils in the State. Large corn yields are obtained occasionally but hot winds and summer droughts account for a lower average yield per acre of corn than in the counties farther north.

On the 25 farms on which records were obtained in this area, hogs accounted for 36 per cent of the income, cattle 34 per cent, crop sales 15 per cent, chickens 13 per cent, and sheep 2 per cent. Only one-fourth of these farms had any sheep. Hogs were raised on eighty per cent of the farms. Usually less than six sows were kept. About one-half of the farms had from five to twelve cows. Less than one-half of the cows were milked. Hens per farm ordinarily numbered from 100 to 175 at the beginning of the year.

There was a wide diversity in the type of farming on the farms studied in this area (See Table 2). Beef breeding was the most important enterprise on one-third of the farms. Hogs were the leading source of income on another one-third of the farms. General and cash-grain farms made up a larger proportion of the total farms than in any other area in which records were obtained. Farms averaged smaller in size than in any other area studied except the Greene and Franklin county areas.

**Small General Farms.**—A typical organization of small general farms in this area is shown in Table 7. An 80-acre farm in this area has about 20 acres in corn, 6 acres each of oats, wheat, and soybean hay and about 10 acres of mixed hay. The livestock consists of about 6 cows, of which 4 are milked, 2 brood sows, and 150 hens.

TABLE 7.—SMALL GENERAL FARM IN CASS COUNTY PRESENT AND PROPOSED ORGANIZATION

| Item | | Present Plan | Proposed Plan |
|---|---|---|---|
| **Land Use** | | | |
| Size of farm | Acres | 80 | 80 |
| Harvested crops | " | 48 | 58 |
| Rotation pasture | " | 10 | — |
| Permanent pasture | " | 18 | 18 |
| Farmstead | " | 4 | 4 |
| **Crop Acreage** | | | |
| Corn | " | 20 | 17 |
| Oats | " | 6 | 16 |
| Wheat | " | 6 | 17 |
| Soybean hay | " | 6 | — |
| Mixed hay | " | 10 | — |
| Alfalfa | " | — | 8 |
| Korean lespedeza hay | " | — | 6* |
| Korean lespedeza pasture | " | — | 27* |
| **Crop Yield per Acre** | | | |
| Corn | Bu. | 27 | 30 |
| Oats | " | 28 | 28 |
| Wheat | " | 16 | 16 |
| Soybean hay | Tons | 1.5 | — |
| Mixed hay | " | 0.9 | — |
| Alfalfa | " | — | 2.5 |
| Korean lespedeza hay | " | — | 0.5 |
| **Livestock** | | | |
| Cows kept | No. | 5 | 9 |
| Cows milked | " | 4 | 9 |
| Brood sows | " | 2 | 2 |
| Hens | " | 150 | 250 |
| Chickens raised | " | 225 | 350 |
| **Livestock Production** | | | |
| Cattle and calves | Lbs. | 3000 | 2050 |
| Hogs | " | 4765 | 4765 |
| Chickens | " | 675 | 1050 |
| Eggs | Doz. | 1225 | 2215 |
| Butterfat | Lbs. | 640 | 1890 |
| **Products Sold** | | | |
| Wheat | Bu. | 39 | 106 |
| Cull cows | No. | 1 | 1 |
| Veal calves | " | 2 | 6 |
| Fat yearlings | " | 2 | — |
| Hogs | " | 19 | 19 |
| Chickens | Lbs. | 550 | 925 |
| Eggs | Doz. | 1225 | 2215 |
| Butterfat | Lbs. | 408 | 1618 |
| **Products Used in Home** | | | |
| Hogs | Lbs. | 715 | 715 |
| Chickens | " | 125 | 125 |
| Eggs | Doz. | 150 | 150 |
| Butterfat | Lbs. | 200 | 200 |
| **Value of Sales** | | | |
| Wheat | | $25 | $69 |
| Cattle and calves | | 188 | 114 |
| Butterfat | | 102 | 404 |
| Hogs | | 281 | 281 |
| Chickens and eggs | | 322 | 573 |
| Total | | 918 | 1441 |
| **Cash Expenses** | | | |
| Hired labor | | — | 25 |
| Feed bought | | 125 | 146 |
| Seed | | 21 | 34 |
| Twine and threshing | | 16 | 42 |
| Fertilizer and lime | | 8 | 58 |
| Livestock expense | | 66 | 96 |
| Bldg. and fence expense | | 95 | 112 |
| Machinery expense | | 45 | 53 |
| Taxes and insurance | | 63 | 72 |
| Total | | 439 | 638 |
| Net Cash Returns | | 479 | 803 |
| Capital Investment | | 6200 | 6675 |

*The 27 acres of Korean lespedeza pasture and 6 acres of Korean lespedeza hay would be double cropped in connection with oats and wheat.

The cows are usually of mixed dairy and beef breeding. Milk production per cow is low. Sour cream is the principal dairy product sold. Some of the calves are raised and fattened and some are sold as veals.

On some farms of this type there may be even less livestock than is shown by the example in Table 7. In these cases a part of the feed grains may be sold for cash. In the typical organization presented it was considered to be a normal practice to buy a small quantity of additional corn on farms of this size. In other words, many small farms have an extensive type of organization similar to that of much larger farms in the community. This results in a low income to the operator. If the illustration in Table 7 is considered typical, the products to be sold at the prices assumed account for a gross income of only $918. The net return, in addition to the farm products used in the household, amounts to only $479

for an investment of $6,200, and for the labor of the operator and his family.

In suggesting a reorganization of a farm of this type, two considerations have been judged important. In the first place the recommended cropping system provides for the maintenance or increase of crop yields and minimizes the losses from soil erosion. In addition, the proposed plan is a more intensive organization of both crops and livestock which should be especially important on a small farm.

The proposed cropping system involves the use of a rotation of corn, oats and wheat with Korean lespedeza in both crops of small grain and with a field of alfalfa hay to be alternated with the regularly rotated land every three or four years. A charge was made for 16 tons of lime every four years for the alfalfa land, lespedeza seed for 17 acres per year, and for 125 to 150 pounds of superphosphate yearly on the wheat and oats. There would be somewhat more wheat available for sale but livestock would account for most of the increased income.

The livestock enterprise was intensified by increasing the number of cows to nine, by increasing production per cow from 160 pounds to 210 pounds of butterfat, and by increasing the number of hens from 150 to 250. All of the calves except replacement heifers would be vealed. The fattening of two yearlings per year would be discontinued.

The increased production per cow would be made possible by the higher quality of alfalfa for roughage, by better late summer pasturage of lespedeza, and by some improvement in quality of cows. A greater increase could be conservatively estimated if this last factor were emphasized. The quantity of concentrates to be fed per cow was also increased.

The increased number of livestock would be made possible without buying any more feed, except protein concentrates, than under the present plan. The double cropping of the Korean lespedeza in connection with small grain allows for an increase of 16 acres of harvested crops and 17 acres of rotation pasture as compared with the present plan of organization.

The increased quantity of hay required will be obtained from fewer acres than under the present plan. The estimated yield per acre of corn was increased by 11 per cent and the per acre yields of oats and wheat were left unchanged. It is contemplated that the ground would be plowed only once in the three year rotation. The wheat would be sown following oats after the lespedeza seed had matured

and with only disking for seedbed preparation. The increased fertilizer application and the influence of the lespedeza on the yield per acre of wheat would at least balance the unfavorable effects of less thorough seedbed preparation. If the Korean lespedeza is pastured out rather closely, the seed will have ripened somewhat earlier and the old growth will not be large enough to interfere seriously with disking for the wheat. No extra labor would need be hired except in harvesting the additional acreage of small grain or perhaps in haying.

In summing up the effects of the proposed changes in organization on income, the sales of wheat are increased by $44, butterfat by $302, and chickens and eggs by $251, while the sales of cattle and calves are $74 less than under the present plan. The increased value of sales under the proposed plan amounts to $523. An increased expenditure of $199, especially for fertilizer, lime, threshing, and livestock expense, was estimated to be necessary to fulfill the conditions set up under the recommended system. This leaves the operator a net increase of $324 for the use of his labor and capital. His capital investment would be increased by about $475 by the proposed changes.

On farms larger than 80 acres in size the increased number of cattle probably should be beef cattle rather than dairy cattle. The suggested increase in number of chickens would not generally apply to the larger farms in the area. An 80-acre general farm was chosen as a type in this area because it was as common as any other size and type of farm and also because it illustrates problems found on small farms in other areas. For the larger farms in this area, a recommendation similar to that given for Grundy silt loam would be appropriate.

Another recommendation for farms in this area would involve the application of limestone on all of the rotated land and the growing of red clover for hay and sweet clover for pasture. This recommendation would apply more often to farms on Summit silt loam than to farms on Putnam or Lindley loam, assuming an equal cost per ton of limestone application. A cropping program of this kind would account for a greater increase in yield per acre of crops than is shown in the 80-acre illustration in Table 7. Even if this more intensive system is contemplated for a long-time plan, the changes suggested by the reorganization in Table 7 constitute a logical stepping stone in that direction.

### Crawford Gravelly Loam—Greene County

The Crawford gravelly and silt loams are generally known as the red limestone lands on the western Ozark border in southwest Missouri. It is a level to gently rolling soil and probably the most fertile upland soil in the border Ozark region of southern Missouri. There is some moderately hilly land along the main streams, but when not too stony, is rarely too steep for cultivation. Being a much older soil than is found in the northern part of the State, the long process of weathering has removed most of the lime from the surface soil. There is also a lower content of phosphates, nitrogen and organic matter than in the northern Missouri soils. The open, porous nature of the soil, together with the lack of organic matter, causes it to dry out quickly.

The principal type of farming in Greene county is dairying. There are dairy cows on practically every farm in the county. Orcharding, poultry raising, and hog raising are also of some importance. There are very few beef cattle farms and practically no cash grain farms. In fact large quantities of feed grain are shipped in even in normal years. On the farms on which records were obtained 44 per cent of the income was from cattle, 22 per cent from crop sales (mostly wheat, grass seed, and fruit), 18 per cent from hogs, 15 per cent from chickens and 1 per cent from sheep.

The great importance attached to dairying in this county necessitates a large supply of pasturage. Probably more has been done here in the way of pasture improvement than in any of the other areas visited. Bluegrass does not produce a very dense sod in this area and many farmers have come to regard it as of minor importance in the pasture system. Orchard grass withstands the summer heat better than bluegrass and is preferred on the very gravelly land. Korean lespedeza has been sown on some of the permanent pastures and grain fields. Hop clover and common lespedeza grow voluntarily in most pastures in the spring months. Many farmers depend largely on rotated crops such as winter wheat, winter barley, oats, red clover, sweet clover, and sudan grass for pasture.

