POWER COSTS BY CROP REPORTING DISTRICTS

IN OKLAHOMA 1924-1934

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By

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PREFACE

The cost of power is one of the major costs of agricultural production in Oklahoma. The use of animal and mechanical power in American agricultural production has increased rapidly during the past one hundred years. Especially striking has been the increase in the use of power machinery since the beginning of the twentieth century and particularly during the last twenty years.

The use of tractors on farms has increased in each district since 1924. Table 1 shows the percent of farms with tractors for each district in the years 1924, 1929 and 1934. The topography and the type of farming in each district are important determining factors regulating the use of tractors as a source of power. Districts one, two four, five, and seven are the most important districts in the state from the standpoint of the utilization of tractor power. There have been fewer farmers who have changed to tractor farming in districts nine and six than in any other district. Only one-half of one percent of the farms in district nine use tractors and less than two percent in district six. The map on page 18A shows the distribution of tractors in Oklahoma by counties for the year 1929. On small farms, where a relatively small amount of power is required, it is difficult to displace horses and mules with tractors. Some horses or mules are needed on practically every farm to do those jobs for which tractor power is not adapted, and when a tractor is used there is probably a temporary excess of power.

The number of horses in the United States increased very rapidly during the early colonial days due to the natural environment favorable to horse production. During the colonial period horses were in demand largely to serve, as a means of transportation, for military operations,

and in the latter part of the period, for horse racing.

Following the colonial period the horse was in demand for draft purposes, and emphasis was placed on breeding for a larger animal. However, very little emphasis was placed on the breeding of the present draft breeds, such as the Percherons, Clydesdales, Shires and Belgiums until after the Civil War. The first Percheron importation was made about 1840.

The increase in the number of horses and mules in the United States was definitely halted in 1919 as a result of a shift to mechanical power. The number of tractors on farms in the United States more than trippled between 1920-1930 while the number of trucks increased six fold. In spite of these increases in mechanical power, 86 out of every 100 farms in the United States were still operated solely with horse and mule power in 1930.

The decrease in the number of horses and mules on farms in Oklahoma has varied somewhat because of the topography of some of the districts. This is particularly true in districts six and nine. The percentage of decrease in the number of horses and mules has been less in those districts than in other districts, and as mentioned before, the introduction of mechanical power has been slower.

The object of this study is to determine the cost of operating tractors by the nine crop reporting districts in Oklahoma, and also show the cost of horse and mule power as used by the different districts. In estimating the cost of tractors each item of expense was determined. The items determined were: Interest, depreciation, tags, tools, repairs, fuel and oil and grease. The items determined for the horse and mule costs were: Interest, depreciation, feed, labor, shelter, harness, taxes and miscellaneous costs.

This study attempts to work toward some satisfactory method of calculating power costs for farmers by crop reporting districts in Oklahoma. It is primarily a study in methodology and deals with fundamental principles and various methods that have been used in computing farm power costs. The study also serves as a comparison of animal and mechanical power for the different years by districts for different years. These comparisons should aid the farmers in selecting the more economical type of power to be used in agricultural production. It also serves as a check up on the amount of money that is actually put into farm power. The study tends to point out factors influencing the kind of power to be used on farms in Oklahoma.

CONTENTS

CHAPTER I

Farm Mechanization

One of the most important factors in determing the type of farming in terms of size of farm, production program, and capital requirements, is the amount of implements and machinery available in farming. The extent of use of the different types of implements and the influence of new inventions on farming has been limited by the nature of farm land in each part of the agricultural area. There must also be an economic motive for the utilization of such machines strong enough to make their manufacture and sale profitable.

Following the World War there was a remarkable acceleration in the readaption and use of agricultural machinery, both in this country and abroad, which has continued down to the present. Future development in mechanization must be conditioned: (1) By the adaptability of the various portions of our agricultural area to the practical and economic use of new implements; (2) by the extent and character of the demand for the commodities whose production may be increased by the new machines; (3) by the degree of success with which these machines fit into the present organization of farms, or could be fitted into a system reorganized on the basis of the use of new machines and new practices which they induce, and the type of financial and business organization necessary to make their use both technically successful and economically feasible. 1/

Two good examples of what mechanization will do for certain agricultural products are: (1) The invention of the cotton gin in the late eighteenth century is one of the most outstanding examples in American agriculture.

1/ U. S. D. A. Yearbook of Agriculture, 1932, page. 411.

There is no doubt but that the invention of the cotton gin was a prime factor in the rapid spread of cotton production. Under the old method of ginning, picking the seed from the lint with the hands, only a few pounds could be picked from the seed by one person in a day. The first cotton gin, even though it was in an experimental stage, could do the work of several individuals.

Mechanization in planting and cultivating cotton never progressed very far until recently. During the early years of American cotton production, low-priced labor enabled growers to furnish a sufficient supply of cotton at relatively low production cost. The heavy loss due to the boll weevil following the World War caused a greater growth of cotton in the western Texas and Oklahoma regions. The people could produce cotton in the sub-humid areas at a reasonable profit, since the price had been higher due to the loss in the Eastern section of the cotton region.2/

The invention of the reaper in the early part of the nineteenth century is another example of what an invention can do for rapid agricultural expansion. In more primitive times, the production of wheat was somewhat on a self-sufficing basis. Wheat production was conducted on a small scale. This was so also with other small grains, but is particularly true in the case of wheat.

Under the old system of wheat growing it was almost impossible to produce a surplus. However, Russia did produce a surplus under those conditions. Surplus for export has been greatly influenced by the invention of machinery. In the wheat sections large scale production was not possible until the invention of the steel plow. This plow enabled the wheat farmers in the wheat growing section to plow the heavy prairie soils. Following

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2/ Ibid, p. 412.

the invention of the steel plow came the invention of the reaper, and the separator just prior to the Civil War.

When the Civil War broke out there was a great demand for wheat and it gave rise to an immediate demand for the new inventions. Greater mechanization and increase in the size of the wheat farm unit followed. It was during this period that the rapid spread of wheat growing extended over almost the entire Great Plains region and the upper Mississippi Valley region.

Mechanization of the wheat farm naturally brought about a change in the labor set-up on the farm. It did not destroy the family-farm relationship. It did much in solving the seasonal-labor question; because the invention increased the capacity of labor. This made it possible for a man to increase the size of his unit if he had the necessary capital to finance his enterprise.

Following the invention of the plow, reaper and separator, came the combustion engine, which was first used primarily as a stationary source of power. Later the combustion engine was developed into a source of mobile power. The truck was also a development for farm use as well as commercial use.

The invention of the new power and new power machinery increased the capacity of the farmer in terms of land and capital. These in turn have certainly been factors influencing the increased amount of production of wheat in the United States, as well as foreign countries. Labor was displaced by machinery, yet the amount of capital to work the larger units was increased. Machinery costs were likewise increased. This condition made an attractive situation for some large corporations. They had the capital and could get hold of the land that would be necessary to be used

under the larger unit system. The serious question of whether, the farm family would continue to have a place in American agriculture arose over the existing condition. Statistics give but little support to such a supposition. It is not likely that large corporations would draw capital from other existing industries to venture into the supposed new field.

There has been recent development in practically every field of agricultural activity. This development is due to possibly two important factors, supply and demand. Mechanization produces to the point of surplus and is slowed by lower prices. Attractive demand of agricultural products increases mechanization. Mechanization would also transform the type of power used in agriculture and decrease price as a result of a decrease in the farm demand for farm products.

During the past 15 or 20 years the development of mechanical sources of power and the development of machinery and implements to accompany them, have greatly increased the physical efficiency of human labor. As long as favorable prices for these commodities could be secured this physical efficiency was reflected in economic efficiency and higher profits, and worked to displace considerable human labor, to increase the size of the operating unit, and to expand the output. These very developments, however, have helped to reduce the prices of commodities, and thereby to reduce the economic efficiency and also the profits of farm operation under the present conditions.[3/]

Effects of Mechanization on Supply and Demand of Agricultural Products

One of the best examples illustrating the fact that mechanization increases production and decreases price, is the introduction of the combine

3/ Ibid, p. 414.

and the increased use of the tractor. The reduced direct labor required in wheat production from 65 percent to 85 percent per acre on some of the level, semi-arid land.[4/] There was probably an increase in the cash expense per farm. The costs for machinery and machinery supplies must, for the most part be met in cash payment which must come from the gross value of the product of farm operations. Hired labor does not always receive full nominal value for the product produced. Hired labor may be met by other means and in such cases, crop failure would not result in bankruptcy or abandonment of farms. During this period, however, there was a quantity of transcient labor which in some cases did not prove entirely satisfactory. In some cases the labor situation acted as a pressure to adapt machinery even though it was not best financially. High production costs naturally came on the farmer and forced him to increase the size of his farm unit.

There has also been an increase in the size of farm unit that the individual wheat producer could handle. He was forced to increase his farm unit to the place where he could profitably make a reasonable return upon his investment. This probably meant a reduction of the margin between cash expense and income per farm, assuming the amount of wheat sold remained the same.

Mechanization made wheat production profitable until 1930-31, and as a result the wheat acreage has tended to increase in semi-arid areas. Not only has this increase been in the United States but it has been in Australia, Canada and Argentina, the high producing foreign countries.

A second influence of mechanization tended to change the type of power used in agricultural production. There was a decrease in horse and mule power which meant an increase in the demandfor raw material and industrial

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4/ Ibid, p. 415.

labor. The demand for hay, grain and pasture for animal power was decreased because of the lack of need for it. The tractor has tended to replace the horse and mule as the horse and mule replaced the oxen. The number of oxen on farms in the United States decreased greatly before 1900. The Census of the United States has not reported any since that time. Table 1 shows the number of working oxen on farms in the United States for the different Census years. Mechanization has meant much to farm units where routine operations have to be performed and on single type enterprises.

Since 1921-1922 there has been a 25 percent increase in the world supply of wheat. Apparently the world demand for wheat has been increasing from year to year. The price of wheat in the United States, when adjusted for changes in the general price level, shows a downward trend throughout the 1921-1931 period (See Figure I).

Table 1. Number of Working Oxen on Farms in the United States by Census Years, 1850-1900

Year	Number	Year	Number
1850	1,700,744	1880	993,841
1860	2,254,911	1890	1,117,494
1870	1,319,271	1900	None reported

Source: Census of the United States for each of the above mentioned years.

A third factor may be considered which is a result of the first two factors. When production increases price decreases, the high-cost producer tends to readjust by cutting acreage. (See Figure II). Also, a decrease in demand and a decrease in price, the high-cost producer is forced to cut production. This may tend to be an influencing factor in the concentration of production for agricultural products to reas best suited to the crop under consideration.

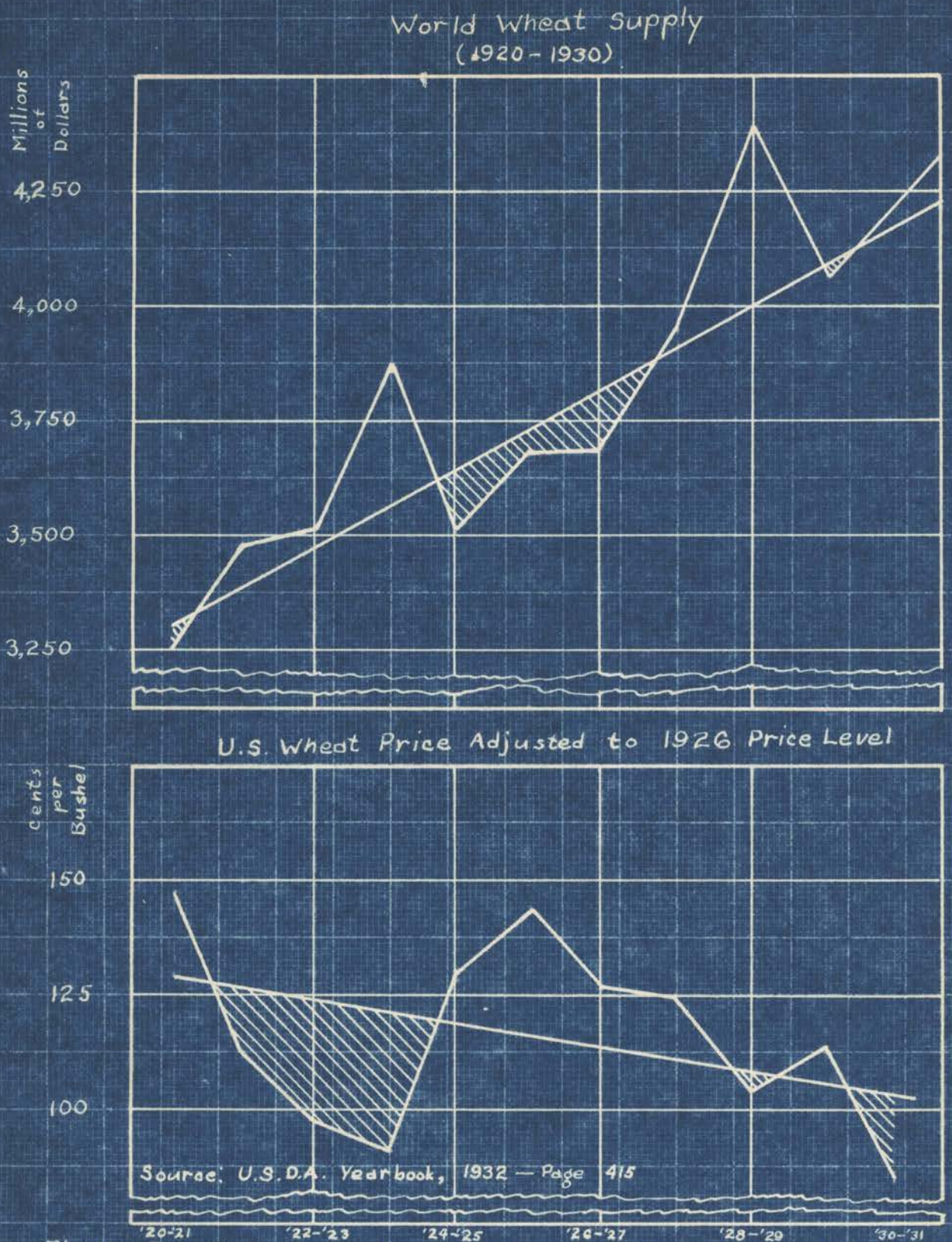
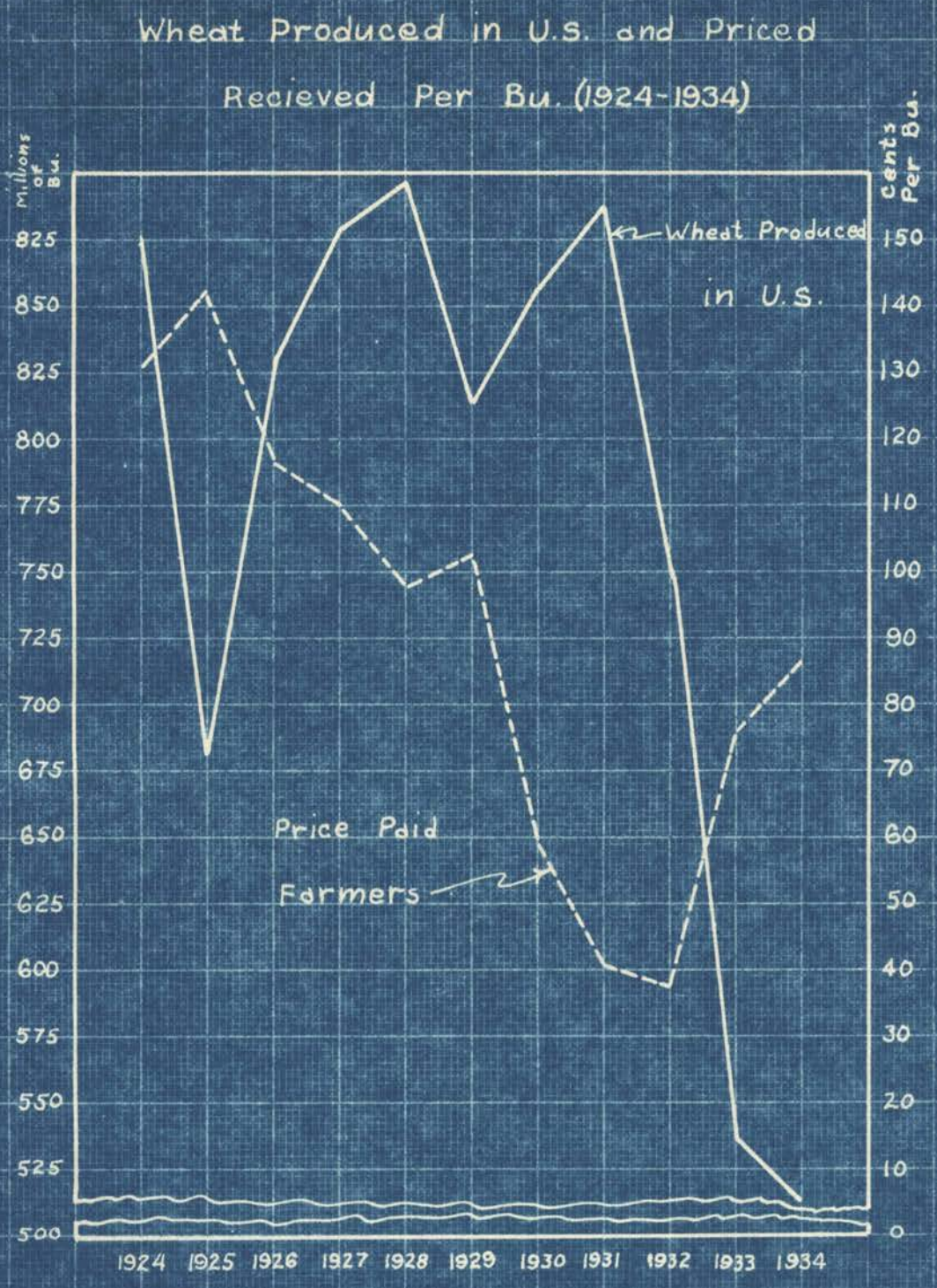


Figure I.--When the world wheat supply and the average farm price of wheat in the United States from 1920-21 through 1930-31 are are compared, the supply-price relationship is quite clearly indicated. When the wheat supply has been above the trend line, prices have been below the average and when the supply has been below trend, prices have been above average.



Source: 1932 Yearbook of Agri. - Page 578 - Table I

Figure 2.--When production has been above the trend line, prices have been below average and when production has been above trend line, prices have been above the average.

Several attempts were made in 1858 and in following years to introduce steam plows for which the Illinois Central Railroad Company offered a premium of $3,000.00 They had (in 1860) been employed for several years in England with success. The English steam ploughs were operated by stationary engines placed at one side of the field and draw the plough from one side to the other by means of wire chains. At other seasons of the year they were used to perform other farm labor. The first tractors for mobile power would work on hard ground but would bury themselves in loose or moist soil.

Adaptation of Tractors to Various Farm Operations in Later Years

During the past twenty-five years the development of power and power machinery has been so great that today some of our farms are operated entirely without the use of animal power. In the early days it took one man several trips to the row to give it a thorough plowing. The plowman in many cases had to go up one side of the row and back on the other side in order to plow only the row. This method required the services of one man and a team. Today that man can operate a machine that will plow several rows, and do a much better job in cultivating the soil. Mechanization has also meant much as far as speed in plowing is concerned. Plowing with the modern machine one does not have to slow down in hot weather, and an excessive number of hours may be worked without stopping. Tractor farming has also eliminated the labor involved in caring for the horses and mules.

Tractors have not always been the success they are today. Like every other invention of great importance, the tractor has had to go through its period of development. The first tractors were very cumbersome.

Their weight was enormous and because of it much damage was done to the crops and soil when it was used. The early steam tractor required about the labor of two men to keep the fuel and water hauled for its operation. This of course was a continuous process while the tractor was in operation. In an investigation made in southwestern Oklahoma, it was found that five hours of man labor was required to produce an acre of cotton aside from the chopping and picking where a tractor was the sole source of power. 5/ On mule-operated farms, six and six-tenths hours of man labor were required to accomplish the same result. That was a difference of 25 percent in labor requirements in favor of tractor operation. (See Table 2). The farmers using tractors as a source of power gained one cent per pound of cotton more than those using mule power for labor and management. Assuming the cost per acre or per unit had been the same, it still would have been profitable to have used tractor power because there was more cotton produced on the tractor-operated farms. 6/

Table 2.
Man Labor in Number of Days for Cotton Production in Southwestern Oklahoma, Acres Produced and Days of Man Labor per Acre, 1929

	Man labor in number of days excluding picking and chopping	Number of acres	Number of days per acre for man labor
Farms using mules only	95	143	.66
Farms using both horses and mules	104	190	.55
Farms using tractors only	87	175	.50

Source: P. H. Stephens, "Mechanization of Cotton Farms," p. 31.

Gasoline tractors like the steam tractors, were first used as a stationary source of power. In 1876 the Otto engine appeared. This was not the first combustion engine, but it was the first of the four stroke-cycle type, the principle on which our modern machines were built. There were

5/ Stephens, P. H. "Mechanization of Cotton Farms," p. 31.

6/ Ibid.

many advantages as far as the gasoline type of power was concerned, and the people using mechanical power soon recognized this fact, but many developments and corrections had to be made to the gasoline engine before it could be used successfully in agricultural production.

About 1912 there developed a need for smaller units. The large cumbersome units were not the type to do the work, and were not suitable for use on the farm. The demand for a different type of machine led to the development of the general-purpose tractor. The general-purpose tractor of today weighs about one half as much as did the corresponding tractor twenty years ago. The present 30 horse-power tractor weighs about three tons. The first general-purpose tractor came into use about 1924. Unlike the first tractors, this general-purpose machine was lighter in weight and could be handled with much greater ease. Especially did it prove more suitable in the cultivating of the smaller tracks of land.

Following the development of the general-purpose tractor, came the development of equipment suitable to the new source of power. With the new equipment it was possible to do everything necessary for crop production, from turning the soil the first time, through the planting season, through the cultivating season, and until the crop was "laid by." Not only was this true in row crop cultivation, but it was true in the production of grain. The tractor revolutionized the entire agricultural production field. "With the increase in the number of tractors and trucks has come a large decrease in the number of horses and mules. According to the 1931 Yearbook, the number of these on farms, January 1, 1918, was 26428,000, and on January 1, 1930, only 18,643,000."[1/]

1/ Gray, R. B. "Farm Mechanization," 1931 Yearbook of Agriculture, p. 441.

In 1909 the number of tractors manufactured in the United States was about 2000. Before this time the tractor had played an unimportant part in agricultural production. In 1919 in the Great Plains area alone, the United States Census reported about 82,000 tractors, which only included farms from eight of the most important of our wheat producing states. Our neighbor on the north, Kansas, led at that time with a total of 17,000 machines. From that time farm mechanization throughout the agricultural sections of the United States had a rapid increase and in some places the increase has been 100 percent over the previous year. (See Table 5 for recent growth in Oklahoma by districts).

The following are advantages of mechanization and utilization of tractor power:

Mechanization on farms in Oklahoma has reduced the labor requirements. Much time is spent in the care of horses and mules and at certain seasons when farm labor is in demand there would have been a saving to the farmer if the labor could have been properly used.

The use of the tractor permits continuous hours of working, especially during the rush periods when time is of major importance.

Ordinarily mechanization reduces seasonal shortages of labor.

Mechanization has enabled the farmer to increase his farm unit. This increase in acreage has been greatest in our wheat growing sections.

The use of mechanical power has enabled the farmer to produce more per acre, giving him a greater per acre financial return.

Not only does the use of the tractor reduce labor requirements during idle seasons, but it reduces requirements in production.

CHAPTER II

Description of Crop Reporting Districts in Oklahoma

District one includes the following counties: Beaver, Cimmaron, Ellis, Harper and Texas. The soil in this district consists mostly of nearly level fine sandy loam, with the exception of the western side of Cimmarron county, the eastern side of Beaver County and all of Harper and Ellis Counties which consists mostly of sand and rough pastures, of rolling sandy loam soil, and level clay loam soils. The types of farming in this district are cash grain and livestock. The average size of the farm increased from 245 acres in 1908 to 678 acres in 1934. This increase was largely made possible through the increased use of machinery.

District two includes the following counties: Alfalfa, Garfield, Grant, Major, Kay, Noble, Woodward and Woods. District two is very similar to District one, in respect to types of soils and crops grown. There is more general farming in this district and some cotton is produced. The average size of farm in 1908 was 212 acres as compared with the average size farm in 1934 which was 253 acres. It is one of the most productive districts in the state. District two is also adapted to the use of tractors and tractor machinery. Parts of the district are characterized by decidedly rough topography and poor soils.

District three includes the following Counties: Craig, Deleware, Mayes, Nowata, Osage, Ottowa, Pawnee, Rogers, Tulsa, Wagner and Washington. The soil in this district is from a brown sandy loam to a dark brown clay loam. The topography is rough and rolling. The western half of the district is devoted to general farming consisting of livestock, dairy and poultry, and is primarily a self-sufficing district. The remaining part is also self-sufficing. Tractor and tractor implements are used to a

small extent in this district. The size of the farms in this district varies from 89 acres to 300 acres. The average size of the farms remained almost constant from 1908 to 1934 (154-169).

District four includes the following counties: Beckham, Blaine, Carter, Dewey, Roger Mills and Washita. The soil in this district is rolling sandy loam, level clay loam, sand and rough pasture land. The type of farming in this district includes production of cotton, cash grain, general farming and livestock. This district is not as well adapted to tractor farming as districts one and two, yet the use of tractors and tractor machinery has increased with improvement of machinery adapted to this type of farming. The average size of farms has remained almost constant at about 200 acres from 1908 to 1934.

District five includes the following counties: Canadian, Cleveland, Grady, Creek, Kingfisher, Lincoln, Logan, McClain, Okfuskee, Oklahoma, Payne, Pottawatomie and Seminole. This district is the central prairie region of Oklahoma. The topography is undulating to rolling. The type of soils consists principally of rolling sandy loam or level clay loam and a reddish brown sandy soil. The eastern part of this district is generally poor except on small bottoms. The types of farming include: General farming, cotton, livestock, dairy, poultry and self-sufficing. The average sized farm in this district is approximately 130 acres. This district is not well adapted to tractor farming.

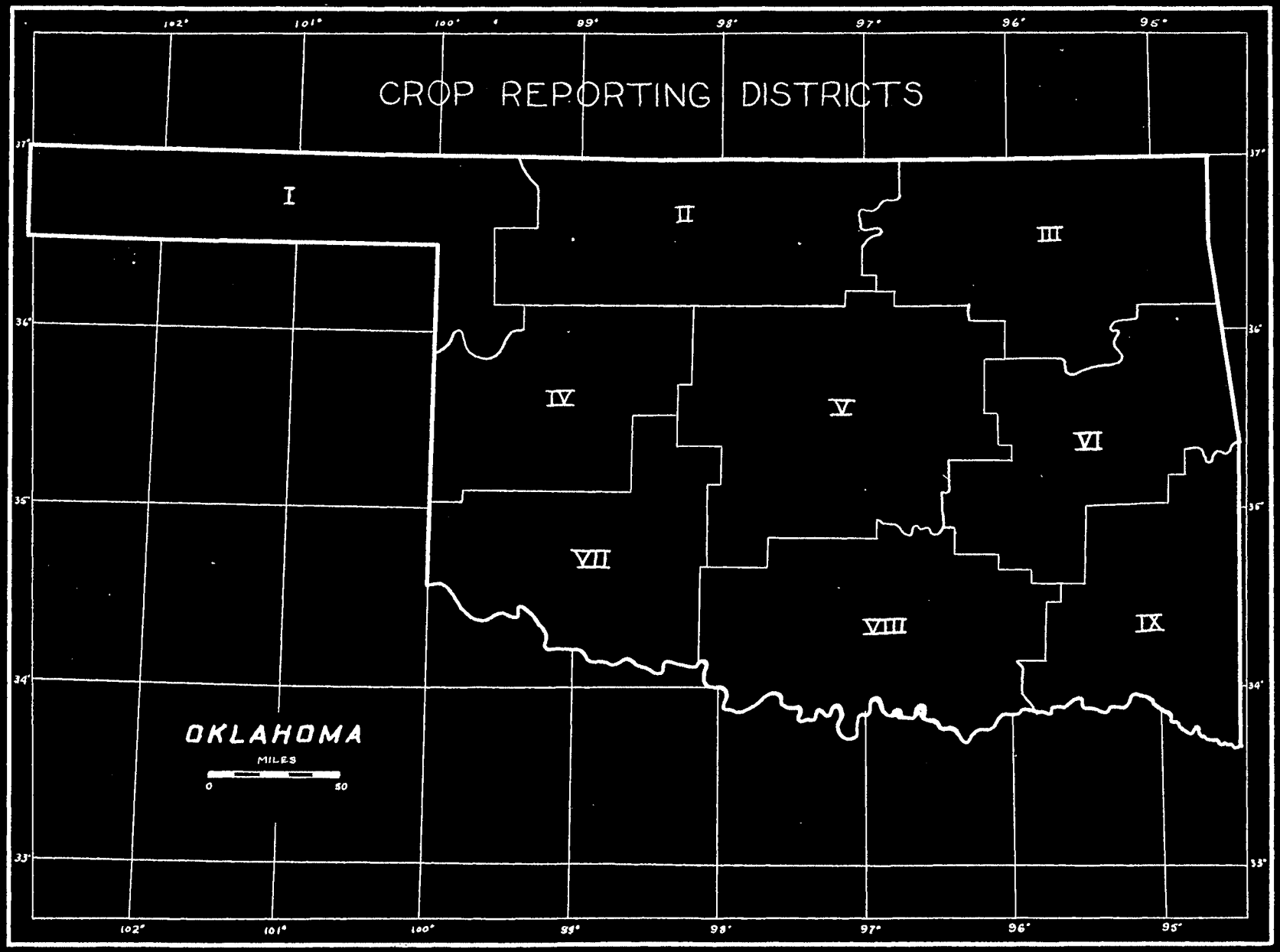
District six is a hilly to mountainous areas including the following counties: Adair, Cherokee, Haskell, Hughes, McIntosh, Muskogee, Okmulgee, Pittsburg and Sequoyah. Agriculture in this district is mostly self-sufficing. The principal products are cotton, some dairy, potatoes, some fruit, general farming and poultry. The average size of farms in this

district is 90 acres. The use of tractors and tractor machinery in this district is very limited.

District seven consists of the following counties: Caddo, Comanche, Cotton, Greer, Harmon, Jackson, Kiowa and Tillman. The topography is from level to gently rolling. The types of soils are sandy loam, level clay loam, with some sand and rough pasture. The average sized farm is approximately 180 acres. The types of farming are predominately cotton, some grain, dairy and poultry. The use of tractors and tractor machinery has increased in this district. The percent of farms with tractors increased from 5.8 percent in 1924 to 21.4 percent in 1934.

District eight consists of the following counties: Atoka, Bryan, Carter, Coal, Garvin, Jefferson, Johnson, Love, Marshall, Murray, Pontotoc and Stephens. The soil is a dark brown clay and a reddish brown sandy soil strongly inclined toward erosion. The types of farming are cotton and general farming. The average size of a farm is about 140 acres. Less than three percent of the farms in this district are equipped with tractors.

District nine consists of the following counties: Choctaw, Latimer, LeFlore, McCurtain and Pushmataha. This is a rough to mountainous district consisting of small self-sufficing farms, producing some cotton and livestock. The use of tractors and tractor machinery is very limited. Less than one percent of the farms are equipped with tractors.


CROP REPORTING DISTRICTS
102°
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100°
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CHAPTER III

Tractor Power Costs 1924-1934

The main sources of information for this chapter were records from the Agricultural Economics Department of the Oklahoma Agricultural and Mechanical College, records from other states, the Agricultural Census of the United States and the report of the Oklahoma State Tax Commission. The information obtainable concerning the operation costs of tractors in Oklahoma was somewhat meager. Only in recent years has the Agricultural Economics Department of the Oklahoma Agricultural and Mechanical College kept records of tractors costs.

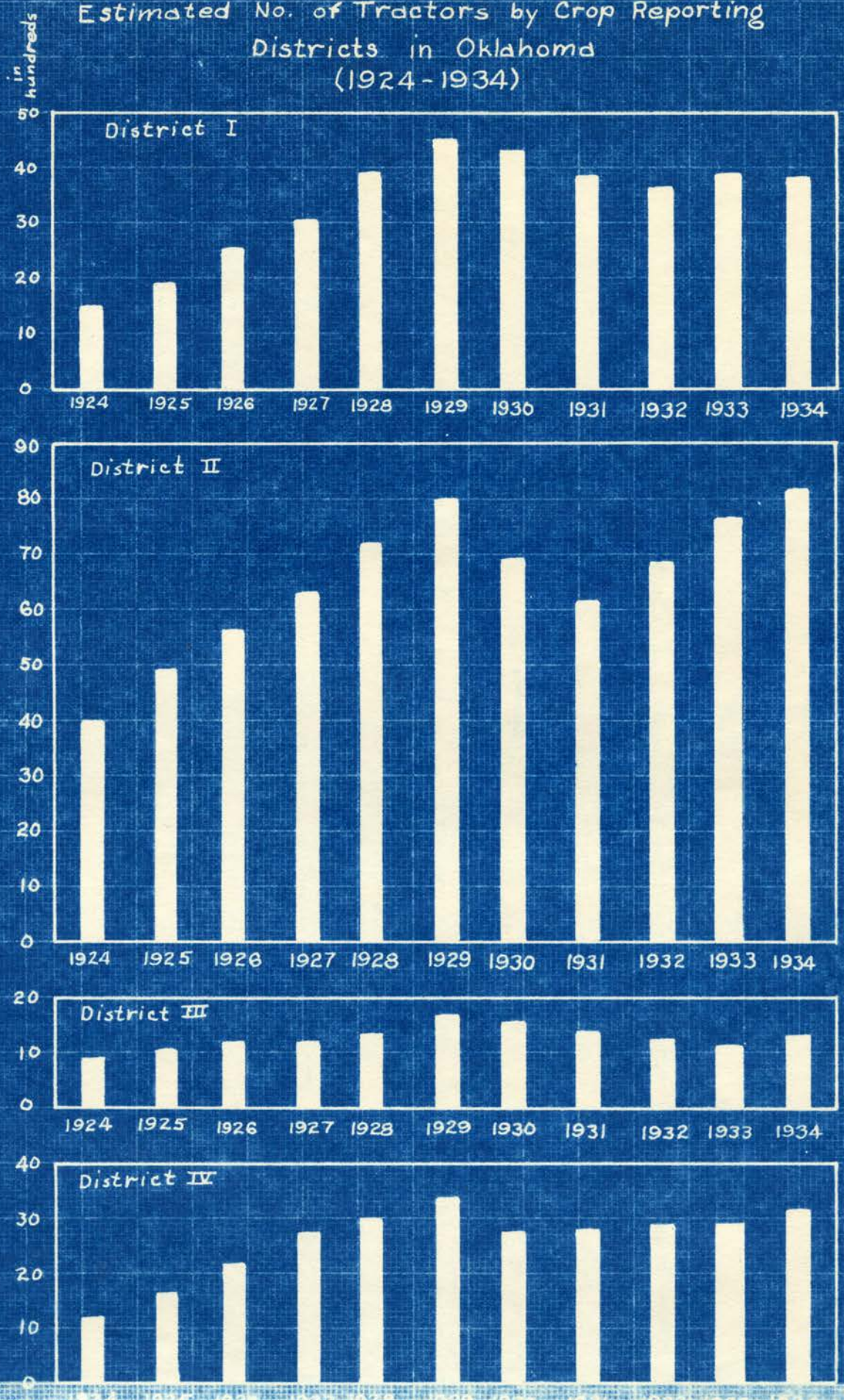
Sources indicate the cost of operating tractors vary with the kind of operator, the area in which the tractor is used, the price of fuel, the kind and size of the tractor, and the total number of hours used annually; these in turn are affected by the type of crop grown, the size of the farm and climatic conidtions. Careful consideration was given the above factors in estimating the tractor cost in each district. The cost determinations represent the estimated average of all tractors in the district.