On the farms studied about one-fourth of the rotated land had been limed at the average rate of 2.3 tons per acre. It was reported customary to use commercial fertilizer on about one-fourth of the corn land and two-thirds of the wheat land. Twenty per cent superphosphate was the fertilizer usually applied. The proportion of land fertilized more nearly represents the proportion of farms using fertilizer than the proportion of the crop fertilized on each farm.

From five to twelve cows were commonly found on each farm although one-half of the farms had more than this number. Ninety-seven per cent of the cows were milked. About one-half of the farms visited had silos. Five-sixths of the butterfat was sold as whole milk. Seventy per cent of the farms normally kept brood sows, usually from one to four in number. Hens numbered from 100 to 175 on most farms. Egg production per hen was the highest and the weight of chickens raised per hen kept was the lowest of any area in which records were taken.

**Dairy-Hog Farms.**—Two-thirds of the farms studied in this area could be classified as dairy or dairy-hog farms. The dairy farms actually outnumbered the dairy-hog farms, but the latter type was chosen for illustrative purposes in the typical budget in Table 8 because there was a larger proportion of dairy-hog farms in this area than in any other area where records were taken.

TABLE 8.—DAIRY-HOG FARM IN GREENE COUNTY, PRESENT AND PROPOSED ORGANIZATION

| Item | | Present Plan | Proposed Plan* |
|---|---|---|---|
| **Land Use** | | | |
| Size of farm | Acres | 100 | 100 |
| Harvested crops | " | 66 | 69 |
| Rotation pasture | " | 3 | — |
| Permanent pasture | " | 21 | 21 |
| Woods pasture | " | 5 | 5 |
| Farmstead | " | 5 | 5 |
| **Crop Acreage** | | | |
| Corn | " | 18 | 17 |
| Oats | " | 13 | 8 |
| Wheat | " | 15 | 17 |
| Winter barley | " | 4 | 9 |
| Soybeans | " | — | 4 |
| Soybean hay | " | 6 | 5 |
| Clover and timothy hay | " | 10 | 9 |
| Korean lespedeza hay | " | 6** | — |
| Korean lespedeza pasture | " | 4** | 25** |
| Barley fall pasture | " | 4** | 9** |
| **Crop Yield per Acre** | | | |
| Corn | Bu. | 30 | 34 |
| Oats | " | 28 | 28 |
| Wheat | " | 16 | 16 |
| Winter barley | " | 25 | 28 |
| Soybeans | " | — | 12 |
| Soybean hay | Tons | 1.5 | 1.5 |
| Clover and timothy hay | " | 1.0 | 1.5 |
| **Livestock** | | | |
| Dairy cows | No. | 10 | 10 |
| Brood sows | " | 2 | 2 |
| Hens | " | 175 | 175 |
| **Livestock Production** | | | |
| Whole milk | Cwt. | 480 | 540 |
| Cattle and calves | Lbs. | 2700 | 2700 |
| Hogs | " | 4850 | 4850 |
| Chickens | " | 600 | 600 |
| Eggs | Doz. | 1610 | 1610 |

| Item | | Present Plan | Proposed Plan |
|---|---|---|---|
| **Products Sold** | | | |
| Wheat | Bu. | 82 | 111 |
| Whole milk | Cwt. | 413 | 473 |
| Cull Cows | No. | 2 | 2 |
| Veal calves | " | 6 | 6 |
| Hogs | " | 22 | 22 |
| Chickens | Lbs. | 500 | 500 |
| Eggs | Doz. | 1410 | 1410 |
| **Products Used in Home** | | | |
| Hogs | Lbs. | 500 | 500 |
| Chickens | " | 100 | 100 |
| Milk | " | 5000 | 5000 |
| Eggs | Doz. | 175 | 175 |
| **Value of Sales** | | | |
| Wheat | | $53 | $72 |
| Whole milk | | 578 | 662 |
| Cattle and calves | | 135 | 135 |
| Hogs | | 302 | 302 |
| Chickens and eggs | | 352 | 352 |
| Total | | 1420 | 1523 |
| **Cash Expenses** | | | |
| Hired labor | | 30 | 30 |
| Feed bought | | 170 | 48 |
| Seed | | 25 | 12 |
| Twine and threshing | | 40 | 53 |
| Fertilizer and lime | | 16 | 89 |
| Livestock expense | | 116 | 121 |
| Bldg. and fence expense | | 125 | 130 |
| Machinery expense | | 115 | 115 |
| Taxes and insurance | | 100 | 100 |
| Total | | 737 | 698 |
| Net Cash Returns | | 683 | 825 |
| Capital Investment | | 8650 | 8650 |

*The proposed cropping system involves a rotation of corn, soybeans, winter barley and red clover on 35 acres and corn, oats, wheat, wheat with Korean lespedeza in the small grain, on 34 acres.
**Double cropped acreage.

The typical organization shown in Table 8 is for a 100-acre farm with 69 acres of rotated crop land. There are normally more than twice as many acres of small grain and hay as there are of corn. The high per acre yields of crops shown in Table 10 indicate there was a somewhat greater degree of selection of the better farmers among those interviewed in this area than in the other areas thus far described.

The livestock in this typical organization consists of 10 dairy cows, 2 brood sows raising two litters each, and 175 hens. All of the milk available for sale is ordinarily sold as whole milk and all calves are vealed except those kept for replacement. To keep this number of livestock, farmers feed a high proportion of the wheat raised and buy some corn and protein concentrates for cows, chickens, and hogs.

The gross sales for this farm with assumed production and prices would amount to $1,420. Farm expenses add to $737, leaving $683 net return to the operator for his investment of approximately $8,650 and for the labor of himself and his family during the year. This is in addition to the value of products obtained from the farm.

The proposed recommendation for this type of farm involves the use of a cropping system with two rotations. On the most nearly level one-half of the crop land, a four year rotation of corn, soybean hay, winter barley, and red clover hay, would be used. Another four year rotation of corn, oats, and two years of wheat, with Korean lespedeza in the small grain, would be used on the other one-half of the crop land. This would allow for 25 acres of lespedeza pasture in addition to 9 acres of fall barley pasture. The acreage of wheat, winter barley, and soybeans would be increased somewhat. The acreage of oats would be reduced, and the acreage of corn and clover-timothy hay would be about the same as under the present plan.

The mixed hay under the proposed plan would be largely clover rather than being mostly timothy with a sprinkling of clover as it is at present. This would be made possible by the application of two and one-half tons of ground limestone per acre every nine years on the 35 acres of most nearly level land. Allowance is made for the application of 200 pounds of finely ground limestone per acre on the other 34 acres of rotated land every four years. This would replace the lime extracted from the soil by the crops grown but would not allow for any considerable loss by leaching.

In the proposed plan, a charge is made for superphosphate to be applied to the oats at the rate of 125 pounds per acre, to the wheat

at the rate of 150 pounds per acre, and to the barley at 200 pounds per acre. The estimated yield per acre of corn is increased by 13 per cent, winter barley by 12 per cent, and mixed hay by 50 per cent. The yield per acre of oats and wheat which would be grown on the more rolling land is not increased. In the calculated expenses for the proposed plan no charge is made for lespedeza seed. After the plan has been in operation for a few years, this expense may be avoided by harvesting seed in favorable season when the pasture would not be completely utilized.

The increased acreage of barley pasture in the fall and wheat pasture during the winter should decrease somewhat the quantity of hay necessary during the winter feeding season. The increased pasturage of Korean lespedeza available during the summer would enable the production per cow to be increased from 4,800 pounds to 5,400 pounds of milk without any increase in total quantity of concentrates fed. The protein concentrates formerly purchased would be replaced by the use of soybeans and the increased pasturage available. By substituting barley for a part of the corn formerly fed to cattle and hogs, especially to the milk cows, it would not be necessary to purchase corn.

After Korean lespedeza had been grown on all the crop land for a few years, plowing would be necessary only for corn and soybeans. This would probably mean less labor and power in seedbed preparation than is used in the present cropping system. An increased charge for fencing has been made to provide for pasturing the lespedeza on all of the grain fields.

The gross income for the proposed plan as shown in Table 8 is $103 greater than for the present organization. A saving in purchased feed more than balances the increase in other costs so that there is an estimated decrease in annual expenditures of $39. This leaves a net advantage of $142 in yearly returns to the operator for making the changes suggested. The probability that returns from present methods will not be maintained in the future on account of declining fertility should also be considered.

Despite the fact that the present farm organization in this area approaches the recommended system perhaps more closely than in the areas so far considered, it is probable that the financial comparison shown in Table 8 is a conservative judgment of the benefits to be derived from the proposed changes. While some winter barley, wheat, and Korean lespedeza are now pastured, the proposed system provides for an increase of at least 25 acres of such pasture without any increase in livestock numbers. There may actually be

an increased yield of oats and wheat on account of the influence of the lespedeza and the increased fertilizer application. In addition, soil fertility would be more nearly maintained, erosion losses would be minimized, and the reduced summer grazing of permanent pastures would give them a chance to be restored to their previous grazing capacity.

### Union Silt Loam—Franklin County

The Union silt loam is a rolling, hilly soil commonly found over the greater part of the northern and northeastern border of the Ozark region of Missouri (Type-of-farming area 4, See Figure 1). It occurs mostly south of the Missouri River although there is an extensive area north of the river in Callaway, Montgomery and Warren counties. Erosion is a serious problem on this soil type and near the larger rivers a high proportion of the land is too steep for cultivation. This soil is particularly deficient in phosphorus and nitrogen. The lime deficiency is not nearly as marked as in northeastern and southwestern Missouri. Clovers are often grown successfully without the application of lime, which proves very helpful in maintaining the supply of nitrogen.

For the most part the Union silt loam is very well drained. The subsoil is distinctly friable and is rarely heavier than a silty clay. The soil is too low in fertility and washes too easily to permit the growing of crops requiring frequent cultivation. Wheat is probably the most important crop grown. As a rule, corn growing is confined to the creek bottom land and hardly ever is it grown more than one year in succession on rolling land. Clover has always been the principal hay crop although farmers have experienced difficulty in getting stands in late years. Fertilizer is applied rather generally to wheat. Where lime is also applied, clover seems to be a more dependable crop.