Method and Procedure of Calculating Cost of Operating Tractors in Oklahoma, 1924-1929

Number of Tractors

Figure III shows the estimated number of tractors on farms in each district for each year 1924-1934. District totals are calculated by Census of Agriculture figures in number of tractors on farms in each county for the years 1924-1929. The number of tractors for the intercensual years were estimated by straight line interpolation. (See Table

Estimated No. of Tractors by Crop Reporting Districts in Oklahoma (1924-1934)



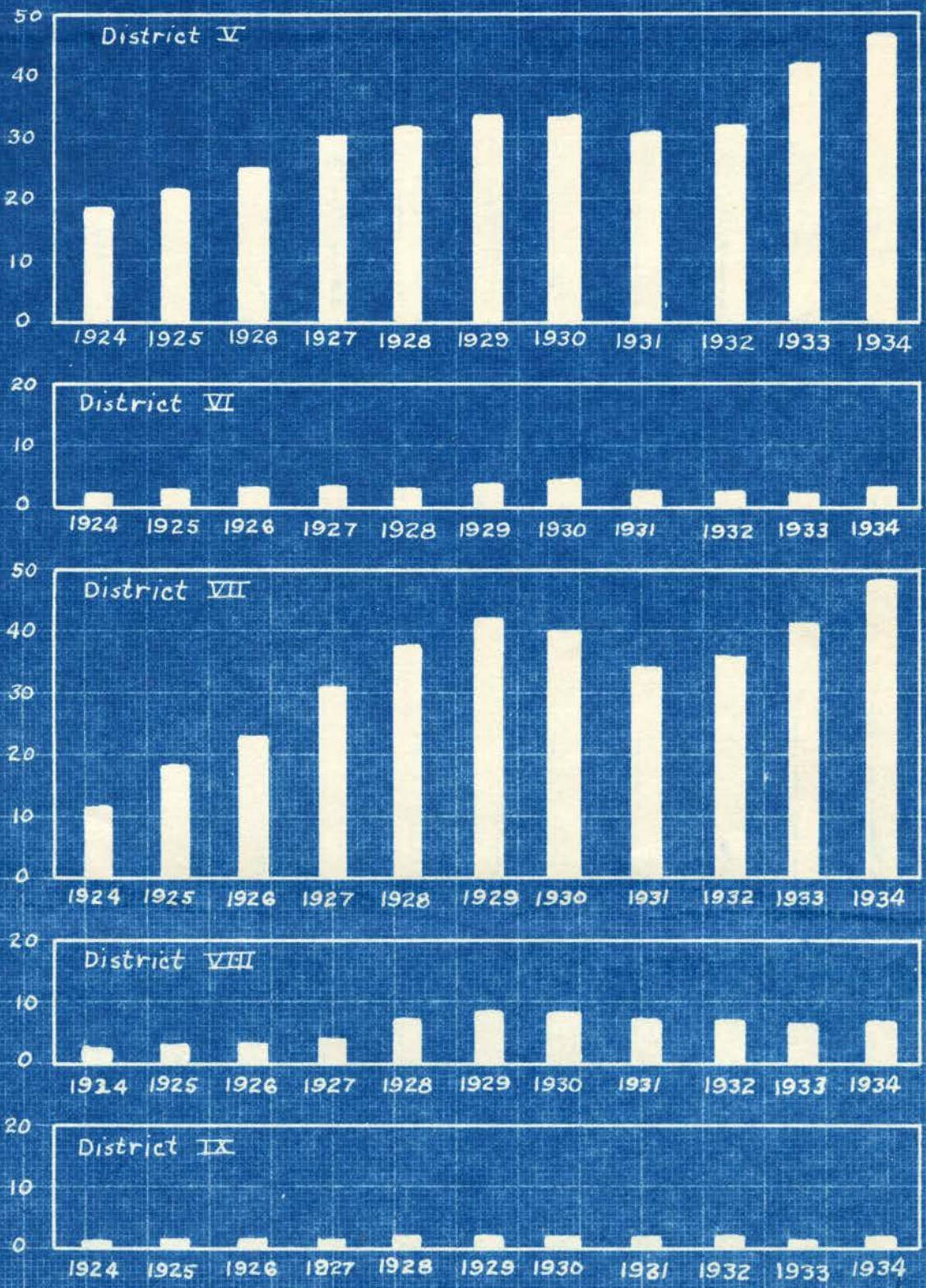


Figure III shows the number of tractors by districts in Oklahoma Some districts shows a greater gain than does others. The grain sections of Oklahoma tend to have a greater per cent increase in tractor power than do other districts. Districts three, six, eight and nine show the smallest percent increase.

6). The number of tractors on farms for the years 1929 to 1934 were estimated from the registration of tractors in each district. (The estimate was calculated from the registration the succeeding year.) The percentage of the number of tractors on farms in each district to the number registered in the state was assumed to be the same for each district as it was in 1929.

Value of tractors

The average value of farm tractors in 1929 was $823.63 as estimated from 116 tractors records by the Agricultural Economics Department of the Oklahoma Agricultural and Mechanical College.[1/] The value of tractors for other years was calculated by adjusting the index of farm machinery prices[2/] to the 1929 basis and applying this adjusted index to the base value of $823.63 per tractor.

Year	Actual Index of Farm Machinery Prices 3/	Adjusted Index
1924	152	99.3
1925	153	100.0
1926	154	100.6
1927	154	100.6
1928	154	100.6
1929	153	100.0
1930	152	99.3
1931	150	98.0
1932	141	92.2
1933	137	89.5
1934	144	94.1

Fixed Costs

Fixed costs include interest, depreciation, repairs, tags and tools.

Depreciation is the largest single item of expense in all districts except district one and two. In these districts the total hours of annual use is greater than in the other districts; therefore, fuel is the great-

1/ Chase, Art B., "Cost of Operating Tractors in the Wheat Belt of Oklahoma", p. 47, 19__.

2/ United States Department of Agriculture, Yearbook of Agriculture, 1935, p. 680.

3/ Ibid.

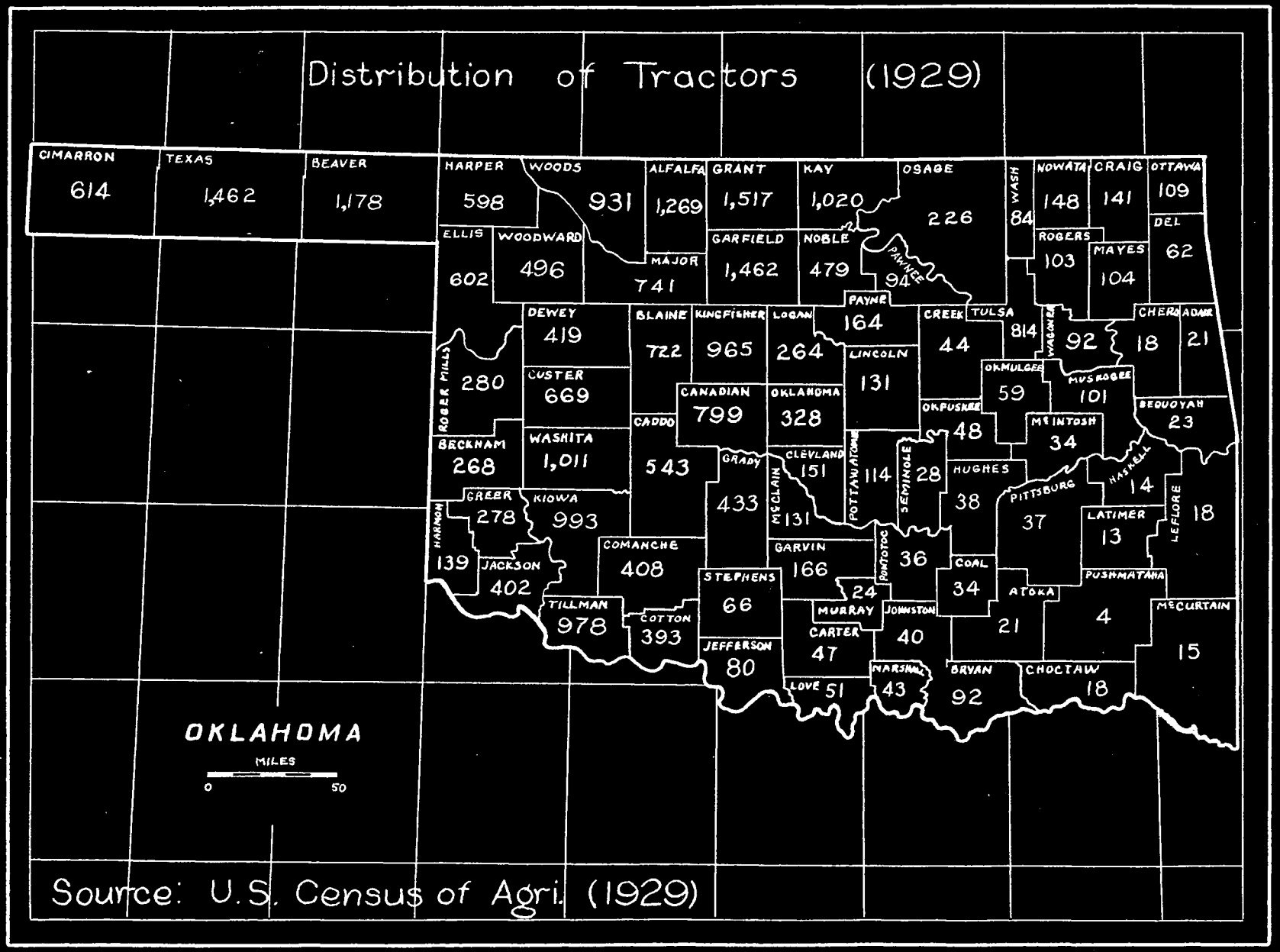

Distribution of Tractors (1929)
CIMARRON 614
TEXAS 1,462
BEAVER 1,178
HARPER 598
WOODS 931
ALFALFA 1,269
GRANT 1,517
KAY 1,020
OSAGE 226
WASH 84
NOWATA 148
CRAIG 141
OTTAWA 109
ELLIS 602
WOODWARD 496
MAJOR 741
GARFIELD 1,462
NOBLE 479
PAWNEE 94
ROGERS 103
MAYES 104
DEL 62
PAYNE 164
DEWEY 419
BLAINE 722
KINGFISHER 965
LOGAN 264
CREEK 44
TULSA 814
WAGONER 92
CHER
ADAIR 21
ROGER MILLS 280
CUSTER 669
LINCOLN 131
OKMULGEE 59
MUSKOGEE 101
CANADIAN 799
OKLAHOMA 328
OKFUSKEE 48
MCINTOSH 34
SEQUOYAH 23
CADDO 543
BECKNAM 268
WASHITA 1,011
GRADY 433
CLEVLAND 151
POTTAWATOMIE 114
SEMINOLE 28
HUGHES 38
PITTSBURG 37
HASKELL 14
LATIMER 13
LEFLORE 18
GREER 278
KIOWA 993
HARMON 139
JACKSON 402
MCCLAIN 131
COMANCHE 408
GARVIN 166
POTTOTOC 36
COAL 34
ATOKA 21
PUSHMATAHA 4
MCCURTAIN 15
TILLMAN 978
COTTON 393
STEPHENS 66
MURRAY 24
JOHNSTON 40
CARTER 47
JEFFERSON 80
LOVE 51
MARSHALL 43
BRYAN 92
CHOCTAW 18
OKLAHOMA
MILES
0
50
Source: U.S. Census of Agri. (1929)

Table 3. Number of Tractors and Percent of Farms with Tractors by Crop Reporting Districts in Oklahoma According to Census Year

Districts	Number of farms			Number of tractors			Percent of Farms with tractors 1/		
	1924	1929	1934	1924	1929	1934	1924	1929	1934
I	8,489	7,843	8,060	1,186	4,454	3,573	13.9	56.8	44.3
II	18,061	19,420	18,879	4,049	7,915	8,299	22.4	40.8	44.0
III	21,378	24,101	27,084	865	1,377	1,360	4.5	5.7	5.0
IV	14,424	17,942	17,056	1,181	3,369	3,165	8.2	18.8	18.6
V	42,253	36,846	39,629	1,758	3,600	4,546	4.2	9.8	11.5
VI	26,776	27,296	29,505	209	345	293	.8	1.3	1.0
VII	22,172	24,317	22,213	1,295	4,134	4,747	5.8	17.0	21.4
VIII	29,204	25,950	29,131	382	700	734	1.3	2.7	2.4
IX	15,933	14,744	17,174	25	68	75	.2	.5	.4

1/ Assuming one tractor per farm.

est item of expense. The less a tractor is used the greater the percentage of depreciation is of the total operating cost. Tractors depreciate at about the same rate regardless of the amount of use because depreciation is due largely to obsolescence; however, standardization in our modern machinery may tend to make obsolescence a less important factor in regard to depreciation. The average life of a tractor is generally agreed to be ten years. The average rate of depreciation is estimated from the farm management records from Oklahoma Agricultural and Mechanical College as 15 percent of the average value. The same rate of depreciation was used by the University of Arkansas in calculating tractor costs.[4/]

Interest was calculated at six percent of the average value of the tractors.

The cost of repairs varies greatly with individual reporters and the age of the tractor.[5/] However, records from several experiment stations show that repair costs do not vary greatly in different localities and different years. One reason for this is that in the districts where there are only a few tractors and the annual use of the tractors is small, the cost of repairs are high compared with districts where more repairs are sold. A second reason is that farmers who use their tractors more hours per year are more efficient and take better care of them and need fewer repairs for the same amount of services. In the third place, less skilled operators have to hire more skilled labor to perform the repair operations. Therefore repairs were considered here as a fixed cost and estimated to be

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4/ Deane B. Carter, "Tractors in Arkansas," p. 9.

5/ Arkansas Bulletin No. 164, Ohio Bulletin No. 383, Minnesota Bulletin No. 280, Oklahoma, Art B. Chase "Cost of Operating Tractors in the Wheat Belt."

4.21 percent of the average value of the tractor.[6]

The average cost of tractor tags for 1935 was $2.50 calculated by the Oklahoma State Tax Commission from the total number of tractors registered and the gross receipts from tractor registration. The average cost of tractor tags for other years was estimated by finding the index of the average tag cost for all motor vehicles and applying this index to tractor tag cost for the base year, 1935.

Estimated Tractor Tag Prices for Oklahoma

Year	Index of Motor Vehicle Tag Prices	Estimated Tractor Tag Prices
1924	170	$4.25
1925	170	4.25
1926	170	4.25
1927	175	4.38
1928	182	4.55
1929	186	4.65
1930	183	4.58
1931	187	4.68
1932	173	4.33
1933	116	2.90
1934	104	2.60
1935	100	2.50

Tools were a very minor cost. Art B. Chase estimated the average annual cost of tools to be fifty-one cents per tractor.[7]

Varying Costs

The varying costs include the cost of fuel and the cost of oil and greases. The varying costs are determined by the number of hours the tractor is used annually and the cost of fuel.

The fuel requirement per hour estimated from 116 tractor records was 2.35 gallons of gasoline and 0.13 gallons of lubricating oil.[8] The number

6/ Estimated from Oklahoma farm records, Agricultural Economics Department, Oklahoma A. and M. College.

7/ Art B. Chase, "Cost of Operating Tractors in the Wheat Belt."

8/ Ibid.

of hours of annual use in each district was estimated on the basis of the average size of farms. Table 4 shows the estimated number of tractor hours per tractor for 1924 for each district. These estimates were based upon a study made by the Agricultural Economics Department, Oklahoma Agricultural and Mechanical College (unpublished data). The prices of gasoline were taken from the Statistical Abstract. Tank wagon prices were

Table 4. Estimated Cost of Operating Tractor Per Hours, 1924

District	Number of hours annually	Total annual cost	Cost per hour
I	900	$476	$ .53
II	400	324	.81
III	300	294	.98
IV	350	309	.88
V	250	279	1.12
VI & IX	160	251	1.57
VII	340	306	.90
VIII	285	289	1.01

Source: Comparable with cost analyses in Table 27, page 34 of Experiment Station Bulletin 199, "System of Farming in Oklahoma," by P. H. Stephens.

used with the addition of one cent federal tax for the years 1932, 1933 and 1934. The oil prices were estimated from the price paid for oil by farmers ($0.75 per gallon) in 1926.[9] The oil price for other years was estimated by calculating an index of oil prices listed in the Statistical Abstract and applying this index to the price of the base year, 1926, which was $0.75 per gallon. Four cents per gallon federal tax was added for the years of 1932, 1933 and 1934. An average cost of $4.41 per tractor was added to the oil cost to include the combined cost of oil and grease.[10]

9/ J. O. Ellsworth and R. W. Baird, "The Combine Harvester on Oklahoma Farms", 1926, pg. 5.

10/ Chase, Art B. "Cost of Operating Tractors in the Wheat Belt."

The accompanying table shows the estimated prices for fuel.

Prices per gallon including federal tax

Year	Gasoline	Oil
1924	15.9	74.2
1925	16.6	78.0
1926	17.5	75.0
1927	15.0	68.2
1928	14.7	66.7
1929	13.9	84.7
1930	11.7	63.7
1931	8.7	47.2
1932	9.9	50.5
1933	9.7	51.2
1934	9.4	63.2

Figures IV to XII show the estimated operating costs for each of the nine Crop Reporting Districts in Oklahoma. They also show the cost of operation per tractor in the different districts. The trend of the per tractor operating cost has been downward over the 1924-1934 period. The total operating costs for tractors seemed to reach a peak in 1929. Most districts showed a decline during the next three years. Since that time apparently there has been a general increase in the total operating costs.

Table 5 shows the average cost per acre for district I and IX. In district I where the farms are large, the cost per acre was much less than in district nine where the farms were small. The costs per acre will be much lower in this particular case because all acres in farms were used to calculate per acre costs. Table 5 also shows the average size of farm and average cost of tractor per farm. In district I the average cost per acre decreased more than the average cost per acre in district IX. Both districts showed an increase in the size of farm using tractor power.

Table 5. Total Tractor Costs, Farms with Tractors, Size of Farm, Cost Per Acre and Cost Per Farm, 1924-1929-1934

Year	Total tractor cost	Number of farms with tractors	Average size of farm	Average cost per acre	Average cost per farm
			District I		
1924	729,322	1,180	560	$1.10	616.00
1929	2,669,626	4,455	588	1.02	599.76
1934	1,699,520	3,570	678	.70	474.60
			District IX		
1924	7,264	31.8	75	3.84	288.42
1929	19,521	73.7	79	3.31	264.87
1934	18,857	68.6	86	3.20	274.80

Estimated Tractor Operating Cost

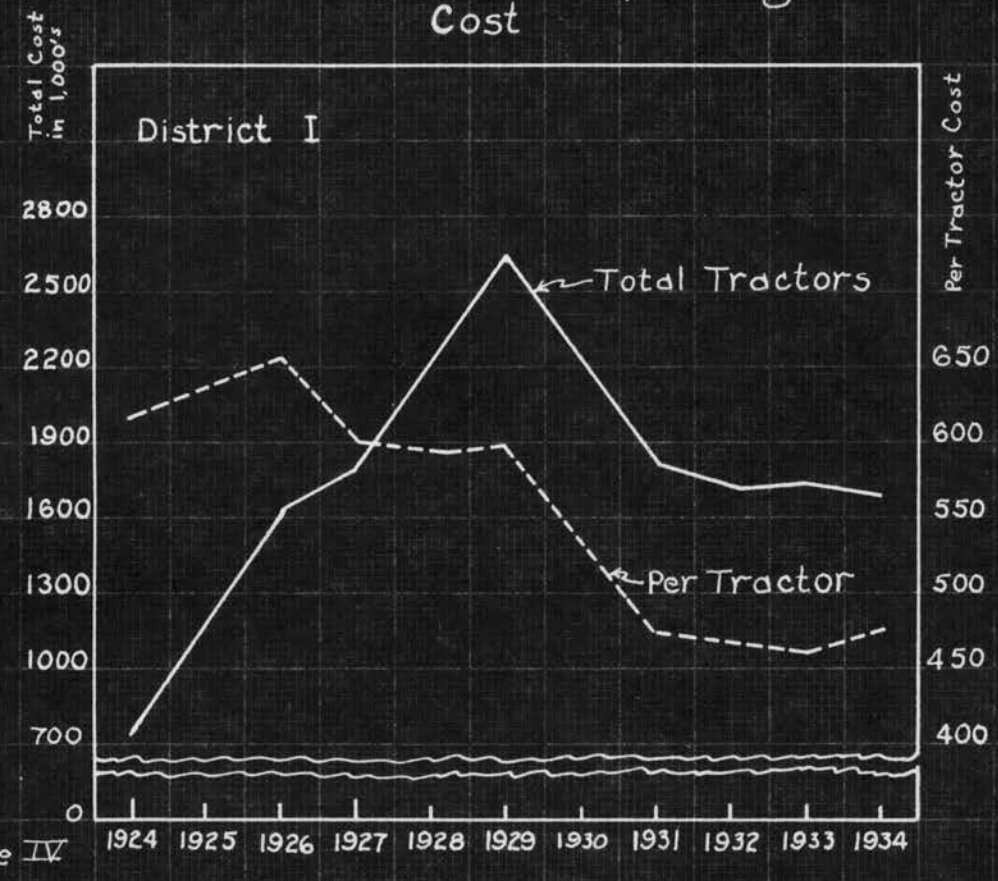


Figure IV

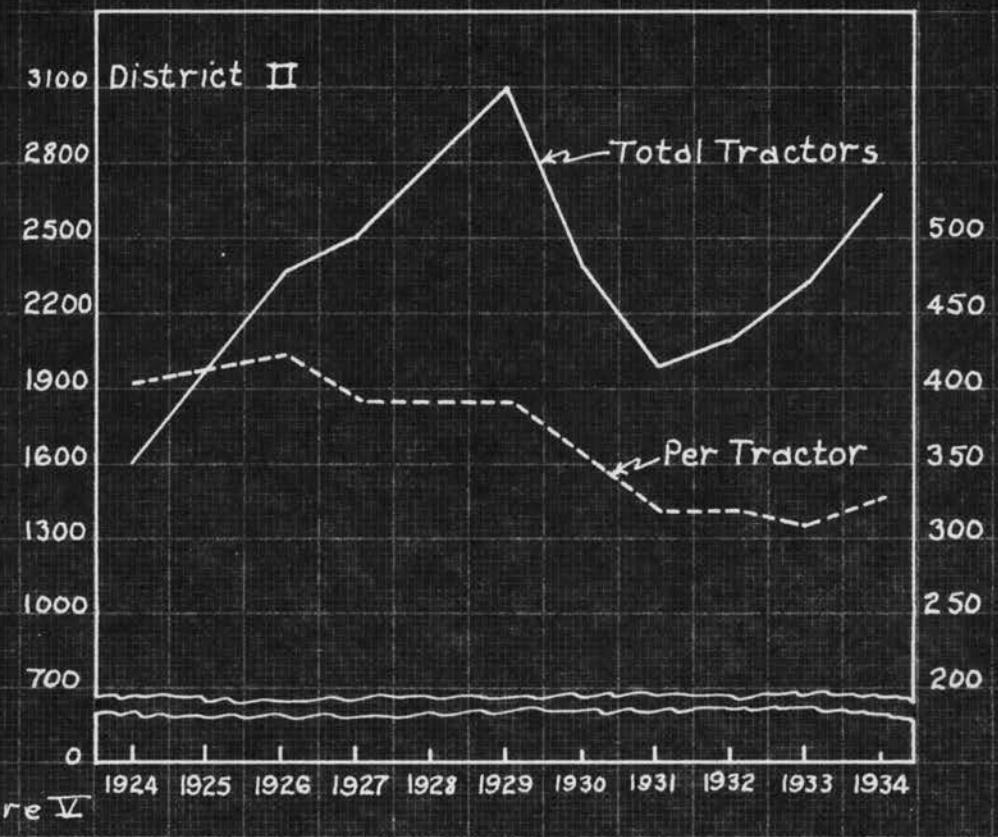


Figure V

Estimated Tractor Operating Cost (1924-1934)

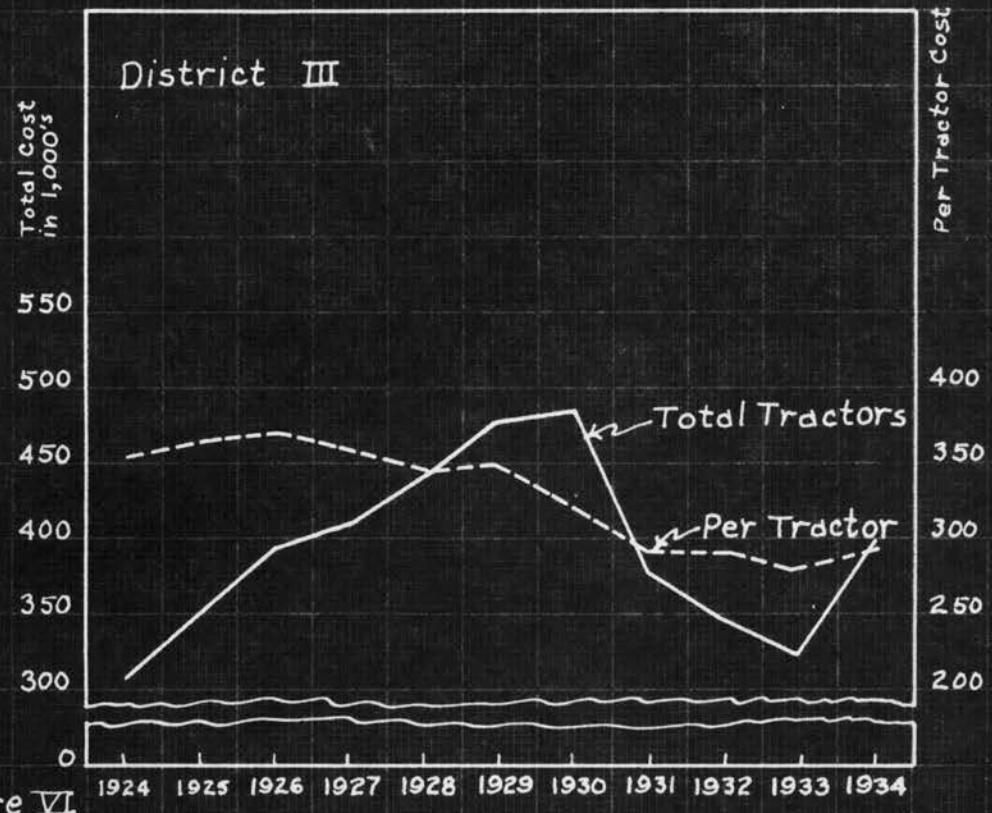


Figure VI

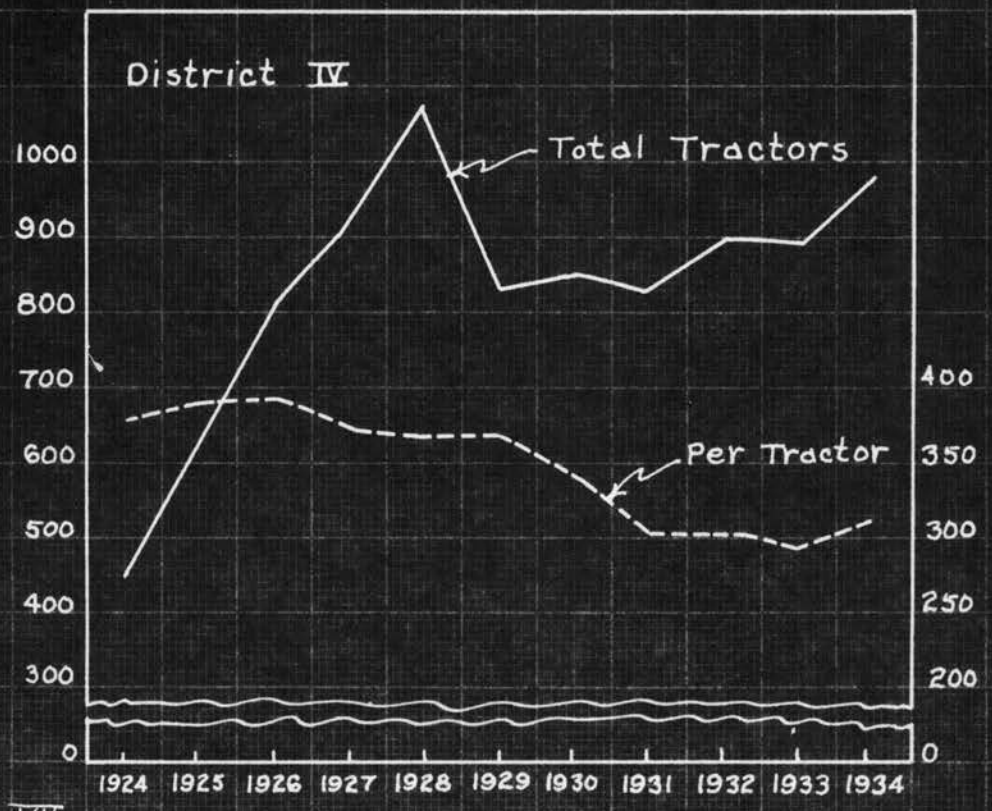


Figure VII

Estimated Tractor Operating Cost (1924-1934)

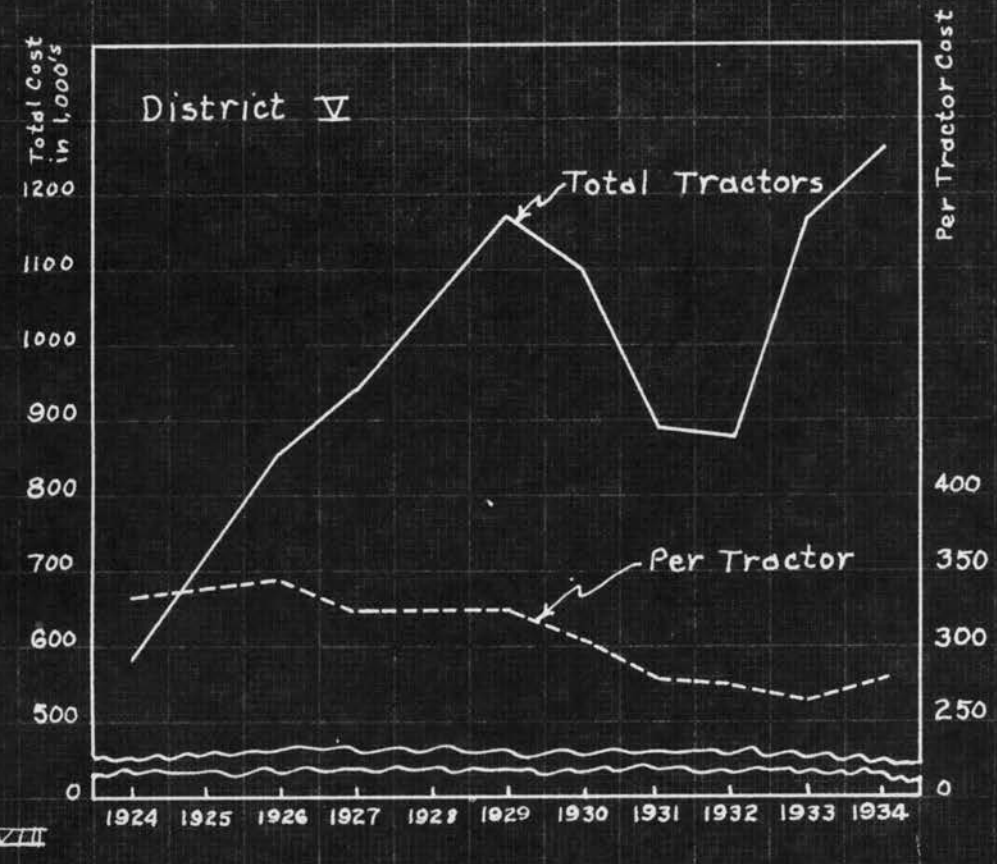


Figure VIII

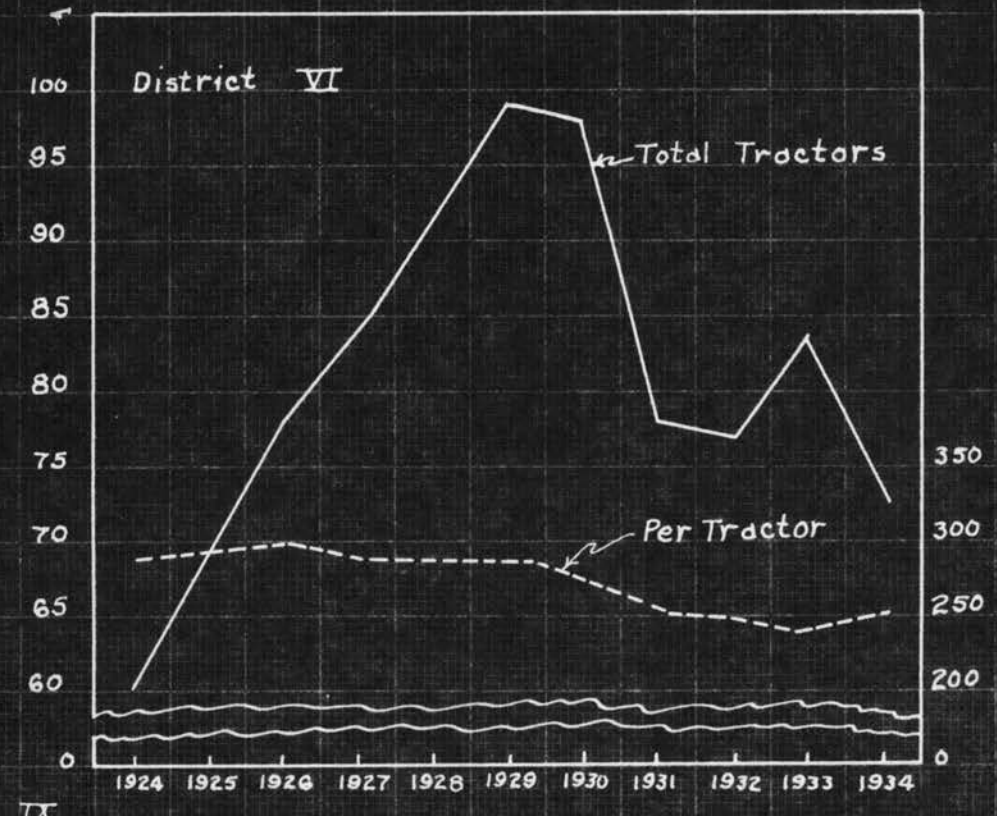


Figure IX

Estimated Tractor Operating Cost (1924-1934)