Dairying is the principal livestock enterprise. Poultry raising is also important. The St. Louis market offers an excellent outlet for both dairy and poultry products. A few hogs are raised on most farms, primarily for the family meat supply. Beef cattle also are of minor importance. There are practically no sheep raised in the county. On the farms visited in this area, 49 per cent of the gross income was from cattle, 20 per cent from chickens, 16 per cent from hogs, 14 per cent from crop sales and 1 per cent from sheep.

**Dairy Farms.**—About sixty per cent of the farms studied in this area were classified as dairy or dairy-hog farms (See Table 2). A typical organization for a 140-acre dairy farm in Franklin county is shown in Table 9. The 70 acres in crops are usually made up of

TABLE 9.—DAIRY FARM IN FRANKLIN COUNTY, PRESENT AND PROPOSED ORGANIZATION

| Item | | Present Plan | Proposed Plan |
|---|---|---|---|
| **Land Use** | | | |
| Size of farm | Acres | 140 | 140 |
| Crop land | " | 70 | 70 |
| Permanent pasture | " | 33 | 33 |
| Woods pasture | " | 15 | 15 |
| Farmstead and woods | " | 22 | 22 |
| **Crop Acreage** | | | |
| Corn | " | 12 | 12 |
| Oats | " | 5 | 12 |
| Wheat | " | 25 | 26 |
| Oat hay | | — | 10 |
| Mixed hay | " | 20 | — |
| Winter barley | " | — | 10 |
| Soybean hay | " | 8 | 10* |
| Korean lespedeza hay | " | — | 18* |
| Korean lespedeza pasture | " | — | 30* |
| Winter barley pasture | " | — | 10* |
| **Crop Yield per Acre** | | | |
| Corn | Bu | 32 | 32 |
| Oats | " | 26 | 25 |
| Wheat | " | 16 | 16 |
| Winter barley | " | — | 30 |
| Soybean hay | Tons | 1.5 | 1.5 |
| Mixed hay | " | 0.8 | — |
| Korean lespedeza hay | " | — | 0.5 |
| Oat hay | " | — | 1.0 |
| **Livestock** | | | |
| Dairy cows | No. | 12 | 16 |
| Brood sows | " | 1 | 1 |
| Hens, Jan. 1 | " | 180 | 180 |
| Chickens raised | " | 270 | 270 |
| **Livestock Production** | | | |
| Cattle and calves | Lbs. | 2675 | 3050 |
| Hogs | " | 1330 | 1330 |
| Chickens | " | 900 | 900 |
| Whole milk | Cwt. | 540 | 800 |
| Eggs | Doz. | 1620 | 1620 |
| **Products Sold** | | | |
| Wheat | Bu. | 154 | 294 |
| Whole milk | Cwt. | 464 | 716 |
| Cull cows | No. | 2 | 2 |
| Veal calves | No. | 7 | 10 |
| Hogs | " | 3 | 3 |
| Chickens | Lbs. | 750 | 750 |
| Eggs | Doz. | 1415 | 1415 |
| **Products Used in Home** | | | |
| Hogs | Lbs. | 700 | 700 |
| Whole milk | Lbs. | 5600 | 5600 |
| Chickens | " | 150 | 150 |
| Eggs | Doz. | 175 | 175 |
| **Value of Sales** | | | |
| Wheat | | $100 | $191 |
| Whole milk | | 696 | 1074 |
| Cattle and calves | | 133 | 160 |
| Hogs | | 42 | 42 |
| Chickens and eggs | | 388 | 388 |
| Total | | 1359 | 1855 |
| **Cash Expenses** | | | |
| Hired labor | | 75 | 125 |
| Feed bought | | 137 | 103 |
| Seed | | 27 | 33 |
| Twine and threshing | | 36 | 63 |
| Fertilizer and lime | | 34 | 103 |
| Livestock expense | | 93 | 111 |
| Bldg. and fence expense | | 140 | 161 |
| Machinery expense | | 125 | 132 |
| Taxes and Insurance | | 98 | 105 |
| Total | | 765 | 936 |
| Net Cash Returns | | 594 | 919 |
| Capital Investment | | $200 | 8750 |

*The 18 acres of Korean lespedeza hay and 30 acres of Korean lespedeza pasture would be double cropped in connection with oats and wheat. Winter barley and soybean hay are double cropped on 10 acres.

about 12 acres of corn, 25 acres of wheat, 5 acres of oats, 8 acres of soybean hay, and 20 acres of mixed hay. All of the corn is cut and husked out of the shock on most farms.

A typical number of livestock for such a farm consists of about 12 dairy cows, 1 brood sow, and 180 hens, with about 270 chickens raised. All of the calves raised are usually vealed except the heifers kept for replacement. The milk produced is ordinarily sold as whole milk for distribution in St. Louis.

After deducting the quantities of milk, eggs, chickens, and hogs that were ordinarily used in the household, there was available for sale on a farm of this size products with a total value of $1359. Expenses shown in Table 9 amount to $765, leaving a net return to the operator of $594. The value of farm products used in the household should be added to this figure which represents the return on an investment of $8,200 as well as for the labor of the operator and his family for a year.

In recommending a cropping system for a typical farm in this area, no corn was suggested for the twenty acres of crop land of lowest fertility or most rolling topography. On ten acres a continuous rotation of oats and Korean lespedeza was used in the proposed set-up. On another ten acres, soybean hay and winter barley grown continuously is suggested. For the other fifty acres, a rotation of corn, wheat two years, followed by oats, with Korean lespedeza in all of the small grain would be used. This accounts for a total of 12 acres of corn, 48 acres of small grain, 38 acres of hay, and 41 acres of pasture on the rotated land.

In the proposed plan a charge was made for superphosphate to be applied to the wheat, barley, and oats. Only a light application of fine limestone was contemplated. This would prevent any greater lime deficiency in the soil than now exists. On this soil plowing should be necessary only in preparation of the seedbed for corn. In the year in which wheat follows wheat, the lespedeza should be pastured closely so that the seed would mature somewhat more quickly and so that any excess growth would not interfere with disking for wheat. The lespedeza seed must be allowed to mature to avoid the necessity of reseeding the following spring.

In estimating the influence of the proposed cropping system on the production of livestock, the number of dairy cows kept was increased from 12 to 16, and the production per cow was increased from 4,500 pounds to 5,000 pounds of milk. This should be made possible by the increased quantity of pasturage available and by the addition of 130 pounds of grain per cow annually in the ration. The better seasonal distribution of pasturage brought about by the grazing of Korean lespedeza and winter barley in the summer and fall is another important factor in increasing production per cow. The feed requirements of other livestock would remain unchanged except for the substitution of some barley for corn.

The income statement in Table 9 shows an expected increase in sales for the proposed organization of $91 of wheat, $378 of milk, and $27 of veal calves. With incomes from hogs and chickens remaining unchanged, the total increase in gross income would be $496. In addition, it would be necessary to buy somewhat less feed for the increased number of livestock than is now required. Other expenses would be increased, however, so that the calculated net advantage of the proposed system would be $325. The capital investment would be increased from $8,200 to $8,750.

As is true of the budgets given for farms in other parts of the State, the estimated increased income does not represent the full

advantage of the recommended cropping system. The maintenance of soil fertility and the decreased rate of soil erosion are advantages that are difficult to evaluate in a given year but may be the most important considerations over a period of years.

## FARM BUDGET FORM

Only a few of the typical crop and livestock systems in specified areas could be treated in this bulletin. Even in a specified area there are many farms on which the usual recommendations for crop and livestock organization are not well adapted. The same method of analyzing the organization of a farm is useful, however, on off-type farms within an area or on farms in widely separated areas where the usually recommended cropping systems differ greatly. In all situations the organization of the farm should be studied from the standpoint of net returns to the farm as a whole over a period of years.

To assist farmers and others in a solution of farm organization problems, the farm budget form which has proved very useful in the preparation of budgets in this bulletin is also included. The figures given are for the Franklin county dairy farm on Union silt loam. Farm account records for a number of years would be of considerable assistance in filling out the items under "present organization."

After the figures for the present crop and livestock organization and the details concerning feed and expense items have been listed, the logical next step is to consider the changes in crop acreage and cropping practices which would better maintain the fertility of the soil and increase production over a period of years. The effects of these changes should then be traced to the distribution of feed to livestock, livestock production, crop and livestock expense and to net farm income. Information concerning the effects of changes in crop rotations and cropping practices on crop yields and carrying capacity of pastures is necessary to make a wise selection of changes to be made. It may be necessary to make several calculations for varying kinds and degrees of change before one is satisfied that he has improved his present or normal organization.

Mimeographed copies of this farm budget form may be obtained by writing to the Department of Agricultural Economics of the University of Missouri at Columbia, Missouri, or to the Bureau of Agricultural Economics, Department of Agriculture, Washington, D. C.

## SUMMARY

The acreage and yield per acre of corn in northern Missouri has declined markedly since 1910. This was true even before the unfavorable seasons of 1934, 1935, and 1936. Increased erosion of the surface soil promises a continued decrease in crop and livestock production if systems of land use emphasizing the conservation of soil resources are not followed on a larger proportion of farms.

A program of soil conservation on an individual farm may decrease the current net income by decreasing sales or increasing costs or both. It is necessary to consider production over a period of five to ten years together with a consideration of improved or impaired soil resources in correctly evaluating alternative farm organizations.

On the Grundy silt loam it is not so important from the soil fertility standpoint that there should be a decrease in the percentage of farm land in grain as that the rotated hay and pasture should consist of legumes rather than timothy. There should be an increased application of limestone and phosphate to make possible the growth of red clover, sweet clover, and alfalfa on this potentially productive soil. There should be a large increase in the acreage of Korean lespedeza sown in the small grain where it is not feasible to grow red clover. Korean lespedeza is also very valuable in supplementing bluegrass pasture in July and August when ordinarily the carrying capacity of permanent pastures is seasonally low.

On Putnam silt loam where a much heavier lime application is necessary to make possible the growth of most legumes, the use of Korean lespedeza, double-cropped with small grain should receive even greater emphasis. The use of winter barley following soybean hay provides a cover crop during the winter, increases the quantity of fall pasturage, and compares favorably in yield of grain with corn in many parts of Missouri.

The size of many of the farms located on Lindley loam should be greatly increased. Beef cattle and sheep should probably be the principal enterprises. Only on the small area of bottom land and on the broader ridges should any general farming be practiced.