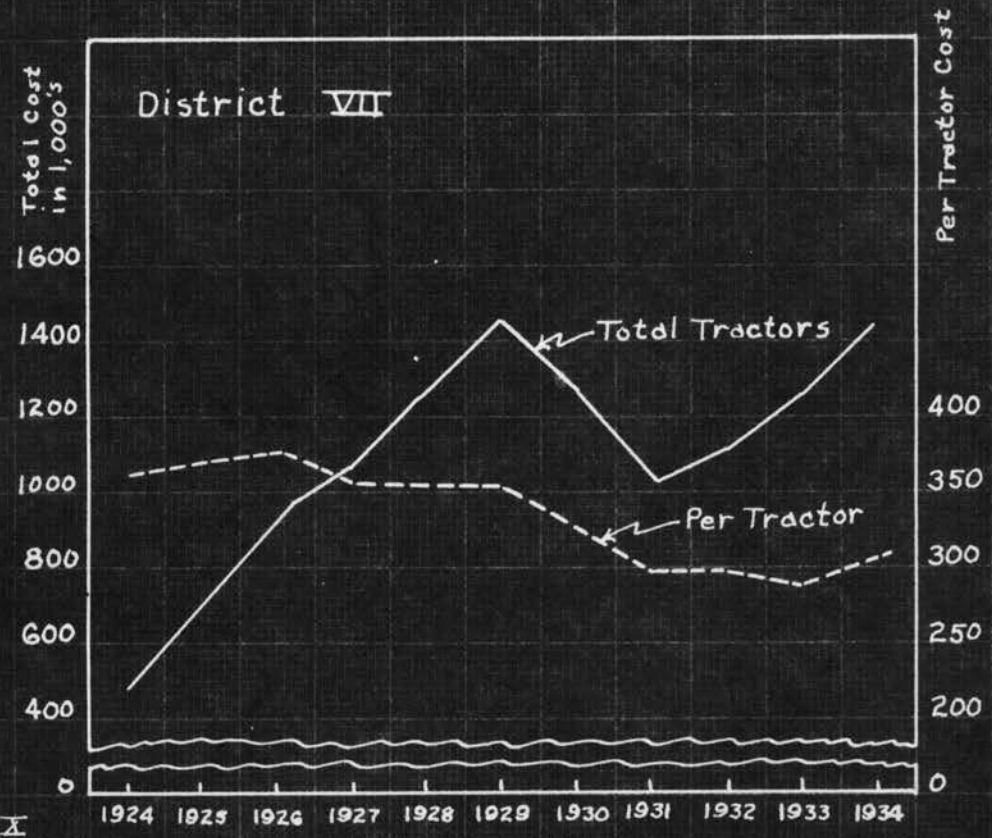


Figure X

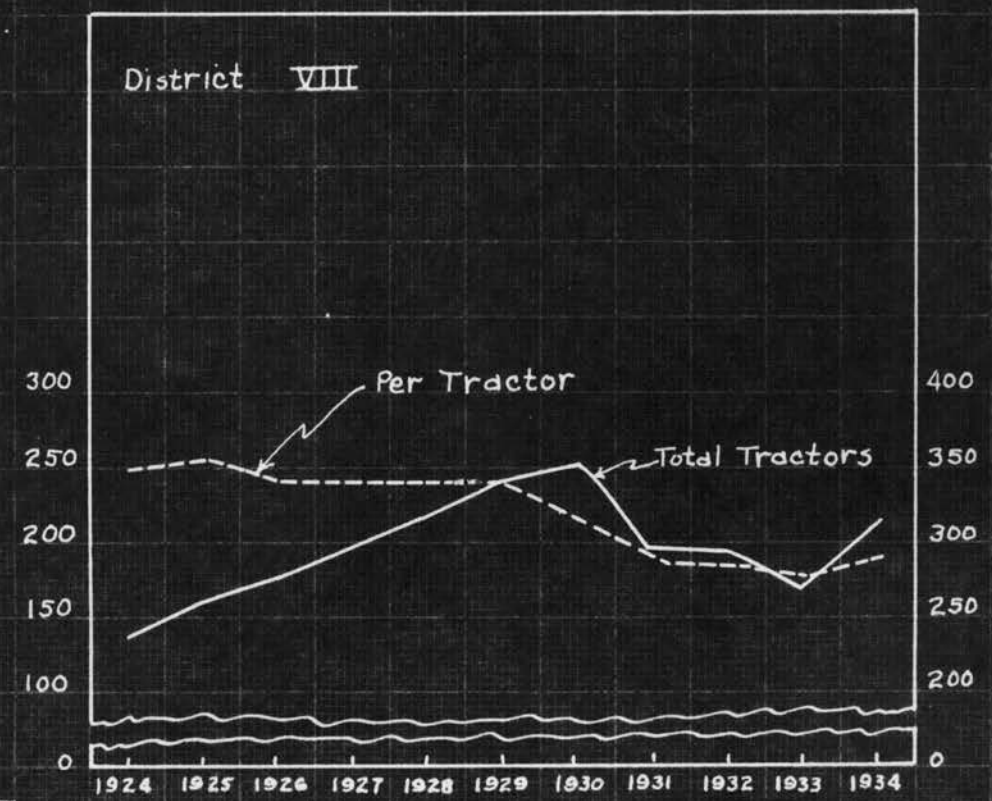


Figure XI

Estimated Tractor Operating Cost (1924-1934)

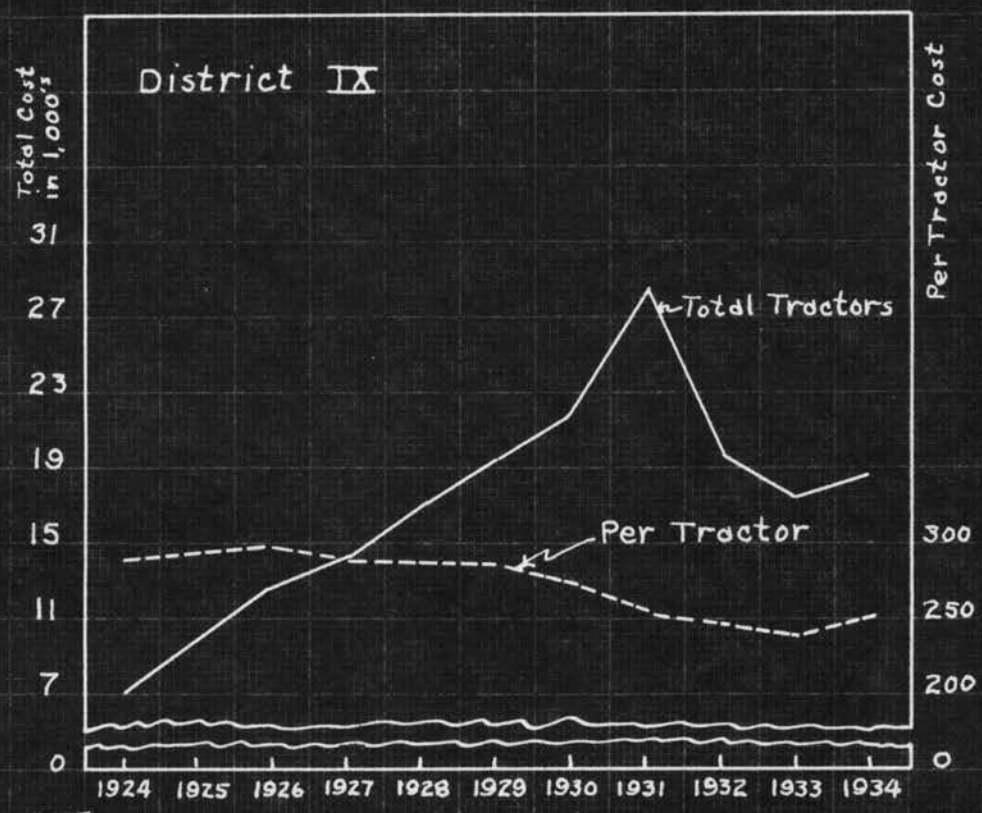


Figure XII

Figures IV to XII show the Estimated Tractor Operating costs by Districts in Oklahoma. The Cost per tractor in each district is also shown. The cost per tractor operating expense depends greatly on the number of days the tractor was in operation.

Table 6. Tractors: Number, Value and Estimated Operating Cost (By Crop Reporting Districts 1924-1934)

District	Number of tractors	Value of tractors	Cost										
			Fixed						Varying			Fixed and Varying: Total	Per Tractor
			Interest	Depreciation	Tag	Tools	Repairs	Total	Fuel	Oil & grease	Total		
			(DOLLARS)										
District I													
1924	1,186	969,987	59,199	145,498	5,040	695	40,836	250,178	376,674	102,470	479,144	729,322	615
1925	1,840	1,515,479	90,929	227,322	7,820	938	63,802	390,811	613,714	167,642	781,356	1,172,167	637
1926	2,493	2,065,629	123,928	309,844	10,595	1,271	86,963	532,601	881,699	220,032	1,101,731	1,634,332	656
1927	3,147	2,607,516	156,451	391,127	13,784	1,605	109,776	672,743	959,552	255,222	1,214,774	1,887,517	60 0
1928	3,800	3,148,573	188,914	472,286	17,290	1,938	132,555	812,983	1,142,052	303,430	1,445,482	2,258,465	594
1929	4,454	3,668,448	220,107	550,267	20,711	2,272	154,442	947,799	1,273,042	448,785	1,721,827	2,669,626	599
1930	4,256	3,470,315	208,219	520,547	19,492	2,170	146,100	896,528	1,029,782	328,904	1,358,686	2,255,214	530
1931	3,793	3,061,547	183,693	459,232	17,751	1,934	128,891	791,501	763,834	245,976	1,009,810	1,801,311	475
1932	3,725	2,828,716	169,723	424,307	16,129	1,900	119,089	731,148	771,299	234,079	1,005,378	1,736,526	466
1933	3,809	2,807,800	168,468	421,170	11,046	1,943	118,208	720,835	777,112	243,700	1,020,813	1,741,647	457
1934	3,573	2,769,203	166,152	415,380	9,290	1,822	116,583	709,227	710,348	279,945	990,293	1,699,520	476
District II													
1924	4,049	3,311,534	198,692	4 96,730	17,208	2,065	139,416	854,711	605,164	174,067	779,231	1,633,342	403
1925	4,822	3,971,544	238,293	595,732	20,493	2,459	167,202	1,024,179	752,425	216,845	969,270	1,993,449	413
1926	5,595	4,635,859	278,152	695,379	23,779	2,853	195,170	1,195,333	920,378	242,879	1,163,257	2,358,590	422
1927	6,369	5,277,173	316,630	791,576	27,896	3,248	222,169	1,361,519	898,029	253,932	1,151,961	2,513,480	395
1928	7,142	5,917,659	355,060	887,649	32,496	3,642	249,133	1,527,980	986,882	279,181	1,266,063	2,794,043	391
1929	7,915	6,519,031	391,142	977,855	36,805	4,037	274,451	1,684,290	1,034,174	383,482	1,417,656	3,101,946	392
1930	6,817	5,558,539	333,512	833,781	31,222	3,477	234,015	1,436,006	749,734	255,842	1,005,576	2,441,582	358
1931	6,273	5,063,298	303,798	759,495	29,358	3,199	213,165	1,309,015	513,006	181,603	694,609	2,003,624	319
1932	6,818	5,177,499	310,650	776,625	29,522	3,477	217,973	1,338,247	634,483	209,108	843,591	2,181,838	320
1933	7,526	5,547,782	332,867	832,167	21,825	3,838	233,562	1,424,259	686,221	233,532	919,753	2,344,012	311
1934	8,299	6,432,022	385,921	964,803	21,577	4,232	270,788	1,647,321	733,300	309,304	1,042,604	2,689,925	324

Continued

Table 6. (Continued)

District	Number of tractors	Value of tractors	Cost										
			Fixed						Varying			Fixed & Varying	Per Tractor
			Interest	Depreciation	Tag	Tools	Repairs	Total	Fuel	Oil & grease	Total	Total	
			(Dollars)										
District III													
1924	865	707,453	42,447	106,118	3,676	441	29,784	182,466	96,966	28,848	125,814	308,280	356
1925	967	796,450	47,787	119,468	4,110	493	33,531	205,389	113,168	33,681	146,849	352,238	364
1926	1,070	886,572	53,194	132,986	4,548	546	37,325	228,599	132,006	36,016	168,022	396,621	370
1927	1,172	971,086	58,265	145,663	5,133	598	40,883	250,542	123,939	36,344	160,283	410,825	360
1928	1,275	1,056,429	63,386	158,464	5,801	650	44,476	272,777	132,141	38,786	170,927	443,704	348
1929	1,377	1,134,138	68,048	170,121	6,403	702	47,747	293,021	134,946	51,555	186,501	479,522	348
1930	1,508	1,229,614	73,777	184,442	6,907	769	51,767	317,662	124,380	44,109	168,489	486,151	322
1931	1,291	1,042,040	62,522	156,306	6,042	658	43,870	269,398	79,177	29,461	108,638	378,036	293
1932	1,199	910,504	54,630	136,576	5,192	611	38,332	235,341	83,678	28,908	112,586	347,927	290
1933	1,161	855,829	51,350	128,374	3,367	592	36,030	219,713	79,401	28,259	107,660	327,373	282
1934	1,360	1,054,048	63,243	158,107	3,536	694	44,375	269,955	90,127	39,522	129,649	399,604	294
District IV													
1924	1,181	965,898	57,954	144,885	5,019	602	40,664	249,124	154,451	45,079	199,530	448,654	380
1925	1,619	1,333,457	80,007	200,019	6,881	826	56,139	343,872	221,058	64,598	285,656	629,528	389
1926	2,056	1,703,543	102,213	255,531	8,738	1,049	71,719	439,250	295,941	79,238	375,179	814,429	396
1927	2,494	2,066,458	123,987	309,969	10,924	1,272	86,998	533,150	307,685	88,387	396,072	929,222	373
1928	2,931	2,428,544	145,713	364,282	13,336	1,495	102,242	627,068	354,387	101,882	456,269	1,083,337	370
1929	3,369	2,774,809	166,489	416,221	15,666	1,718	116,619	716,913	385,178	144,699	529,877	1,246,790	370
1930	2,511	2,047,454	122,847	307,118	11,500	1,281	86,198	528,944	241,634	83,842	325,476	854,420	340
1931	2,716	2,192,239	131,534	328,836	12,711	1,385	92,293	566,759	194,357	70,317	264,674	831,433	306
1932	2,933	2,227,819	133,669	334,173	12,700	1,496	93,791	575,829	238,834	80,345	319,179	895,008	305
1933	2,997	2,209,350	132,561	331,402	8,691	1,528	93,014	567,196	239,101	83,047	322,148	889,344	297
1934	3,165	2,452,988	147,179	367,948	8,229	1,614	103,271	628,241	244,718	104,983	349,701	977,942	309

Continued

Table 6. (Continued)

District	Number of tractors	Value of tractors	Cost										
			Fixed						Varying			Fixed and Varying	Per
			Interest	Depreciation	Tag	Tools	Repairs	Total	Fuel	Oil & grease	Total	Total	Tractor
			(Dollars)										
District V													
1924	1,758	1,437,806	86,268	215,671	7,472	897	60,532	370,840	164,215	50,138	214,353	585,193	333
1925	2,126	1,751,037	105,062	262,656	9,035	1,084	73,719	451,556	207,349	63,270	270,619	722,175	340
1926	2,495	2,067,287	124,037	310,093	10,604	1,272	87,033	533,039	256,511	71,831	328,342	861,381	345
1927	2,863	2,372,201	142,332	355,830	12,540	1,461	99,870	612,033	252,316	76,099	328,415	940,448	328
1928	3,232	2,677,944	160,677	401,692	14,706	1,648	112,741	691,464	279,116	84,323	363,439	1,054,093	326
1929	3,600	2,965,068	177,904	444,760	16,740	1,836	124,829	766,069	293,976	114,984	408,960	1,175,029	326
1930	3,640	2,968,033	178,082	445,205	16,671	1,856	124,954	766,768	250,214	91,400	341,614	1,108,382	305
1931	3,189	2,574,024	154,441	386,104	14,934	1,626	108,366	665,471	162,999	62,983	225,982	891,453	280
1932	3,207	2,435,353	146,121	365,303	13,886	1,636	102,528	629,474	186,519	66,770	253,219	882,693	275
1933	4,382	3,230,187	193,811	484,528	12,708	2,235	135,991	829,273	249,730	92,241	341,971	1,171,244	267
1934	4,546	3,523,313	211,399	528,497	11,820	2,318	148,331	902,365	251,030	113,423	364,453	1,266,818	279
District VI													
1924	209	170,934	10,256	25,640	888	107	7,196	44,087	12,494	4,147	1 6,641	60,728	291
1925	236	194,377	11,663	29,157	1,003	120	8,183	50,126	14,731	4,869	19,600	69,726	295
1926	263	217,915	13,075	32,687	1,118	134	9,174	56,188	17,305	5,263	22,568	78,756	299
1927	291	241,114	14,467	36,167	1,275	148	10,151	62,208	16,412	5,413	21,825	84,033	289
1928	318	263,485	15,809	39,523	1,447	162	11,093	68,034	17,576	5,813	23,389	91,423	287
1929	345	284,152	17,049	42,623	1,604	176	11,963	73,415	18,030	7,600	25,630	99,045	287
1930	356	290,280	17,417	43,542	1,630	182	12,221	74,992	15,660	7,355	23,015	98,007	275
1931	306	246,990	14,819	37,048	1,432	156	10,398	63,853	10,009	4,354	14,363	78,216	256
1932	310	235,410	14,125	35,312	1,342	158	9,911	60,848	11,538	4,622	16,160	77,008	248
1933	352	259,477	15,569	38,922	1,021	180	10,924	66,616	12,837	5,298	18,135	84,751	241
1934	293	227,086	13,625	34,063	762	149	9,560	58,159	10,355	5,145	15,500	73,659	251