On the small general farms on Summit silt loam as well as on several other soil types the farm organization should be considerably intensified by the growing of higher yielding legumes and by increasing per acre yields of crops and milk production per cow. While these suggestions are also applicable to many larger farms it is especially important on extensively organized small farms with a gross income of less than $1,000.

On the Crawford gravelly loam in Southwestern Missouri the greater use of Korean lespedeza during the summer, and winter barley for pasturage during the fall would probably increase milk production per cow, decrease the quantity of winter roughage required, and lessen the quantity of purchased concentrates.

On the dairy farms on Union silt loam the double-cropping of Korean lespedeza following small grain and of winter barley following soybeans for hay is also suggested. The increase in total pasturage available, the better seasonal distribution of grazing, and a slight increase in grain fed per cow would make it possible to increase the number of cows as well as the milk production per cow.

If some of the practices suggested are not put into effect, crop and livestock production will decline still further, soil resources will be still further diminished by depletion and erosion, and future incomes will be reduced.

## APPENDIX

Not all of the Tables 10 to 22 have been referred to in the text of the bulletin. They may be useful, however, to those who are interested in the detailed figures by type-of-farming areas, concerning the acreage and yield per acre of crops, livestock numbers and production, quantities of feed fed to specific classes of livestock, fertilizer practices, building and equipment charges, and farm products used in the household.

## TABLE 10.—AVERAGE ACREAGE AND YIELD PER ACRE OF CROPS
(Normals per farm figure for 10 areas in Missouri)

| Item | | Northern Meat Production Area | | | | | | Western Corn and Small Grain | Ozark Plateau Dairy | | Ozark Border Dairy Wheat | Average Ten Areas |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | a | b | | c | d | e | | | | | |
| Counties in which farms were located | | Clinton | Linn | Mercer | Adair | Audrain Callaway Ralls | Cass | St. Clair Vernon Cedar | Greene | Webster Wright | Franklin | |
| Farms | Number | 31 | 44 | 25 | 27 | 48 | 25 | 22 | 24 | 22 | 26 | 294 |
| Per farm | | | | | | | | | | | | |
| Corn (grain) | Acres | 78 | 40 | 29 | 22 | 54 | 49 | 66 | 22 | 15 | 19 | 41 |
| Silage | " | 1 | 1 | — | — | 3 | 2 | 2 | 6 | 5 | 3 | 2 |
| Oats | " | 37 | 16 | 11 | 10 | 23 | 24 | 37 | 18 | 8 | 6 | 19 |
| Wheat | " | 16 | 4 | 2 | 1 | 12 | 15 | 28 | 20 | 14 | 31 | 14 |
| Soybeans (grain) | " | 3 | 1 | 1 | 1 | 5 | 1 | 1 | 0 | 0 | 0 | 2 |
| Soybean hay | " | 5 | 9 | 2 | 4 | 16 | 6 | 9 | 5 | 3 | 3 | 7 |
| Other hay | " | 39 | 44 | 48 | 53 | 27 | 13 | 24 | 16 | 34 | 18 | 32 |
| Other crops | " | 2 | — | 2 | — | 3 | 4 | 7 | 10 | 1 | 4 | 3 |
| Total crops | " | 181 | 115 | 95 | 91 | 143 | 114 | 174 | 97 | 80 | 84 | 120 |
| Rotated pasture | " | 16 | 16 | 2 | 4 | 22 | 2 | 12 | 27 | 8 | 10 | 13 |
| Permanent pasture tillable | " | 90 | 80 | 88 | 57 | 71 | 57 | 84 | 21 | 45 | 29 | 64 |
| Open pasture not tillable | " | 18 | 22 | 36 | 55 | 8 | 21 | 18 | 16 | 42 | 17 | 24 |
| Woods pasture | " | 7 | 17 | 17 | 45 | 21 | 3 | 2 | 7 | 26 | 18 | 17 |
| Woods not pastured | " | — | 3 | 2 | — | 2 | — | — | 1 | 22 | 14 | 4 |
| Farmstead, etc. | " | 13 | 8 | 12 | 13 | 9 | 7 | 14 | 8 | 11 | 10 | 10 |
| Total operated | " | 325 | 261 | 252 | 265 | 276 | 204 | 304 | 177 | 234 | 182 | 252 |
| Yield per acre | | | | | | | | | | | | |
| Corn | Bushels | 42.7 | 36.9 | 36.4 | 37.9 | 29.0 | 29.8 | 23.3 | 35.5 | 26.4 | 35.4 | 33.6 |
| Oats | " | 41.4 | 27.5 | 31.5 | 28.9 | 28.1 | 30.3 | 26.6 | 32.5 | 25.7 | 26.0 | 31.2 |
| Wheat | " | 19.4 | 13.2 | 18.2 | 19.5 | 19.1 | 16.8 | 14.5 | 15.3 | 13.9 | 17.4 | 16.7 |
| Soybean seed | " | 11.3 | 14.6 | 12.0 | 10.9 | 11.9 | 12.0 | 10.8 | — | — | — | 12.0 |
| Soybean hay | Tons | 2.00 | 1.66 | 2.00 | 2.01 | 1.41 | 1.82 | 1.38 | 1.51 | 1.70 | 1.52 | 1.59 |
| Other hay | " | 1.32 | .83 | .81 | .92 | .98 | 1.76 | 1.01 | 1.86 | 1.12 | 1.36 | 1.06 |

## TABLE 11.—LIVESTOCK NUMBERS AND PRODUCTION
(Normal per farm figures for 10 areas in Missouri)

| Item | | Northern Meat Production Area | | | | | | Western Corn and Small Grain | Ozark Plateau Dairy | | Ozark Border Dairy Wheat | Average Ten Areas |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | a | b | | c | d | e | | | | | |
| Counties in which farms were located | | Clinton | Linn | | Mercer | Adair | Audrain Callaway Ralls | Cass | St. Clair Vernon Cedar | Greene | Webster Wright | Franklin | |
| Farms | Number | 31 | 44 | | 25 | 27 | 48 | 25 | 22 | 24 | 22 | 26 | 294 |
| Livestock per farm | | | | | | | | | | | | | |
| Workstock | " | 5.7 | 4.6 | | 3.7 | 4.4 | 5.2 | 5.2 | 6.0 | 4.4 | 3.6 | 3.5 | 4.7 |
| Cows | " | 11.9 | 17.8 | | 17.8 | 21.9 | 15.4 | 15.6 | 16.0 | 18.6 | 20.9 | 12.1 | 16.6 |
| Other cattle, Jan. 1 | " | 31.5 | 15.6 | | 19.3 | 17.4 | 18.6 | 12.2 | 22.4 | 11.1 | 12.4 | 11.3 | 17.5 |
| Mature sheep | " | 8.1 | 18.8 | | 17.2 | 15.7 | 21.5 | 6.7 | 10.5 | 4.6 | 5.5 | 1.5 | 12.7 |
| Brood sows | " | 22.0 | 4.8 | | 3.3 | 3.1 | 6.5 | 4.3 | 5.7 | 2.2 | 1.5 | 1.4 | 5.9 |
| Pigs raised | " | 221 | 53 | | 41 | 35 | 72 | 50 | 70 | 29 | 20 | 20 | 64 |
| Chickens kept | " | 115 | 152 | | 129 | 92 | 140 | 133 | 191 | 180 | 126 | 159 | 141 |
| Chickens raised | " | 191 | 266 | | 191 | 138 | 234 | 182 | 203 | 193 | 153 | 211 | 204 |
| Cows in dairy herds | Per cent | 29 | 15 | | 10 | 35 | 33 | 12 | 18 | 92 | 50 | 69 | 34 |
| Cows in dual purpose herds | " | 25 | 21 | | 16 | 20 | 9 | 35 | 17 | 8 | 31 | 24 | 20 |
| Cows in beef herds | " | 46 | 64 | | 74 | 45 | 58 | 53 | 65 | 0 | 19 | 7 | 46 |
| Feeder cattle bought | Number | 24 | 3 | | 5 | 4 | 5 | — | 10 | 3 | 1 | 4 | 6 |
| Fat cattle sold | " | 30 | 9 | | 11 | 2 | 10 | 6 | 18 | 4 | 4 | 6 | 10 |
| Litters per 100 sows | " | 190 | 176 | | 198 | 194 | 180 | 198 | 200 | 200 | 197 | 200 | 189 |
| Weight per hog sold | Pounds | 208 | 207 | | 213 | 213 | 213 | 216 | 221 | 210 | 181 | 175 | 210 |
| Farms with tractor | Per cent | 32 | 16 | | — | — | 33 | 16 | 18 | 4 | 18 | 35 | 19 |
| Men per farm | Number | 2.32 | 1.66 | | 1.56 | 1.63 | 1.98 | 1.85 | 2.15 | 2.18 | 1.59 | 1.83 | 1.88 |
| Livestock production | | | | | | | | | | | | | |
| Butterfat per cow kept | Pounds | 62 | 48 | | 23 | 41 | 69 | 45 | 39 | 183 | 86 | 127 | 69 |
| Butterfat per cow milked | " | 111 | 133 | | 112 | 85 | 148 | 116 | 123 | 189 | 119 | 143 | 135 |
| Butterfat sold as sour cream | Per cent | 63 | 74 | | 100 | 63 | 31 | 74 | 50 | 11 | 21 | 19 | 36 |
| Butterfat sold as milk | " | 37 | 22 | | — | 21 | 69 | 26 | 50 | 85 | 49 | 77 | 57 |
| Total butterfat sold | " | 66 | 79 | | 60 | 78 | 79 | 68 | 64 | 92 | 88 | 85 | 81 |
| Beef produced per farm | Pounds | 17460 | 11076 | | 13706 | 12591 | 10722 | 9257 | 13966 | 6226 | 9580 | 6421 | 11196 |
| Fat beef of total beef gain | Per cent | 89 | 54 | | 56 | 13 | 54 | 58 | 75 | 26 | 34 | 48 | 55 |
| Hogs produced per farm | Pounds | 45680 | 10935 | | 10137 | 7724 | 15383 | 12303 | 15350 | 7299 | 5101 | 3973 | 14060 |
| Cows milked | Per cent | 56 | 36 | | 20 | 48 | 47 | 37 | 32 | 97 | 72 | 88 | 52 |
| Eggs per hen | Dozen | 9.4 | 7.3 | | 9.0 | 8.6 | 9.2 | 9.5 | 9.0 | 9.7 | 8.9 | 9.0 | 8.9 |
| Chickens produced per hen | Pounds | 4.0 | 4.4 | | 3.8 | 3.4 | 3.9 | 3.4 | 3.2 | 2.5 | 2.9 | 3.1 | 3.5 |

## TABLE 12.—FEED FOR HORSES AND MULES
(Average per head in 10 areas in Missouri)

| Item | | Northern Meat Production Area | | | | | Western Corn and Small Grain | Ozark Plateau Dairy | | Ozark Border Dairy Wheat | Average Ten Areas |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | a | b | c | d | e | | | | | |
| | | Clinton | Linn | Mercer | Adair | Audrain Callaway Ralls | Cass | St. Clair Vernon Cedar | Greene | Webster Wright | Franklin | |
| Horses per farm | | | | | | | | | | | | |
| Workstock | Number | 5.7 | 4.6 | 3.7 | 4.4 | 5.2 | 5.2 | 6.0 | 4.4 | 3.6 | 3.5 | 4.7 |
| Colts | " | .3 | .2 | .3 | .6 | .2 | .2 | .2 | — | .1 | .1 | .2 |
| Horse equivalent | " | 5.8 | 4.7 | 3.8 | 4.7 | 5.3 | 5.3 | 6.2 | 4.4 | 3.7 | 3.5 | 4.8 |
| Concentrates | | | | | | | | | | | | |
| Corn | Bushels | 22.6 | 20.7 | 21.2 | 20.0 | 23.6 | 18.6 | 19.4 | 20.0 | 15.0 | 15.8 | 21.7 |
| Oats (threshed) | " | 24.4 | 15.5 | 18.0 | 17.8 | 19.7 | 23.9 | 20.6 | 18.5 | 8.4 | 8.7 | 18.4 |
| Oats (sheaf) | " | 3.2 | .8 | 1.2 | — | 15.5 | — | — | 3.2 | — | 2.9 | 3.9 |
| Total | Pounds | 2150 | 2185 | 1802 | 1690 | 2448 | 1806 | 1746 | 1816 | 1109 | 1256 | 1840 |
| Hay | | | | | | | | | | | | |
| Clover and mixed | " | 1640 | 2240 | 3040 | 2880 | 620 | 1020 | 440 | 860 | 80 | 420 | 1420 |
| Timothy | " | 300 | 640 | 240 | 120 | 640 | 300 | 900 | — | 340 | 740 | 440 |
| Alfalfa | " | 820 | 40 | 60 | 320 | 40 | 860 | 80 | 700 | — | 720 | 340 |
| Soybean | " | 300 | 200 | 40 | 40 | 640 | 60 | 60 | 80 | — | 40 | 212 |
| Other | " | — | 160 | — | — | — | 60 | 780 | 200 | 600 | 140 | 194 |
| Total | " | 3060 | 3280 | 3380 | 3360 | 1940 | 2300 | 2260 | 1840 | 1020 | 2060 | 2606 |
| Other roughage | | | | | | | | | | | | |
| Corn stover | " | 40 | 480 | 280 | 720 | 280 | 300 | 260 | 820 | 1260 | 4280 | 674 |
| Sorghum fodder | " | — | — | 100 | — | 260 | 820 | 420 | 200 | 280 | — | 172 |
| Straw | " | 160 | 560 | 420 | 740 | 2080 | 1620 | 2480 | 3400 | 1200 | 520 | 1446 |
| Total | " | 200 | 1040 | 800 | 1460 | 2620 | 2740 | 3160 | 4420 | 2740 | 4800 | 2292 |
| Total roughage | " | 3260 | 4320 | 4180 | 4820 | 4560 | 5040 | 5420 | 6260 | 3760 | 6860 | 4898 |
| Concentrates and roughage | Feed Units | 3423 | 3470 | 3095 | 3088 | 3483 | 3088 | 2916 | 3142 | 2477 | 2734 | 3188 |

## TABLE 13.—FEED FOR COWS
(Average for 10 Areas in Missouri)

| Item | | Northern Meat Production Area | | | | | | Western Corn and Small Grain | Ozark Plateau Dairy | | Ozark Border Dairy Wheat | Average Ten Areas |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | a | b | | c | d | e | | | | | |
| | | Clinton | Linn | Mercer | Adair | Audrain Callaway Ralls | Cass | St. Clair Vernon Cedar | Greene | Webster Wright | Franklin | |
| Cows per farm | Number | 11.9 | 17.8 | 17.8 | 21.9 | 15.4 | 15.6 | 16.0 | 18.6 | 20.9 | 12.1 | 16.6 |
| Cows milked | Per cent | 56 | 36 | 20 | 48 | 47 | 37 | 32 | 97 | 72 | 88 | 52 |
| Butterfat per cow milked | Pounds | 111 | 133 | 112 | 85 | 148 | 116 | 123 | 189 | 119 | 143 | 135 |
| Feed per cow: | | | | | | | | | | | | |
| Corn | Pounds | 750 | 437 | 588 | 308 | 879 | 655 | 409 | 1089 | 543 | 622 | 622 |
| Oats (threshed) | " | 250 | 147 | 99 | 67 | 227 | 202 | 134 | 298 | 90 | 74 | 160 |
| Sheaf oats | " | 13 | 36 | 24 | — | 166 | — | — | — | — | 22 | 36 |
| Soybeans | " | — | 12 | — | 2 | 24 | — | — | — | — | — | 7 |
| Barley | " | — | — | — | — | — | 11* | — | 115 | 5 | 10 | 12 |
| Wheat | " | — | — | — | — | 60 | 12 | 60 | 234 | 150 | 288 | 68 |
| Cottonseed meal | " | — | 2 | — | — | — | — | — | 164 | 61 | 54 | 24 |
| Bran or shorts | " | — | — | 14 | 25 | 17 | — | — | 114 | 56 | — | 22 |
| Dairy feed | " | 16 | 5 | 7 | 135 | 54 | — | — | 112 | — | 38 | 40 |
| Total concentrates | " | 1029 | 639 | 732 | 537 | 1427 | 880 | 603 | 2126 | 905 | 1108 | 991 |
| Clover and mixed hay | " | 1865 | 1936 | 2315 | 1922 | 351 | 610 | 374 | 641 | 1296 | 1155 | 1277 |
| Timothy | " | 70 | 252 | 14 | — | 270 | 36 | 181 | — | 22 | 57 | 110 |
| Alfalfa | " | 499 | 31 | 27 | 443 | 335 | 590 | 312 | 1238 | 474 | 521 | 410 |
| Soybean | " | 791 | 1054 | 347 | 443 | 1678 | 1128 | 912 | 673 | 443 | 521 | 857 |
| Other hay | " | — | — | 54 | — | 179 | 26 | 170 | 255 | 278 | 235 | 110 |
| Total hay | " | 3225 | 3273 | 2757 | 2788 | 2813 | 2390 | 1949 | 2807 | 2513 | 2489 | 2764 |
| Corn stover | " | 43 | 171 | 59 | 761 | 149 | 149 | 408 | 341 | 687 | 2444 | 445 |
| Straw | " | 596 | 245 | 315 | 254 | 465 | 1041 | 2453 | 1107 | 465 | 527 | 652 |
| Sorghum fodder | " | — | 25 | 126 | 68 | 408 | 492 | 255 | 202 | 57 | — | 167 |
| Other dry roughage | " | 639 | 441 | 500 | 1083 | 1022 | 1682 | 3116 | 1650 | 1209 | 2971 | 1264 |
| Silage | " | 434 | 337 | 135 | — | 1716 | 1128 | 1111 | 5561 | 3391 | 2603 | 1522 |
| Total roughage | " | 4298 | 4051 | 3392 | 3871 | 5551 | 5200 | 6176 | 10018 | 7113 | 8063 | 5550 |
| Total concentrates and roughage | Feed Units | 2477 | 2044 | 1923 | 1844 | 2987 | 2322 | 2040 | 4517 | 2678 | 3033 | 2555 |

*Includes kaffir.

TABLE 14.—FEED PER COW BY TYPE OF COW IN SPECIFIED REGIONS IN MISSOURI[1]

| Item | | Dairy cows | | | Dual-purpose cows | | | Beef cows | | | Average all cows three regions |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | North-west | North-east | South-ern | North-west | North-east | South-ern | North-west | North-east | South-ern | |
| Corn | Lbs. | 1231 | 1190 | 954 | 685 | 630 | 367 | 306 | 338 | 229 | 622 |
| Oats | " | 412 | 290 | 215 | 282 | 173 | 95 | 112 | 195 | 68 | 196 |
| Soybeans | " | 43 | 31 | — | — | 21 | — | — | 1 | — | 7 |
| Wheat | " | 15 | 90 | 268 | — | — | 103 | — | — | 16 | 68 |
| Barley or kaffir | " | 14 | — | 58 | — | — | 6 | — | — | — | 12 |
| Cottonseed or linseed oil meal | " | 4 | — | 115 | 1 | — | 29 | — | — | 6 | 24 |
| Bran or shorts | " | — | 47 | 82 | — | 38 | 3 | — | — | — | 22 |
| Dairy feed | " | 22 | 246 | 67 | 10 | 8 | — | — | — | — | 40 |
| Total concentrates | " | 1741 | 1894 | 1759 | 978 | 870 | 605 | 418 | 534 | 319 | 991 |
| Clover mixed hay | " | 1217 | 793 | 859 | 1087 | 1885 | 1250 | 1920 | 1507 | 586 | 1277 |
| Timothy | " | 94 | 41 | 28 | 344 | — | 33 | 89 | 182 | 164 | 110 |
| Alfalfa | " | 449 | 947 | 926 | 256 | 23 | 408 | 244 | 49 | 176 | 410 |
| Soybean hay | " | 1522 | 1455 | 672 | 1354 | 942 | 382 | 696 | 669 | 733 | 857 |
| Oat hay | " | — | — | 110 | — | 77 | 85 | — | 2 | — | 31 |
| Other hay | " | 36 | 61 | 196 | — | 77 | 33 | — | 82 | 164 | 80 |
| Total hay | " | 3318 | 3297 | 2791 | 3041 | 3004 | 2191 | 2949 | 2491 | 1823 | 2765 |
| Corn stover | " | 65 | 480 | 835 | 246 | 460 | 1237 | 107 | 225 | 674 | 445 |
| Straw | " | 500 | 467 | 833 | 692 | 260 | 1368 | 468 | 328 | 1613 | 652 |
| Sorghum fodder | " | 167 | 122 | 125 | 102 | — | 132 | 144 | 330 | 147 | 167 |
| Total other dry roughage | " | 732 | 1069 | 1793 | 1040 | 720 | 2737 | 719 | 883 | 2434 | 1264 |
| Silage | " | 1014 | 2134 | 4284 | 369 | — | 2539 | 502 | 274 | 1466 | 1522 |
| Concentrates | Feed Units | 1699 | 1882 | 1755 | 942 | 852 | 601 | 401 | 521 | 310 | 978 |
| Roughage | " " | 1636 | 1891 | 2166 | 1437 | 1291 | 1745 | 1394 | 1183 | 1350 | 1577 |
| Total Concentrates & Roughages | | 3335 | 3773 | 3921 | 2379 | 2143 | 2346 | 1795 | 1704 | 1660 | 2555 |
| Pct. all cows in region | Pct. | 18 | 28 | 59 | 25 | 15 | 19 | 57 | 58 | 22 | — |
| Pct. of cows milked | " | 99 | 100 | 100 | 69 | 55 | 59 | 10 | 9 | 14 | 52 |
| Butterfat per cow kept | Lbs. | 129 | 124 | 162 | 84 | 54 | 63 | 11 | 11 | 15 | 69 |
| Butterfat per cow milked | " | 130 | 124 | 162 | 122 | 99 | 107 | 109 | 125 | 112 | 135 |
| Calf crop | Pct. | 89 | 85 | 85 | 88 | 93 | 85 | 89 | 89 | 87 | 87 |
| Calves raised | " | 26 | 40 | 30 | 81 | 96 | 92 | 100 | 100 | 100 | 75 |
| Calves sold at birth | " | 14 | 24 | 10 | — | — | — | — | — | — | 5 |
| Calves vealed | " | 60 | 36 | 60 | 19 | 4 | 8 | — | — | — | 20 |
| Average weight of veals | " | 173 | 177 | 148 | 184 | 182 | 150 | — | — | — | 161 |