Continued

Table 6. Continued

District	Number of tractors	Value of tractors	Cost											
			Fixed						Varying				Fixed and Varying	Per
			Interest	Depreciation	Tag	Tools	Repairs	Total	Fuel	Oil & grease	Total	Total	Tractor
			(Dollars)											
District VII														
1924	1,295	1,059,135	63,548	158,870	5,504	660	44,590	273,172	150,000	44,431	194,431	467,603	361
1925	1,863	1,534,423	92,065	230,163	7,918	950	64,599	395,695	226,019	66,975	292,994	688,689	370
1926	2,431	2,014,257	120,855	302,139	10,332	1,240	84,800	519,366	311,922	84,672	396,594	915,960	377
1927	2,998	2,484,058	149,043	372,609	13,131	1,529	104,579	604,891	329,720	96,146	425,866	1,066,757	356
1928	3,566	2,954,686	177,281	443,203	16,225	1,819	124,392	762,920	386,804	112,828	499,632	1,262,552	354
1929	4,134	3,404,886	204,293	510,733	19,223	2,108	143,346	879,703	424,024	161,143	585,167	1,464,870	354
1930	3,886	3,168,620	190,117	475,293	17,794	1,982	133,399	818,589	337,616	118,834	456,450	1,275,039	328
1931	3,469	2,800,029	168,002	420,004	16,235	1,769	117,881	723,891	225,520	82,978	308,498	1,032,389	298
1932	3,750	2,847,700	170,862	427,155	16,237	1,912	119,888	736,054	282,675	96,300	378,975	1,115,029	297
1933	4,384	3,231,661	193,900	484,749	12,714	2,236	136,053	829,652	331,781	116,220	448,001	1,277,653	291
1934	4,747	3,679,095	220,746	551,864	12,342	2,421	154,890	942,263	356,547	153,518	510,065	1,452,328	306
District VIII														
1924	382	312,425	18,746	46,864	1,624	195	13,153	80,582	40,679	12,186	52,865	133,447	349
1925	446	367,339	22,040	55,101	1,895	227	15,465	94,728	49,586	14,856	64,442	159,170	357
1926	509	421,743	25,305	63,261	2,163	260	17,755	108,744	59,660	16,390	66,050	174,794	343
1927	573	474,772	28,486	71,216	2,510	292	19,988	122,492	57,564	17,007	74,571	197,063	344
1928	636	526,972	31,618	79,046	2,894	324	22,186	136,068	62,614	18,520	81,134	217,202	342
1929	700	576,541	34,592	86,481	3,255	357	24,272	148,957	65,170	25,053	90,223	239,180	342
1930	795	648,238	38,894	97,236	3,641	405	27,290	167,466	62,296	22,268	84,564	252,020	317
1931	671	541,603	32,496	81,240	3,140	342	22,801	140,019	39,099	14,695	53,794	193,813	289
1932	677	514,105	30,846	77,116	2,931	345	21,644	132,882	44,892	15,652	60,544	193,426	286
1933	623	451,872	27,112	67,781	1,778	313	19,024	116,008	39,820	14,232	54,052	170,060	277
1934	734	568,876	34,133	85,331	1,908	374	23,950	145,696	46,213	20,427	66,640	212,336	289

Continued

Table 6. (Continued)

District	Number of tractors	Value of tractors	Cost										
			Fixed						Varying			Fixed and Varying: Total	Per Tractor
			Interest	Depreciation	Tag	Tools	Repairs	Total	Fuel	Oil & grease	Total		
District IX			(DOLLARS)										
1924	25	20,447	1,227	3,067	106	13	861	5,274	1,494	496	1,990	7,264	291
1925	34	28003	1,680	4,200	145	17	1,178	7,220	2,122	701	2,823	10,043	295
1926	42	34,800	2,088	5,220	178	21	1,465	8,972	2,764	840	3,604	12,576	299
1927	51	42,257	2,535	6339	223	26	1,779	10,902	2,876	949	3,825	14,727	289
1928	59	48,886	2,933	7,333	268	30	2,058	12,622	3,261	1,078	4,339	16,961	287
1929	68	56,007	3,360	8,401	316	35	2,358	14,470	3,554	1,497	5,051	19,521	287
1930	80	65,231	3,914	9,785	366	41	2,746	16,852	3,519	1,413	4,932	21,784	272
1931	112	90,401	5,424	13,560	524	57	3,806	23,371	3,664	1,594	5,258	28,629	256
1932	78	59,232	3,554	8,885	338	40	2,494	15,311	2,903	1,163	4,066	19,377	248
1933	73	53,812	3,229	8,072	212	37	2,265	13,815	2,662	1,099	3,761	17,576	241
1934	75	58,127	3,488	8,719	195	38	2,447	14,887	2,650	1,317	3,967	18,854	251

CHAPTER IV

Horse and Mule Power Costs

Number of Horses

In calculating the number of horses on farms for the various years from 1924 to and including 1934, data were secured from K. D. Blood, State Statistician. These data were given as all horses and colts. Census percentages for all horses over two years old were used. Intercensal percentages were calculated by straight line interpolation. (See Figure XIII). The percentages were applied to Mr. Blood's figures to estimate the number of horses over two years old. It was assumed that a horse over two years old would be classed as a work horse. (See Table 8).

The value of all horses over two years old was obtained by multiplying the farm price[1/] per head by the estimated number of horses over two years old.

The extent to which horses will be used on farms in the future will depend to a large extent on:

1. The available supply of horses.
2. The relative price of horses and tractors.
3. The relative price of feed for horse and tractor fuel
4. The improvement in tractors and tractor equipment.

The number of horses on farms in the United States has declined since 1920; however, the decline is smaller since 1932. The decrease in the number of horses was more in some districts than in others. In some districts they tended to reduce each year about the same percent. This was especially true in districts I, II and V, which was probably due to the gradual changing to mechanical power. The wheat growing areas seemed to

1/ Ellis, L. S., "Current Farm Economics, Supplement.

Table 7. Number of Horses and Colts on Farms in the United States and Oklahoma, and Percent Decrease of Each 1/

Year	United States		Oklahoma	
	Number	Percent decrease from preceding year	Number	Percent decrease from preceding year
1924	17,222,000		640,000 2/	
1925	16,651,000	3.3	614,000	4.0
1926	16,083,000	3.4	589,000	4 .1
1927	15,388,000	4.3	565,000	4.1
1928	14,792,000	3.9	548,000 3/	3.1
1929	14,234,000	3.8	527,000	3.9
1930	13,742,000	3.5	504,000	4.4
1931	13,195,000	4 .0	482,000	4.4
1932	12,664,000	4.0	453,000	6.1
1933	12,291,000	2.9	439,000 4/	3.1
1934	12,052,000	1.9	431,000	1.9

1/ Crops and Markets Reports,
2/ 1927 Yearbook of Agriculture, p. 1056.
3/ 1931 Yearbook of Agriculture, p. 819.
4/ 1935 Yearbook of Agriculture, p. 596.

Table 7 shows the number of horses and colts on farms in the United States and Oklahoma, and percentage of decrease over the previous year of each.

be more uniform in their reduction than did the other districts. (See Figure 13 for comparisons of all districts).

District IV showed about the same number of horses on farms until in 1931 when the number increased about 6,250 head. In 1932, however, the number dropped to the lowest number since prior to 1924. The price per head during 1931 and 1932 was the lowest over the eleven year period, (1924-1934, inclusive).

There was a general decline in the number of horses in District III. The decline was not so much during the years of 1927, 1928, 1929 and 1930. In 1931, the decline was greater than any year since 1926. From 1930 to 1933 the decline was much greater than any previous year. The decline in number of horses was much less in 1934.

District number VI showed a decline in the number of horses every year from 1924 to 1934, inclusive, with the exception of two years. In 1926, there was an increase of 3,174 head over the previous year, and in 1933 there was an increase of 2,623 head over the previous year.

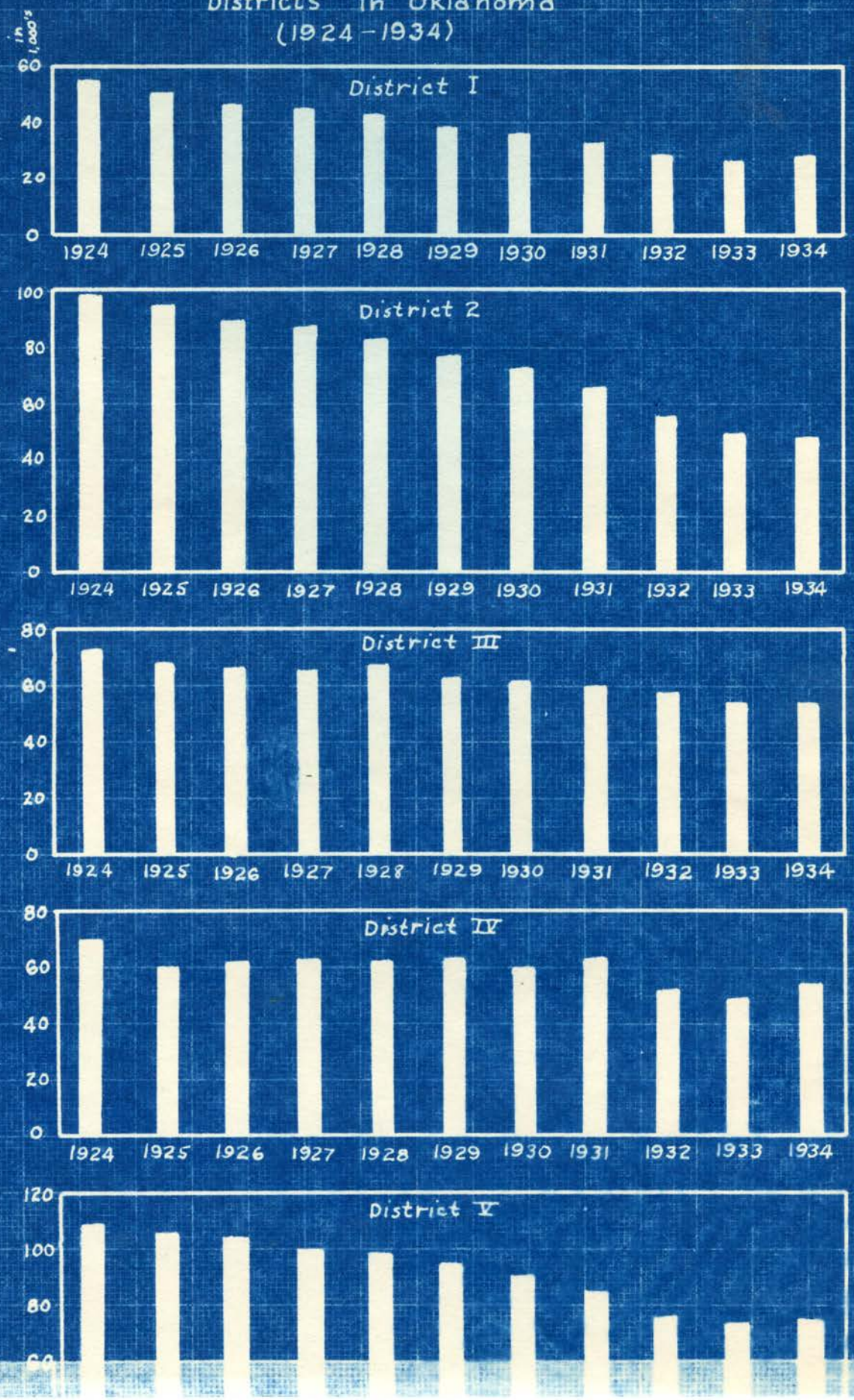
In Districts VII, VIII, and IX there was a remarkable reduction in the number of horses on farms. The trend line was not as even as some of the other districts, but each district showed quite a reduction of the 1924-1934 period.

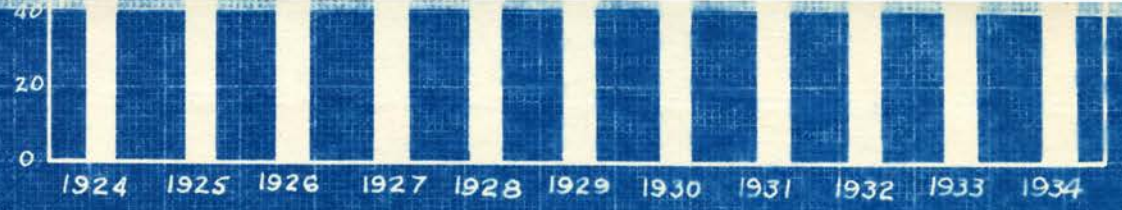
Generally throughout the state there has been a marked reduction in the number of horses on farms. The percentage of this reduction has probably been greater in some sections of the state than in others, due to conditions described before. (See Chapter I). Mechanization, however, has tended to grow in the state, even in our self-sufficing areas.

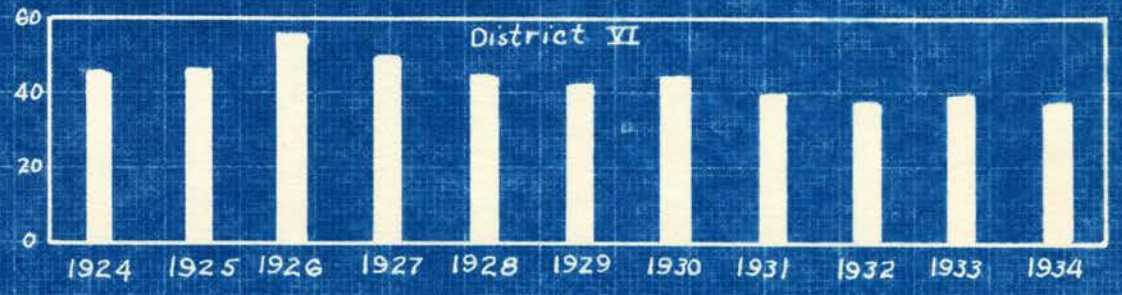
Value of Horses

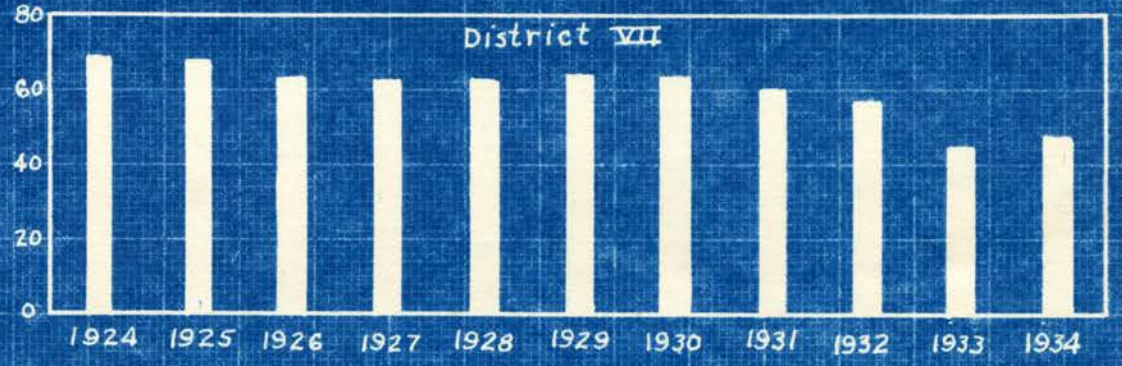
The value of horses was estimated by multiplying the number of

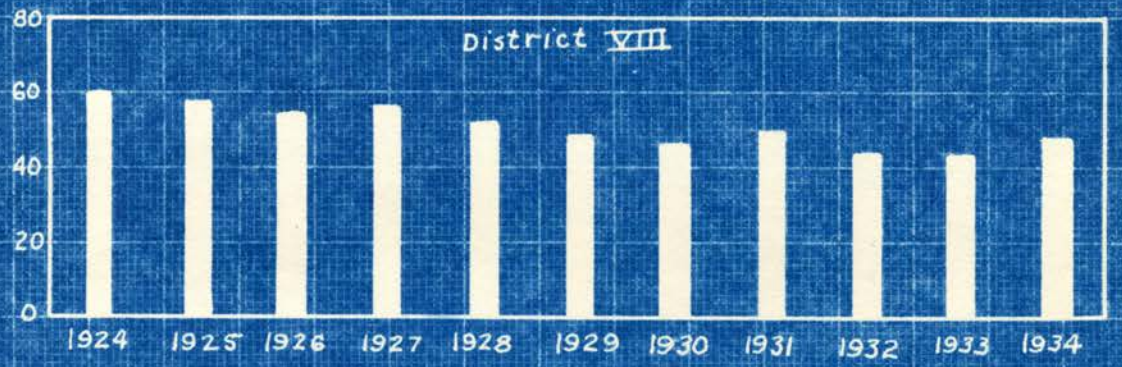
Estimated number of Horses by Crop Reporting Districts in Oklahoma (1924-1934)











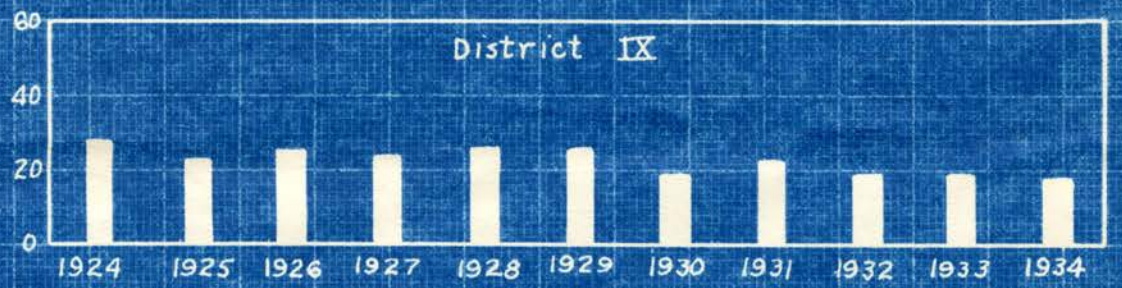


Figure XIII shows the number of horses on farms by crop reporting districts in Oklahoma. Mechanization has meant much in the grain districts, and has tended to gradually displace animal power.

horses by the price per head. The farm price per head was taken from the Current Farm Economics, Supplement by L. S. Ellis.

The price of horses has continued to decrease almost every year since 1910. In 1910, the farm price per head was $113.00. The price remaining slightly above $100.00 up until and including 1920, which was $101.00 per head. Only one year fell below the $100.00 mark, which was in 1914, at that time they were worth $99.00. Following the World War period there was a decided reduction in the price of horses. In 1925, the price had dropped to $49.00 which is a decrease of 57 percent over the 1910 price and 51 percent over 1920. This gradual decline continued until 1933. In 1933, the price per head had advanced to $43.60, and in 1934 even a greater advance in price was made which brought the price up to $58.50.[2/]

Interest

A five percent interest charge was made on the value of horses. This rate was used in other studies similar to this.[3/] Interest on investment is classed as one of the fixed costs in farming and does not vary much in different states.

Depreciation

The method of calculating the depreciation on horses is different to some other methods used in other studies yet a similar percentage was obtained.

The value of colts under two years old in 1915 was $76.46.

The value of horses over two years old in 1915 was $121.46.

2/ Oklahoma Farm Prices, Lippert S. Ellis, pp. 83, Table 76.

3/ Wm. H. Dankers, "An Economic Analysis of the Cost and Utilization of Power Supplied by Horses on Minnesota Farms," p. 50.
P. H. Stephens, "Farm Production Costs in Oklahoma 1931," pp. 22,45, 46.

Table 8. Estimated Number of Horses over Two Years Old, Price Per Head and Total Value, 1924-1934

District	Horses and colts 1/	Percent horses 2/ over two years old	Estimated number horses over two years old	Price per head	Total value
District I					
1924	58,000	92.9	53,882	45	$ 2,424,690
1925	55,000	93.3	51,315	49	2,514,435
1926	52,000	93.7	48,724	45	2,192,580
1927	48,000	94.1	45,168	43	1,942,224
1928	45,000	94.5	42,525	48	2,041,200
1929	42,000	94.8	39,816	45	1,791,720
1930	36,000	94.6	34,056	37	1,260,072
1931	32,000	94.2	30,144	33	994,752
1932	29,000	93.8	27,202	33	897,666
1933	28,000	93.4	26,152	43.6	1,140,227
1934	28,000	93.0	26,040	58.5	1,523,340
District II					
1924	104,000	93.3	96,928	45	4,361,760
1925	101,000	93.7	94,637	49	4,637,213
1926	96,000	94.2	90,432	45	4,069,440
1927	91,000	94.7	86,177	43	3,705,611
1928	85,000	95.2	80,920	48	3,884,160
1929	78,000	95.9	74,802	45	3,366,090
1930	72,000	95.0	68,400	37	2,530,800
1931	66,000	94.2	62,172	33	2,051,676
1932	59,000	93.4	55,106	33	1,818,498
1933	57,000	92.6	52,782	43.6	2,301,295
1934	57,000	91.8	52,326	58.5	3,061,071
District III					
1924	75,000	92.8	69,600	45	3,132,000
1925	74,000	93.4	69,116	49	3,386,684
1926	68,000	94.0	63,920	45	2,876,400
1927	67,000	94.6	63,382	43	2,725,426
1928	67,000	95.2	63,784	48	3,061,632
1929	66,000	95.9	63,294	45	2,848,230
1930	66,000	95.3	62,898	37	2,327,226
1931	63,000	94.8	59,724	33	1,970,892
1932	57,000	94.3	53,751	33	1,773,783
1933	55,000	93.8	51,590	43.6	2,249,324
1934	54,000	93.3	50,382	58.5	2,947,347

Continued

Table 8. (Continued)

District	Horses and colts 1/	Percent horses 2/ over two years old	Estimated number horses over two years old	Price per head	Total value
District IV					
1924	69,000	92.7	63,963	45	$ 2,878,335
1925	63,000	93.9	58,779	49	2,880,171
1926	64,000	93.9	60,096	45	2,704,320
1927	64,000	94.5	60,480	43	2,600,640
1928	61,000	95.1	58,011	48	2,784,528
1929	63,000	95.7	60,291	45	2,713,095
1930	62,000	95.3	59,086	37	2,186,182
1931	69,000	94.7	65,343	33	2,156,319
1932	54,000	94.1	50,814	33	1,676,862
1933	52,000	93.5	48,620	43.6	2,119,832
1934	55,000	92.9	51,095	58.5	2,989,057
District V					
1924	114,000	94.3	107,502	45	4,837,590
1925	111,000	94.8	105,228	49	5,156,172
1926	108,000	95.3	102,924	45	4,631,580
1927	100,000	95.8	95,800	43	4,119,400
1928	95,000	96.3	91,485	48	4,391,280
1929	92,000	96.7	88,964	45	4,003,380
1930	91,000	96.7	87,997	37	3,255,889
1931	85,000	96.7	82,195	33	2,712,435
1932	77,000	96.7	74,459	33	2,457,147
1933	72,000	96.7	69,624	43.6	3,035,606
1934	73,000	96.7	70,591	58.5	4,129,573
District VI					
1924	53,000	93.80	49,714	45	2,237,130
1925	52,000	94.42	49,098	49	2,405,802
1926	55,000	95.04	52,272	45	2,352,240
1927	50,000	95.66	47,830	43	2,056,690
1928	47,000	96.28	45,252	48	2,172,096
1929	46,000	96.90	44,574	45	2,005,830
1930	45,000	96.32	43,344	37	1,603,728
1931	42,000	95.74	40,210	33	1,326,930
1932	37,000	95.16	35,209	33	1,161,897
1933	40,000	94.58	37,832	43.6	1,649,475
1934	37,000	94.00	34,780	58.5	2,034,630

Continued

Table 8. (Continued)

District	Horses and colts 1/	Percent horses 2/ over two years old	Estimated number horses over two years old	Price per head	Total Value
District VII					
1924	77,000	93.9	72,303	45	$ 3,253,635
1925	73,000	94.5	68,985	49	3,380,265
1926	67,000	95.1	63,717	45	2,867,265
1927	67,000	95.7	64,119	43	2,757,117
1928	71,000	96.3	64,545	48	3,098,160
1929	68,000	96.9	64,953	45	2,922,885
1930	65,000	96.86	62,959	37	2,329,483
1931	61,000	96.82	59,060	33	1,948,980
1932	56,000	96.78	54,197	33	1,788,501
1933	49,000	96.74	47,403	43.6	2,066,771
1934	57,000	96.7	49,310	58.5	2,885,044
District VIII					
1924	63,000	93.0	58,590	45	2,636,550
1925	61,000	93.68	57,145	49	2,800,105
1926	58,000	94.36	54,729	45	2,462,805
1927	61,000	95.04	57,974	43	2,492,882
1928	54,000	95.72	51,689	48	2,481,072
1929	51,000	96.4	49,164	45	2,212,380
1930	51,000	96.44	49,184	37	1,819,808
1931	53,000	96.48	50,134	33	1,654,422
1932	48,000	96.52	46,330	33	1,528,890
1933	45,000	96.52	43,430	43.6	1,893,724
1934	49,000	96.6	47,334	58.5	2,769,039
District IX					
1924	27,000	95.2	25,704	45	1,156,680
1925	24,000	95.46	22,910	49	1,122,590
1926	25,000	95.72	23,930	45	1,076,850
1927	22,000	95.98	21,116	43	907,988
1928	23,000	96.24	22,135	48	1,062,480
1929	21,000	96.5	20,265	45	911,925
1930	19,000	95.88	18,217	37	674,029
1931	21,000	95.26	20,005	33	660,165
1932	19,000	94.64	17,982	33	593,406
1933	18,000	94.02	16,924	43.6	737,886
1934	17,000	93.4	15,978	58.5	928,863

1/ Figures taken from K. D. Blood's office.
2/ From Census of Agriculture.

The average life of a horse is about 18 years.

It is assumed that about the same proportionate number die each year. Then 100 devided by 16, which is the number of years a two year old horse has to live, equals 6.25 percent depreciation per year. Then by ration and proportion: 6.25 : 76.46 :: X : 121.46, 76.46 X = 759.13, X = 9.9 or 10% .

Number of Mules

K. D. Blood's Figures were used for the number of mules and colts for the different years. Census percentages were applied to these numbers to obtain the estimated number of mules two years old and over. The price of mules like that of horses has declined in later year. The peak, however, was during the war or just at the close of the War. Since that time the price of mules has continued to decline with the exception of a few years. In 1934, they were higher than they had been since 1921. (See Table 10).

Value of Mules

In order to obtain the value of mules the number was multiplied by the price per head. The price was taken from the Crops and Markets Report.[4/]

Interest and depreciation

The same rate of interest and depreciation was used with mules as was used with horses. The rate used for interest was 5 percent and the depreciation rate was 10 percent.

The reduction in the number of mules by crop reporting districts in Oklahoma, was similar to the reduction of horses. (See Figure XIV). Some of the districts showed a greater reduction than did other districts. The wheat districts had a more rapid reduction than the other districts.

4/ Crops and Markets, Feb. 1932, p. 46 (1924-1932, inclusive).
Crops and Markets, Feb. 1935, p. 35 (1933-1934, inclusive).

Table 9. Number of Mules and Colts on Farms in the United States and Oklahoma, and the Percentage Decrease by Years of Each, 1923-1934

Year	United States 1/		Oklahoma	
	Number	Percent decrease from preceding year	Number	Percent decrease from preceding year
			2/	
1924	5,908,000		360,000	
1925	5,918,000	-.2	369,000	-2.5
1926	5,903,000	.3	369,000	0
1927	5,801,000	1.8	365,000	1.1
1928	5,647,000	2.7	354,000 3/	3.1
1929	5,496,000	2.7	333,000	6.0
1930	5,366,000	2.4	313,000	6.1
1931	5,226,000	2.7	302,000 4/	3.6
1932	5,120,000	2.1	287,000	5.0
1933	5,036,000	1.7	251,000 5/	12.4
1934	4,925,000	2.3	270,000	-7.1

1/ 1935 Yearbook of Agriculture, p. 595.
2/ 1927 Yearbook of Agriculture, p. 595.
3/ 1931 Yearbook of Agriculture, p. 890.
4/ 1933 Yearbook of Agriculture, p. 630.
5/ 1935 Yearbook of Agriculture, p. 596.

Table 9 shows the number of mules and mule colts on farms in the United States and Oklahoma for the different years 1924-1934, inclusive, and percentage decrease of each by years.

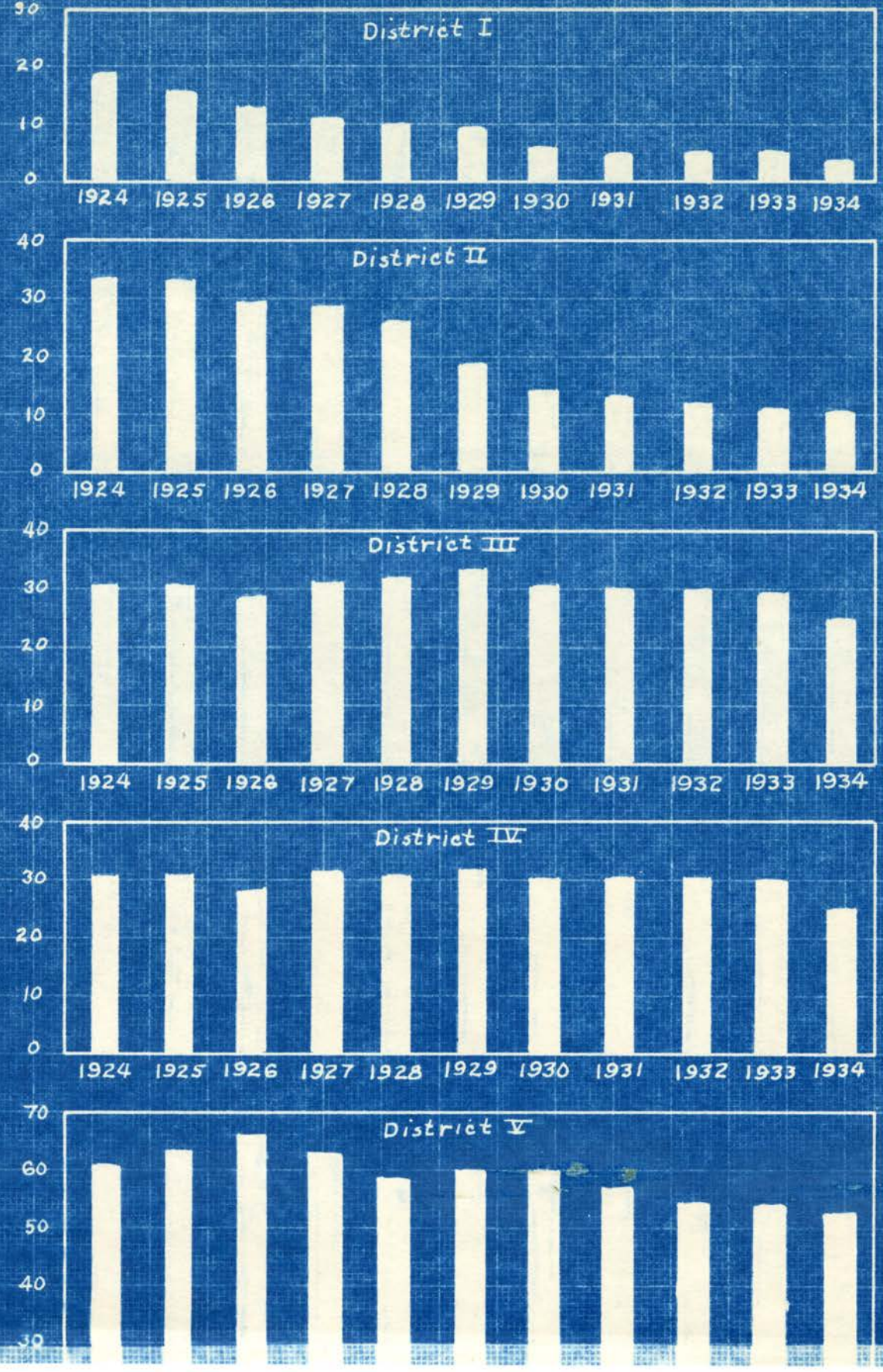
In 1924, there was a total of 18,816 mules for district one; this number was reduced to 2,853 in 1934, which no doubt is the greatest reduction the state had in any district. District two also showed a marked reduction. The 1924 figure was 33,040 as compared with the 12,259 for 1934.

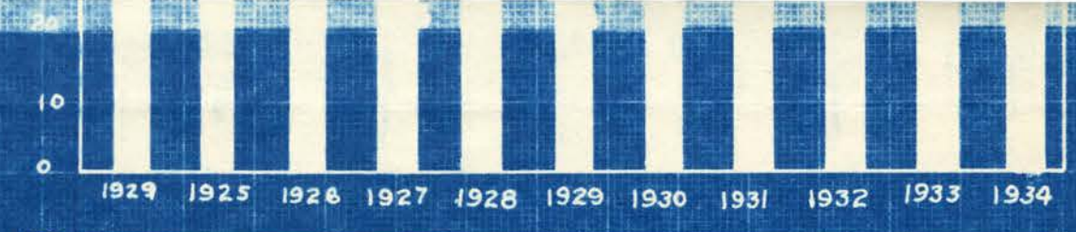
The remaining districts did not show such a reduction. They did not mechanize as thoroughly as did the wheat sections. The number of mules in district nine did not vary greatly from the 1924 number. This was mostly due to the need for mules on the small farms in the rough areas of the state. In some cases there was a small increase in the number of mules in district nine. The only reduction of importance during the entire period was in 1934 when the number was reduced about 3000 over the previous year. (See Figure XIV).

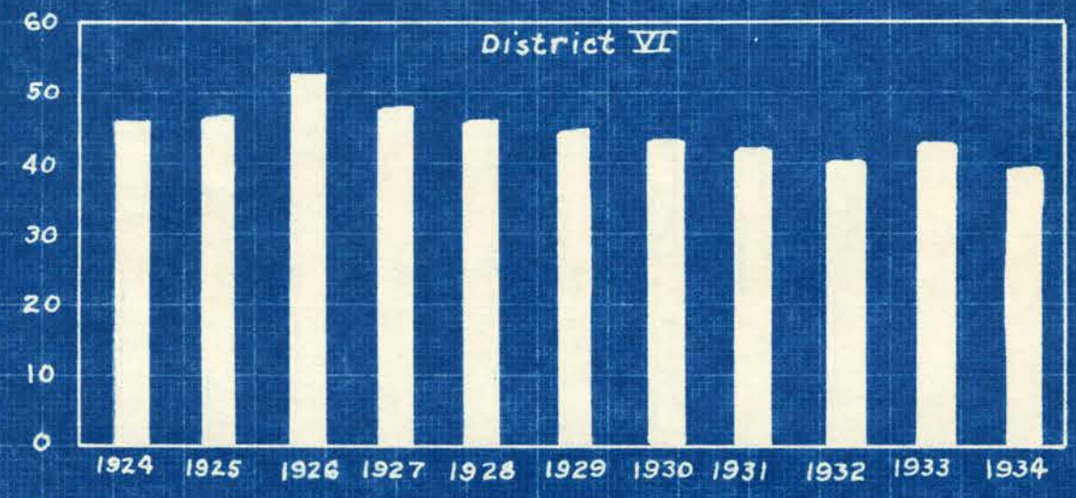
The use of mules as a source of power continued to be of importance in all the districts except in the wheat districts. The continued use of mule power is like that of the horse, will depend to a large extent upon several factors. (See page 35).

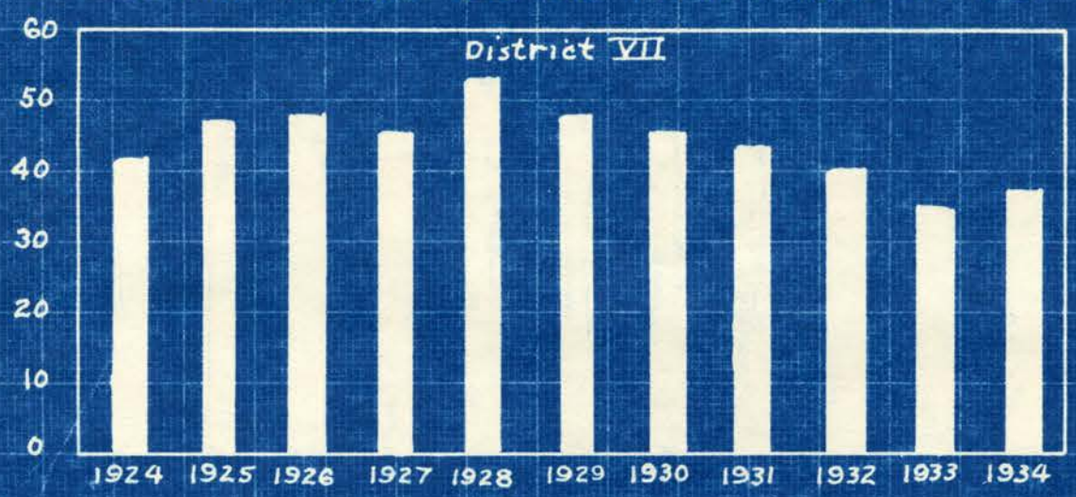
In calculating the feed cost for horses and mules, the number of horses and mules was multiplied by the amount of feed estimated to feed one head. According to a study made in the various counties of Oklahoma for 1929 and 1931 the amount of feed for a horse or mule was divided into grain, hay and pasture. The base for each of these items was taken from the study. To find the other years the index of all grain and hay was used. It was assumed that pasture would vary in value as the price of hay.