[1]Northwest includes the records in Cass, Clinton, and Linn counties. The records in Audrain, Ralls, Callaway, Adair, and Mercer counties are classified as Northeast. All other records are included under Southern.

TABLE 15.—FEED FOR OTHER CATTLE (OTHER THAN COWS)
(Average per farm for 10 areas in Missouri)

| Item | | Northern Meat Production Area | | | | | | Western Corn and Small Grain | Ozark Plateau Dairy | | Ozark Border Dairy Wheat | Average Ten Areas |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | a | b | | c | d | e | | | | | |
| | | Clinton | Linn | Mercer | Adair | Audrain Callaway Ralls | Cass | St. Clair Vernon Cedar | Greene | Webster Wright | Franklin | |
| Livestock per farm | | | | | | | | | | | | |
| Heifers | Number | 1.3 | 2.5 | 3.2 | 4.6 | 3.0 | 2.0 | 1.9 | 3.5 | 4.0 | 2.5 | 2.8 |
| Yearlings | " | 2.2 | 3.2 | 3.9 | 4.7 | 4.0 | 2.2 | 1.9 | 3.5 | 4.0 | 2.6 | 3.3 |
| Calves | " | 6.0 | 8.6 | 8.9 | 8.0 | 8.8 | 6.5 | 3.0 | 3.7 | 4.0 | 3.8 | 6.6 |
| Bulls | " | 1.0 | .9 | 1.2 | 1.1 | 1.1 | .8 | .9 | 1.1 | 1.4 | 1.1 | 1.0 |
| Veal calves | " | 1.4 | 2.2 | 1.6 | 2.3 | 1.5 | 2.5 | 1.8 | 7.0 | 6.4 | 5.4 | 2.9 |
| Feeder cattle raised | " | — | 4.4 | 4.2 | 9.1 | 2.6 | 2.4 | 1.6 | .2 | 3.1 | .1 | 2.9 |
| Fat cattle raised | " | 4.7 | 6.6 | 6.7 | 1.0 | 5.6 | 6.6 | 8.0 | 1.1 | 3.7 | 2.5 | 5.0 |
| Purchased feeders fattened | " | 23.8 | 2.6 | 4.8 | 1.5 | 4.9 | — | 10.0 | 3.4 | .9 | 3.8 | 5.7 |
| Total animal units | | 30.4 | 14.0 | 18.0 | 15.8 | 15.1 | 11.1 | 17.0 | 9.9 | 11.5 | 9.3 | 15.4 |
| Feed per farm | | | | | | | | | | | | |
| Corn | Bushels | 1784 | 420 | 594 | 138 | 544 | 339 | 897 | 179 | 252 | 262 | 555 |
| Oats | " | 186 | 60 | 35 | 13 | 150 | 71 | 128 | 44 | 22 | 8 | 79 |
| Linseed or C.S.M. | Pounds | 1777 | 132 | 240 | 148 | 646 | 240 | 818 | 292 | 455 | 308 | 395 |
| Other concentrates | " | 918 | 137 | 10 | — | 507 | 1000 | 560 | 550 | 704 | 2262 | 743 |
| Total concentrates | Cwt. | 1086 | 257 | 346 | 83 | 364 | 225 | 557 | 123 | 160 | 175 | 348 |
| Clover or mixed hay | Tons | 17.0 | 3.7 | 11.3 | 7.3 | 1.6 | 1.6 | 2.1 | 2.5 | 5.8 | 2.3 | 5.4 |
| Soybean hay | " | 4.0 | 2.9 | .7 | 1.8 | 7.2 | 2.5 | 3.2 | .8 | .6 | .5 | 2.8 |
| Alfalfa | " | 4.7 | .1 | — | 3.4 | .8 | 2.6 | 1.9 | 2.8 | .9 | 3.6 | 1.9 |
| Timothy hay | " | .3 | .9 | .2 | .9 | .7 | .3 | 1.5 | — | .5 | .4 | .6 |
| Other hay | " | — | .2 | .2 | — | — | — | 1.9 | .6 | .8 | — | .4 |
| Total hay | " | 26.0 | 7.8 | 12.4 | 13.4 | 10.3 | 7.0 | 10.6 | 6.7 | 8.6 | 6.8 | 11.1 |
| Straw | " | 3.8 | 1.0 | .9 | 1.8 | 2.3 | 3.8 | 5.9 | 6.1 | 2.4 | 2.0 | 2.8 |
| Corn stover | " | .3 | .6 | .1 | 5.3 | .2 | .5 | 1.3 | 5.0 | 3.5 | 11.7 | 2.5 |
| Sorghum fodder | " | — | — | .6 | .2 | 3.2 | 1.3 | 5.6 | .9 | .5 | — | 1.2 |
| Other dry roughage | " | — | — | — | — | .9 | — | .2 | .2 | .1 | .4 | .2 |
| Total | " | 4.1 | 1.6 | 10.6 | 7.3 | 6.6 | 5.6 | 13.0 | 12.2 | 6.5 | 14.1 | 6.7 |
| Silage | " | 3.9 | 1.7 | 1.0 | — | 5.5 | 4.0 | 7.3 | 9.6 | 10.7 | 8.6 | 4.9 |
| Feed per animal unit | | | | | | | | | | | | |
| Concentrates | Feed units | 3561 | 1813 | 1914 | 552 | 2270 | 1996 | 3244 | 1334 | 1387 | 2326 | 2258 |
| Roughage | " " | 749 | 494 | 564 | 842 | 820 | 813 | 919 | 1393 | 1054 | 956 | 794 |
| Total | | 4310 | 2307 | 2478 | 1394 | 3090 | 2809 | 4163 | 2727 | 2441 | 3282 | 3052 |
| Total gain per farm | Pounds | 17460 | 11076 | 13706 | 12591 | 10722 | 9257 | 13966 | 6226 | 9580 | 6421 | 11196 |
| Fat beef of total gain | Per cent | 89 | 54 | 56 | 13 | 54 | 58 | 74 | 26 | 34 | 48 | 55 |
| Farm selling fat beef | " | 81 | 41 | 44 | 4 | 54 | 52 | 68 | 8 | 18 | 27 | 41 |

## TABLE 16.—FEED FOR SHEEP AND LAMBS
(Average per farm for 10 areas in Missouri)

| Item | | Northern Meat Production Area | | | | | | Western Corn and Small Grain | Ozark Plateau Dairy | | Ozark Border Dairy Wheat | Average Ten Areas |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | a | b | | c | d | e | | | | | |
| | | Clinton | Linn | Mercer | Adair | Audrain Callaway Ralls | Cass | St. Clair Vernon Cedar | Greene | Webster Wright | Franklin | |
| Ewes per farm | Number | 8 | 19 | 17 | 16 | 21 | 7 | 11 | 5 | 5 | 2 | 12 |
| Farms with sheep | Per cent | 23 | 55 | 60 | 48 | 54 | 24 | 23 | 21 | 23 | 4 | 36 |
| Ewes per farm having sheep | Number | 36 | 35 | 29 | 33 | 40 | 28 | 46 | 22 | 24 | 40 | 34 |
| Ewes sold per farm having sheep | " | 8 | 7 | 5 | 7 | 8 | 5 | 8 | 4 | 6 | 8 | 7 |
| Lambs sold per farm having sheep | " | 29 | 30 | 25 | 27 | 35 | 22 | 27 | 17 | 18 | 30 | 28 |
| Wool per farm having sheep | Pounds | 286 | 291 | 228 | 258 | 316 | 223 | 368 | 164 | 192 | 320 | 273 |
| Weight per ewe sold | " | 107 | 110 | 109 | 108 | 113 | 99 | 109 | 110 | 107 | 110 | 110 |
| Weight per lamb sold | " | 68 | 79 | 74 | 68 | 72 | 67 | 75 | 73 | 72 | 70 | 72 |
| Sheep and lamb increase | " | 652 | 1660 | 1430 | 1336 | 1836 | 496 | 690 | 358 | 434 | 115 | 1020 |
| Wool per ewe | " | 8 | 8 | 8 | 8 | 8 | 8 | 9 | 7 | 8 | 8 | 8 |
| Feed per ewe | | | | | | | | | | | | |
| Corn | " | 38 | 78 | 25 | 9 | 24 | 23 | 57 | 23 | 9 | 14 | 36 |
| Oats | " | 21 | 52 | 11 | 3 | 6 | 9 | 24 | 13 | 3 | 8 | 19 |
| Other concentrates | " | — | 10 | — | — | 25 | — | 6 | — | — | — | 10 |
| Total concentrates | " | 59 | 140 | 36 | 12 | 55 | 32 | 87 | 36 | 12 | 22 | 65 |
| Clover or mixed hay | " | 24 | 99 | 98 | 94 | 4 | 48 | 17 | 55 | 67 | 100 | 56 |
| Soybean hay | " | 16 | 176 | 19 | 35 | 62 | 36 | 96 | — | — | — | 73 |
| Alfalfa hay | " | 72 | — | — | 14 | — | 24 | 17 | 55 | 33 | — | 12 |
| Timothy hay | " | — | 2 | — | — | — | — | — | — | — | — | 1 |
| Other hay | " | — | 14 | 14 | — | 6 | — | — | — | — | — | 7 |
| Total hay | " | 112 | 291 | 131 | 143 | 72 | 108 | 130 | 110 | 100 | 100 | 149 |
| Straw | " | — | 10 | 9 | — | 29 | 36 | — | 200 | — | — | 19 |
| Corn stover | " | — | 36 | 9 | — | 10 | — | — | — | — | 100 | 13 |
| Sorghum fodder | " | — | — | 9 | — | 6 | 48 | 17 | — | — | — | 6 |
| Other dry roughage | " | — | — | — | — | — | — | — | — | — | — | — |
| Total | " | — | 46 | 27 | — | 45 | 84 | 17 | 200 | — | 100 | 38 |
| Silage | " | — | 7 | 23 | — | 19 | — | — | — | 33 | — | 11 |
| Total concentrates | Feed Units | 56 | 133 | 34 | 12 | 54 | 31 | 76 | 34 | 12 | 21 | 63 |
| Total roughage | Feed Units | 48 | 121 | 55 | 55 | 38 | 60 | 57 | 75 | 45 | 52 | 65 |
| Total | | 104 | 254 | 89 | 67 | 92 | 91 | 133 | 109 | 57 | 73 | 128 |

## TABLE 17.—FEED FOR HOGS
(Averages for 10 areas in Missouri)

| Item | | Northern Meat Production Area | | | | | | Western Corn and Small Grain | Ozark Plateau Dairy | | Ozark Border Dairy Wheat | Average Ten Areas |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | a | b | | c | d | e | | | | | |
| | | Clinton | Linn | Mercer | Adair | Audrain Callaway Ralls | Cass | St. Clair Vernon Cedar | Greene | Webster Wright | Franklin | |
| Hogs per farm | | | | | | | | | | | | |
| Spring litters | Number | 22.0 | 4.8 | 3.3 | 3.1 | 6.5 | 4.3 | 5.7 | 2.2 | 1.5 | 1.4 | 5.9 |
| Fall litters | " | 19.8 | 3.7 | 3.2 | 2.9 | 5.1 | 4.2 | 5.7 | 2.2 | 1.4 | 1.4 | 5.2 |
| Pigs raised | " | 221 | 53 | 41 | 35 | 72 | 50 | 70 | 29 | 20 | 20 | 64 |
| Feeder pigs bought | " | — | — | 11 | 2 | 2 | 10 | — | 11 | 10 | 5 | 4 |
| Total hogs produced | Pounds | 45680 | 10935 | 10137 | 7724 | 15383 | 12303 | 15350 | 7299 | 5101 | 3973 | 14060 |
| Feed per 100 lbs. gain | | | | | | | | | | | | |
| Corn | " | 391 | 406 | 415 | 418 | 400 | 367 | 280 | 288 | 263 | 248 | 375 |
| Oats | " | 31 | 13 | 22 | 22 | 23 | 26 | 32 | 54 | 22 | 5 | 26 |
| Wheat | " | 19 | 14 | 8 | 12 | 35 | 33 | 81 | 121 | 130 | 182 | 38 |
| Barley | " | 2 | — | — | — | — | — | 11 | — | — | 7 | 2 |
| Soybeans | " | 2 | — | — | 1 | 5 | — | 1 | — | — | — | 2 |
| Shorts | " | 4 | 4 | 2 | — | 2 | 3 | 2 | 3 | 3 | — | 3 |
| Tankage | " | 12 | 10 | 19 | 9 | 7 | 15 | 11 | 9 | 11 | — | 11 |
| Total | " | 461 | 447 | 466 | 462 | 472 | 444 | 418 | 475 | 429 | 442 | 457 |
| Feed units per 100 lbs. gain | No. | 473 | 460 | 489 | 473 | 473 | 462 | 429 | 480 | 441 | 440 | 469 |
| Weight per hog sold | Pounds | 208 | 207 | 213 | 213 | 213 | 210 | 221 | 210 | 181 | 175 | 210 |
| Litters per 100 spring sows | No. | 190 | 176 | 198 | 194 | 180 | 198 | 200 | 200 | 197 | 200 | 189 |
| Pigs raised per litter | " | 5.3 | 6.2 | 6.2 | 5.7 | 6.1 | 6.0 | 6.2 | 6.7 | 7.0 | 6.9 | 5.8 |

## TABLE 18.—FEED FOR CHICKENS
(Average per hen for 10 areas in Missouri)

| Item | | Northern Meat Production Area | | | | | | Western Corn and Small Grain | Ozark Plateau Dairy | | Ozark Border Dairy Wheat | Average Ten Areas |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | a | b | | c | d | e | | | | | |
| | | Clinton | Linn | Mercer | Adair | Audrain Callaway Ralls | Cass | St. Clair Vernon Cedar | Greene | Webster Wright | Franklin | |
| Per farm | | | | | | | | | | | | |
| Hens Jan. 1 | Number | 113 | 145 | 126 | 88 | 135 | 129 | 183 | 177 | 120 | 156 | 136 |
| Chickens raised | " | 191 | 266 | 191 | 138 | 234 | 182 | 203 | 193 | 153 | 211 | 204 |
| Hens sold | " | 34 | 36 | 42 | 24 | 39 | 36 | 45 | 45 | 28 | 49 | 38 |
| Chickens sold | " | 53 | 108 | 76 | 39 | 75 | 70 | 78 | 75 | 46 | 78 | 72 |
| Chickens eaten | " | 51 | 56 | 30 | 36 | 52 | 38 | 36 | 34 | 35 | 37 | 43 |
| Eggs sold | Dozen | 835 | 931 | 988 | 587 | 1046 | 1022 | 1459 | 1533 | 898 | 1233 | 1033 |
| Eggs eaten | " | 226 | 138 | 146 | 167 | 199 | 205 | 184 | 176 | 170 | 176 | 178 |
| Eggs per farm | " | 1061 | 1064 | 1134 | 754 | 1245 | 1227 | 1643 | 1709 | 1068 | 1409 | 1211 |
| Feed per hen | | | | | | | | | | | | |
| Corn | Pounds | 49 | 43 | 36 | 36 | 35 | 33 | 21 | 33 | 37 | 38 | 36 |
| Oats | " | 27 | 9 | 14 | 16 | 13 | 19 | 14 | 16 | 14 | 13 | 15 |
| Wheat | " | 16 | 2 | 3 | 3 | 9 | 11 | 20 | 30 | 29 | 42 | 16 |
| Barley | " | — | — | — | — | — | — | — | 4 | — | — | 1 |
| Grain sorghum | " | — | — | — | — | — | 8 | 16 | — | — | — | 2 |
| Commercial feed | " | 9 | 3 | 15 | 7 | 11 | — | 2 | 4 | 3 | 5 | 6 |
| Total | | 101 | 57 | 68 | 62 | 68 | 71 | 73 | 87 | 83 | 98 | 76 |
| Feed units per hen | Number | 98 | 57 | 69 | 62 | 67 | 70 | 73 | 86 | 81 | 97 | 75 |
| Chickens raised per hen | " | 1.69 | 1.83 | 1.52 | 1.58 | 1.73 | 1.41 | 1.11 | 1.09 | 1.27 | 1.36 | 1.49 |
| Eggs per hen | Dozen | 9.4 | 7.3 | 9.0 | 8.6 | 9.2 | 9.5 | 9.0 | 9.7 | 8.9 | 9.0 | 8.9 |

## TABLE 19.—FEED UNIT VALUE OF SPECIFIC FEEDS[1]

| Kind of Feed | Weight per unit | Feed Units per pound | Feed Units per Unit of weight |
|---|---|---|---|
| Corn | 56 | 1.00 | 56 |
| Oats | 32 | .85 | 27 |
| Barley | 48 | .93 | 45 |
| Rye | 60 | .94 | 56 |
| Grain Sorghum | 56 | .93 | 52 |
| Wheat | 60 | 1.00 | 60 |
| Soybeans | 60 | 1.30 | 78 |
| Cowpeas | 80 | 1.15 | 69 |
| Sheaf Oats (Bus.) | 32 | 1.00 | 32 |
| Sheaf Oats (Tons) | 2000 | .40 | 800 |
| Corn silage | 2000 | .17 | 340 |
| Forage sorghums | 2000 | .25 | 500 |
| Soybean hay | 2000 | .40 | 800 |
| Alfalfa hay, lespedeza | 2000 | .45 | 900 |
| Timothy and wild hay | 2000 | .34 | 675 |
| Clover hay | 2000 | .40 | 800 |
| Mixed hay | 2000 | .37 | 740 |
| Millet | 2000 | .32 | 640 |
| Corn stover | 2000 | .15 | 300 |
| Oat hay | 2000 | .35 | 700 |
| Oat straw | 2000 | .15 | 300 |
| Soybean straw | 2000 | .20 | 400 |
| C. S. meal or L. S. meal | 100 | 1.30 | 130 |
| Tankage | 100 | 2.50 | 250 |
| Shorts | 100 | 1.00 | 100 |
| Chicken mash | 100 | 1.20 | 120 |
| Mixed dairy feed | 100 | 1.10 | 110 |
| Skim milk | 100 | .17 | 17 |
| Bran | 100 | .90 | 90 |

[1]A feed unit is here used to represent that quantity of feed equal in feeding value to one pound of corn.

## TABLE 20.—MANURE, LIME, AND COMMERCIAL FERTILIZER USED (10 areas in Missouri)

| Item | | Northern Meat Production Area | | | | | | Western Corn and Small Grain | Ozark Plateau Dairy | | Ozark Border Dairy Wheat | Average Ten Areas |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | a | b | | c | d | e | | | | | |
| | | Clinton | Linn | Mercer | Adair | Audrain Callaway Ralls | Cass | St. Clair Vernon Cedar | Greene | Webster Wright | Franklin | |
| Per cent of land fertilized: | | | | | | | | | | | | |
| Corn | Per cent | 6 | 38 | 4 | — | 20 | 6 | 3 | 26 | 22 | — | 14 |
| Wheat | " | 38 | 95 | 80 | 4 | 72 | 79 | 35 | 65 | 61 | 74 | 53 |
| Oats | " | — | 5 | — | 6 | 2 | — | — | 3 | 25 | 1 | 4 |
| Average analysis of fertilizer: | | | | | | | | | | | | |
| | Per cent N | 0 | 0 | 0 | — | 1.2 | .9 | 0 | .4 | 1.0 | — | .5 |
| Corn | " P | 20 | 16.6 | 18.7 | — | 14.0 | 13.1 | 20.0 | 18.4 | 16.0 | — | 16.2 |
| | " K | 0 | 0 | 0 | — | 1.5 | 4.1 | 0 | .4 | 1.0 | — | .7 |
| | " N | 0 | 0 | 0 | 0 | 0 | 1.3 | 1.4 | 0 | 2.0 | .3 | .4 |
| Wheat | " P | 20 | 16.9 | 18.5 | 16.0 | 17.1 | 14.1 | 14.4 | 20.0 | 15.9 | 17.8 | 17.6 |
| | " K | 0 | 0 | 0 | 0 | 0 | 1.8 | 2.3 | 0 | 2.0 | .4 | .5 |
| | " N | — | 0 | — | 0 | 2.0 | — | — | 0 | 1.0 | 0 | .5 |
| Oats | " P | — | 16.0 | — | 16.0 | 12.0 | — | — | 20.0 | 18.1 | 20.0 | 17.7 |
| | " K | — | 0 | — | 0 | 2.0 | — | — | 0 | 1.0 | 0 | .5 |
| Application of fertilizer per acre: | | | | | | | | | | | | |
| Corn | Pounds | 111 | 96 | 83 | — | 70 | 100 | 80 | 78 | 80 | — | 86 |
| Wheat | " | 137 | 137 | 153 | 125 | 134 | 122 | 121 | 122 | 119 | 119 | 126 |
| Oats | " | — | 171 | — | 125 | 50 | — | — | 103 | 90 | 80 | 102 |
| Land limed: | | | | | | | | | | | | |
| Acres per farm | | 16 | 1 | — | 5 | 27 | 9 | 11 | 32 | 3 | 24 | 13 |
| Per cent of rotated land | | 8 | 1 | — | 5 | 17 | 8 | 6 | 27 | 3 | 26 | 10 |
| Pounds per acre | | 4461 | 4000 | — | 4667 | 5737 | 3511 | 4800 | 4571 | 4000 | 3934 | 3968 |
| Cost per ton | Dollars | 2.13 | 1.76 | — | 2.08 | 1.55 | 2.97 | 1.72 | 1.65 | 1.68 | 1.89 | 1.74 |
| Distance hauled | Miles | 7.3 | 6.7 | — | 3.5 | 9.7 | 3.3 | 4.3 | 3.5 | 4.9 | 2.0 | 4.5 |
| Land manured: | | | | | | | | | | | | |
| Acres per farm | | 12 | 10 | 6 | 9 | 17 | 10 | 10 | 10 | 16 | 15 | 12 |
| Corn | Per cent | 13 | 8 | 8 | 13 | 25 | 16 | 12 | 29 | 30 | 34 | 17 |
| Wheat | " | 5 | — | — | — | 15 | 4 | 3 | 20 | 38 | 19 | 11 |
| Hay and pasture | | — | 6 | 2 | 3 | 1 | 1 | 1 | 5 | 3 | 2 | 2 |

## TABLE 21.—BUILDINGS AND EQUIPMENT
(Specific items for 10 areas in Missouri)

| Item | Northern Meat Production Area | | | | | | Western Corn and Small Grain | Ozark Plateau Dairy | | Ozark Border Dairy Wheat | Average Ten Areas |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | | c | d | e | | | | | |
| | Clinton | Linn | Mercer | Adair | Audrain Callaway Ralls | Cass | St. Clair Vernon Cedar | Greene | Webster Wright | Franklin | |
| | | | | | | DOLLARS | | | | | |
| Value of Real Estate | | | | | | | | | | | |
| Per acre | 81 | 39 | 36 | 33 | 42 | 59 | 39 | 69 | 37 | 44 | 48 |
| Per farm | 26261 | 10123 | 8966 | 8816 | 11731 | 12090 | 11950 | 12169 | 8587 | 8081 | 12044 |
| | | | | | | DOLLARS PER FARM | | | | | |
| Value of buildings: | | | | | | | | | | | |
| Dwelling | 1907 | 1591 | 1308 | 1608 | 1643 | 1140 | 1055 | 1445 | 1153 | 1342 | 1465 |
| Tenant house | 435 | 34 | 100 | 81 | 42 | 64 | 68 | 42 | 42 | 38 | 94 |
| Barns | 1406 | 970 | 808 | 1037 | 1237 | 860 | 814 | 1017 | 795 | 862 | 1012 |
| Other buildings | 1084 | 536 | 652 | 968 | 950 | 816 | 854 | 890 | 745 | 765 | 824 |
| Total | 4832 | 3131 | 2868 | 3694 | 3872 | 2880 | 2800 | 3394 | 2735 | 3007 | 3395 |
| Value of machinery | | | | | | | | | | | |
| Tractor | 155 | 22 | — | — | 121 | 80 | 86 | 17 | 32 | 54 | 61 |
| Truck | 48 | 18 | — | 22 | 3 | — | — | 8 | — | 8 | 12 |
| Other machinery | 522 | 287 | 296 | 295 | 404 | 355 | 425 | 356 | 293 | 293 | 355 |
| Total | 725 | 327 | 296 | 317 | 528 | 435 | 511 | 381 | 325 | 355 | 428 |
| Annual depreciation | | | | | | | | | | | |
| Dwelling | 82 | 52 | 47 | 56 | 60 | 39 | 41 | 47 | 41 | 42 | 52 |
| Other buildings | 104 | 65 | 54 | 79 | 97 | 61 | 63 | 60 | 56 | 51 | 72 |
| Machinery | 81 | 34 | 26 | 28 | 52 | 44 | 52 | 34 | 30 | 35 | 43 |
| Total | 267 | 151 | 127 | 163 | 209 | 144 | 156 | 141 | 127 | 128 | 167 |
| Annual repairs | | | | | | | | | | | |
| Dwelling | 33 | 28 | 21 | 21 | 28 | 17 | 15 | 24 | 15 | 21 | 23 |
| Other buildings | 35 | 39 | 17 | 19 | 34 | 21 | 21 | 34 | 21 | 25 | 28 |
| Machinery | 64 | 24 | 20 | 23 | 40 | 33 | 47 | 29 | 23 | 26 | 33 |
| Total | 132 | 91 | 58 | 63 | 102 | 71 | 83 | 87 | 59 | 72 | 84 |
| | | | | | | PER CENT OF FARMS EQUIPPED WITH | | | | | |
| Tractor | 32 | 16 | — | — | 33 | 16 | 18 | 4 | 18 | 35 | 19 |
| Truck | 10 | 7 | — | 4 | 2 | — | — | 4 | — | 4 | 3 |
| Cream separator | 71 | 68 | 60 | 85 | 35 | — | — | 91 | 100 | 77 | 58 |
| Manure spreader | 60 | 40 | 24 | 24 | 66 | — | — | 77 | 68 | 73 | 45 |
| Side-delivery rake | — | 4 | — | — | — | — | — | — | — | — | 1 |
| Hay stacker | 3 | 45 | 40 | 3 | — | 8 | 4 | — | — | 7 | 12 |
| Hay loader | — | 4 | — | — | — | — | — | — | — | — | 1 |
| Silo | 6 | 9 | 4 | 4 | 12 | 16 | 14 | 50 | 50 | 26 | 17 |

## TABLE 22.—FARM PRODUCTS USED IN THE HOUSEHOLD
(10 type-of-farming areas in Missouri)

| Item | | Northern Meat Production Area | | | | | | Western Corn and Small Grain | Ozark Plateau Dairy | | Ozark Border Dairy Wheat | Average Ten Areas |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | a | b | | c | d | e | | | | | |
| | | Clinton | Linn | Mercer | Adair | Audrain Callaway Ralls | Cass | St. Clair Vernon Cedar | Greene | Webster Wright | Franklin | |
| Hogs | Pounds | 1084 | 665 | 707 | 793 | 946 | 701 | 692 | 744 | 789 | 865 | 809 |
| Chickens | " | 158 | 161 | 106 | 117 | 157 | 114 | 110 | 106 | 103 | 109 | 118 |
| Cattle | " | 150 | 191 | 32 | 117 | 172 | 74 | 150 | 266 | 141 | 71 | 142 |
| Sheep | " | — | 2 | — | — | 3 | — | 7 | 2 | — | — | 1 |
| Total meat | " | 1392 | 1019 | 845 | 1027 | 1278 | 889 | 959 | 1118 | 1033 | 1045 | 1070 |
| Eggs | Dozen | 226 | 134 | 142 | 167 | 198 | 205 | 183 | 189 | 170 | 176 | 178 |
| Butter | Pounds | 179 | 128 | 120 | 141 | 166 | 156 | 163 | 176 | 150 | 159 | 153 |
| Cream | Pints | 369 | 232 | 265 | 304 | 309 | 321 | 343 | 398 | 365 | 388 | 322 |
| Whole milk | Gallons | 10 | 32 | — | 4 | 19 | — | — | 46 | — | 9 | 14 |
| Skim milk | " | 47 | 102 | 169 | 175 | 162 | 205 | 220 | 191 | 216 | 201 | 161 |
| Potatoes | Bushels | 39 | 18 | 24 | 27 | 31 | 28 | 27 | 28 | 26 | 30 | 28 |
| Apples | " | 35 | 11 | 20 | 22 | 28 | 26 | 22 | 26 | 21 | 22 | 23 |
| Other fruits and vegetables | Dollars | 40 | 34 | 31 | 28 | 34 | 32 | 30 | 32 | 28 | 29 | 32 |
| Person per family | Number | 3.73 | 3.75 | 3.28 | 3.81 | 3.50 | 4.00 | 3.72 | 4.29 | 4.00 | 4.80 | 3.85 |
| Hired labor | Man years | .86 | .28 | .17 | .26 | .55 | .61 | .82 | .71 | .33 | .28 | .48 |