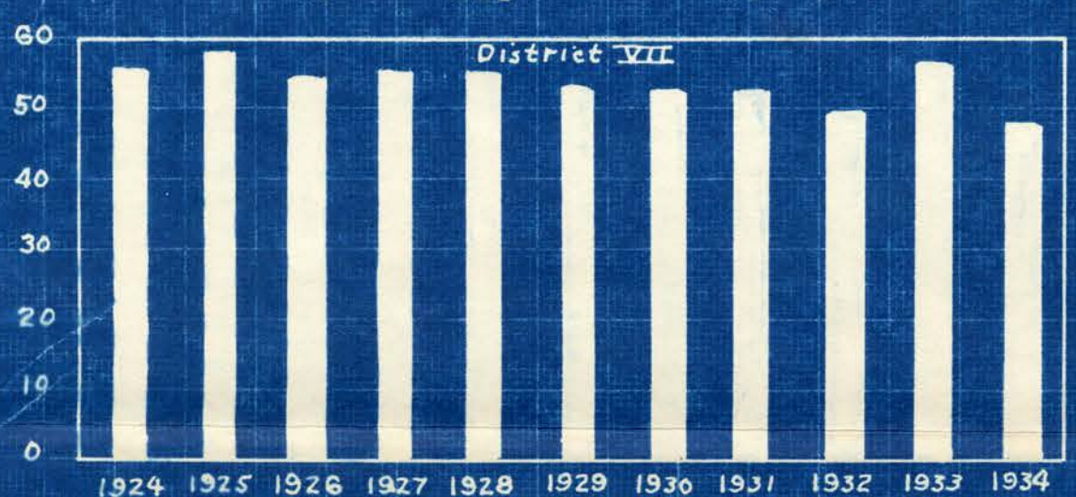
Estimated Number of Mules by Crop Reporting Districts in Oklahoma (1924 – 1934)











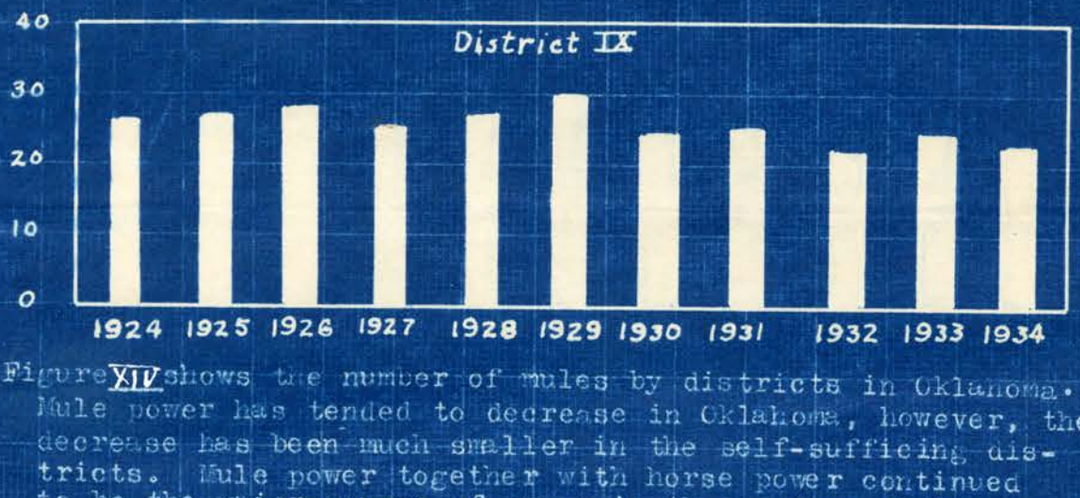


Figure XIV shows the number of mules by districts in Oklahoma. Mule power has tended to decrease in Oklahoma, however, the decrease has been much smaller in the self-sufficing districts. Mule power together with horse power continued to be the major source of power in the eastern districts of Oklahoma.

Table 10. Estimated Number of Mules over Two Years Old, Price Per Head, and Total Value, 1924-1934

District	Mules and colts 1/	Percent mules 2/ over two years old	Estimated number mules over two years old	Price per head	Total value
District I					
1924	21,000	89.6	18,816	56	$ 1,053,696
1925	19,000	89.3	16,967	61	1,034,987
1926	16,000	89.1	14,256	57	812,592
1927	15,000	88.8	13,320	51	679,320
1928	11,000	88.6	9,746	52	506,792
1929	9,000	88.3	7,947	58	460,926
1930	6,000	89.7	5,382	59	317,538
1931	5,000	91.0	4,550	47	213,850
1932	5,000	92.4	4,620	43	198,660
1933	5,000	93.7	4,685	45	210,825
1934	3,000	95.1	2,853	70	199,710
District II					
1924	35,000	94.4	33,040	56	1,850,240
1925	34,000	94.3	32,062	61	1,955,782
1926	31,000	94.3	29,233	57	1,666,281
1927	31,000	94.2	29,202	51	1,489,302
1928	26,000	94.2	24,492	52	1,273,584
1929	21,000	94.1	19,761	58	1,146,138
1930	18,000	94.1	16,938	59	999,342
1931	16,000	94.2	15,072	47	708,384
1932	14,000	94.2	13,188	43	567,084
1933	13,000	94.3	12,259	45	551,655
1934	13,000	94.3	12,259	70	858,130
District III					
1924	34,000	92.6	31,484	56	1,763,104
1925	33,000	93.6	30,888	61	1,884,168
1926	31,000	94.5	29,295	57	1,669,815
1927	32,000	95.5	30,560	51	1,558,560
1928	33,000	96.4	31,812	52	1,654,224
1929	34,000	97.4	33,116	58	1,920,728
1930	33,000	97.2	32,076	59	1,892,484
1931	32,000	97.0	31,040	47	1,458,880
1932	31,000	96.8	30,008	43	1,290,344
1933	30,000	96.6	28,980	45	1,304,100
1934	26,000	96.8	25,064	70	1,754,480

Continued

Table 10. (Continued)

District	Mules and colts 1/	Percent Mules 2/ over two years old	Estimated number mules over two years old	Price per head	Total Value
District IV					
1924	32,000	89.4	28,608	56	$ 1,602,048
1925	30,000	90.5	27,150	61	1,656,150
1926	28,000	91.7	25,676	57	1,463,532
1927	29,000	92.8	26,912	51	1,372,512
1928	27,000	94.0	25,380	52	1,319,760
1929	26,000	95.1	24,726	58	1,434,108
1930	27,000	95.3	25,731	59	1,518,129
1931	26,000	95.5	24,830	47	1,167,010
1932	28,000	95.7	26,796	43	1,152,228
1933	21,000	95.9	20,139	45	906,255
1934	21,000	96.1	20,181	70	1,412,670
District V					
1924	64,000	94.5	60,480	56	3,386,880
1925	68,000	95.0	64,600	51	3,940,600
1926	68,000	95.4	64,872	57	3,697,704
1927	65,000	95.9	62,335	51	3,179,085
1928	60,000	96.3	57,780	52	3,004,560
1929	62,000	96.8	60,016	58	3,480,928
1930	62,000	97.0	60,140	59	3,548,260
1931	58,000	97.2	56,376	47	2,649,672
1932	56,000	97.4	54,544	43	2,345,392
1933	54,000	97.6	52,704	45	2,371,680
1934	52,000	97.8	50,856	70	3,559,920
District VI					
1924	46,000	96.8	44,528	56	2,493,568
1925	48,000	97.0	46,560	51	2,840,160
1926	53,000	97.4	51,622	57	2,942,454
1927	49,000	97,6	47,824	51	2,439,024
1928	47,000	97.9	46,013	52	2,392,676
1929	47,000	98.2	46,154	58	2,676,932
1930	46,000	98.1	45,126	59	2,662,434
1931	44,000	97.9	43,076	47	2,024,572
1932	41,000	97.8	40,098	43	1,724,214
1933	43,000	97.6	41,968	45	1,888,560
1934	39,000	97.5	38,025	70	2,661,750

Continued

Table 10. (Continued)

District	Mules and colts 1/	Percent Mules 2/ over two years old	Estimated number mules over two years old	Price per head	Total value
District VII					
1924	44,000	95.0	41,800	56	$ 2,340,800
1925	49,000	95.4	46,746	61	2,851,506
1926	48,000	95.9	46,032	57	2,623,824
1927	45,000	96.3	43,335	51	2,210,085
1928	52,000	96.8	50,336	52	2,617,472
1929	48,000	97.2	46,656	58	2,706,048
1930	47,000	97.3	45,731	59	2,698,129
1931	43,000	97.4	41,882	47	1,968,454
1932	41,000	97.4	39,934	43	1,717,162
1933	35,000	97.5	34,125	45	1,535,625
1934	35,000	97.6	34,160	70	2,391,200
District VIII					
1924	57,000	96.8	55,176	56	3,089,856
1925	60,000	96.9	58,140	61	3,546,540
1926	56,000	97.1	54,376	57	3,099,432
1927	58,000	97.2	56,376	51	2,875,176
1928	56,000	97.4	54,544	52	2,836,288
1929	53,000	97.5	51,675	58	2,997,150
1930	53,000	97.5	51,675	59	3,048,825
1931	54,000	97.4	52,596	47	2,472,012
1932	51,000	97.4	49,674	43	2,135,982
1933	58,000	97.3	56,434	45	2,539,530
1934	46,000	97.3	44,758	70	3,133,060
District IX					
1924	27,000	98.3	26,541	56	1,486,296
1925	28,000	98.5	27,580	61	1,682,380
1926	29,000	98.6	28,594	57	1,629,858
1927	26,000	98.8	25,688	51	1,310,088
1928	28,000	98.9	27,692	52	1,439,984
1929	30,000	99.1	29,730	58	1,724,340
1930	26,000	98.9	25,714	59	1,517,126
1931	27,000	98.7	26,649	47	1,252,503
1932	23,000	98.4	22,632	43	1,973,176
1933	26,000	98.2	25,532	45	1,148,940
1934	23,000	98.0	22,540	70	1,577,800

1/ K. D. Blood's Figures

2/ Census of Agriculture

Index to All Grain[5] and Hay[6]

Year	All Grain	Hay
1924	126	129
1925	167	129
1926	136	120
1927	138	99
1928	130	1 04
1929	120	96
1930	92	92
1931	47	72
1932	37	53
1933	85	66
1934	100	95

Feed is the major cost in connection with animal power. The amount of money used in the purchase of feed, of course, varies with the price of the feed and the amount used. In many cases, feed costs were not an out-of-pocket cost ot the farmer, because the farmer produced his own; however, in calculating the total feed costs the item had to be used as a total purchase item.

Total feed costs have declined greatly during the period of 1924-1934, which is partially due to the decrease in the number of horses and mules on farms. The cost of feed has also tended to decrease until in 1933 and 1934. Feed costs climbed considerably during 1933 and 1934, this rise being due principally to the increase in the price of feed.

The decrease in the total feed costs varied in the different districts. In district one, total feed costs reduced almost 75 percent, due to the change to mechanical power and the reduction of feed prices, while in district nine the reduction was about 45 percent. The amount of feed consumed in nine probably did not reduce very much because the number of horses and mules did not decline greatly in that district.

5/ Current Farm Economics, Supplement, L. S. Ellis, p. 22, Table 474.

6/ Ibid, p. 43, Table 36.

Method of calculating taxes

In calculating the amount of taxes paid on horses and mules by districts in Oklahoma, the base year was taken from the study made by Dr. P. H. Stephens, in different counties. The index for taxes payable on real estate payable by farmers was used to calculate the other years. The cost of taxes on animal power was not a large item. The amount of taxes paid by farmers per head ranged from about thirty cents to less than one dollar per year during the 1924-1934 period.

Index of Taxes Payable by Farmers on Real Estate 1/

Year	Index	Year	Index
1924	253	1930	2 64
1925	258	1931	249
1926	258	1932	209
1927	264	1933	179
1928	266	1934	170
1929	268		

Method of Calculating Shelter for Animal Power

In calculating the shelter for horses and mules on farms the 1931 figure was used as a base and the other years were found by applying to this base the index to lumber. Barn costs were one of the major costs of animal power. The cost of keeping shelter for animals did not vary greatly in the different districts; however, the northern districts showed a greater expense for shelter. The temperature and weather in the winter probably were two of the influencing factors in this connection.

1/ United States Department of Agriculture, Bureau of Agricultural Economics, Bulletin, May 1937.

Index of Lumber[8]

Year	Index	Year	Index
1924	98	1930	64
1925	101	1931	41
1926	98	1932	25
1927	92	1933	32
1928	91	1934	32
1929	91		

Method of Calculating Harness Costs[9]

Using the 1931 figure as the base again, the harness costs were estimated by multiplying the index of leather and leather products by (the base of 1931 divided by the index of 1931). Harness costs varied in the different districts very little. The cost for harness was about three dollars or less per head per year.

Index for Leather and Leather Products

Year	Index	Year	Index
1924	95	1930	92
1925	97	1931	90
1926	99	1932	85
1927	103	1933	97
1928	102	1934	100
1929	104		

Method of Calculating Labor Costs

The cost of labor in keeping horses and mules was one of the major costs in connection with animal power. During the first years of this study the labor expense was second to feed costs. During the later years, since the decline in the price of farm labor, it was a third ranking cost. In 1931, the amount of labor required to keep a horse did not vary greatly throughout the state. Labor for that year was

8/ Statistical Abstract of the United States, 1938.

9/ Ibid.

used as a base and the other years were found by using the index of farm wages. Farm wages seemed to be about the same during the years 1924 to 1928. The following years showed a marked decline. In 1933, there was more than a 100 percent decline over the year of 1924. Farm wages tended to rise slightly in 1934

Index of Farm Wages [10]

Year	Index	Year	Index
1924	166	1930	152
1925	168	1931	116
1926	171	1932	86
1927	170	1933	80
1928	169	1934	90
1929	170		

In calculating the miscellaneous expense cost, it was assumed that the same percent between miscellaneous and other costs would hold true for the different years as in 1931. This percentage was used to calculate the miscellaneous expense for the other years.

In checking on the amount of expense for horse and mule labor costs, other studies showed a similar amount of expense as was found in this study. The total costs did not vary greatly with other studies on animal power costs. [11]

There are several marked advantages as well as disadvantages in the use of animal power. Since there are many days that the farmer is not busy during the year, the labor cost does not mean an actual cash cost, even though his time requirments may be higher; however at that time when labor is needed it may not be possible to have it to save the crops. This is also true in the case of feed. Feed on many farms is produced at low

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10/ 1935 Yearbook of Agriculture, p. 685, Table 474.

11/ "A Study of the Cost of Horse and Tractor Power on Illinois Farms" by Johnson and Wills; "Cost of Horse Labor on Oregon Farms," by Selby, Rodenword and Schudder; "An Economic Analysis of the Cost and Utilization of Power Supplied by Horses on Minnesota Farms," by Wm. H. Dankers.

cost to the farmer, and he can market it to a good advantage by turning it into power, unless he has an alternative use. In some cases this would result in a saving because at the time of harvest feed is generally cheaper than at other season. Later when the crop is being tilled for the next year feed costs are generally higher. Using animal power probably keeps the farmer employed more days than he would be if he were using mechanical power. To some, this is an important factor, to others it is a non-important factor. The use of animal power probably does not require the use of skilled workmen as does the use of mechanical power. In some instances common labor on farms is not such an item because of the number in the farm family, yet in many cases farm labor is such that a greater return could have been made from hired labor. Labor requirements on the farm often come at a time when the need of common labor is greatest.

Table 11 shows the total cost of animal power used in districts one and nine. The number of farms and average farms were taken from the Census of United States. The number of farms using tractors were subtracted from the total number of all farms to get the estimated number of farms using animal power. The number of farms using animal power divided into the total costs of animal power gave the per farm costs of animal power. The costs per farm divided by the average size of farm equaled the average cost per acre. The average cost per acre probably was low, also in the case of animal power because all land in farms was used to get per acre costs.

Table 11. Total Animal Power, Number of Farms Using Animal Power, Average Size of Farms, Average Cost Per Farm and Average Cost Per Acre, 1924-1929-1934

	1924	1929	1934
	District I		
Total annual power cost	6,853,944	4,211,562	1,962,793
Number of farms with animals	7,309	3,388	4,490
Ave. size of farm	560	588	6 78
Ave. cost per farm	$ 937	$ 1,243	$ 442
Ave. cost per acre	1.67	2.11	.65
	District IX		
Total animal power cost	5,648,352	4,971,057	3,092,998
Number of farms with animals	15,971	14,670	17,105
Ave. size of farm	75	79	86
Ave. cost per farm	$ 359	$ 339	$ 180
Ave. cost per acre	4.78	4.30	2.10

Table 12. Horses and Mules: Value and Estimated Operating Costs (By Crop Reporting Districst 1924-1934)

District	Value of horses	Value of mules	Total value of horses and mules	Costs									
				Interest	Depreciation	Feed	Taxes	Shelter	Harness	Labor	Misc.	Total	Per head
				(Dollars)									
District I													
1924	2,424,690	1,053,696	3,478,386	173,919	347,839	4,209,213	40,710	1,036,673	145,396	698,627	201,567	6,853,944	94.27
1925	2,514,435	1,034,987	3,549,422	177,471	354,942	4,578,989	44,380	1,003,745	139,295	663,701	211,055	7,176,579	105.10
1926	2,192,580	812,592	3,005,172	150,256	300,517	3,649,060	35,268	898,094	130,998	623,502	175,367	5,963,062	94.68
1927	1,942,224	679,320	2,621,544	131,077	262,154	3,139,050	33,923	783,154	126,918	575,521	150,069	5,201,866	88.93
1928	2,041,200	506,792	2,547,992	127,400	254,799	2,771,930	32,930	692,068	112,382	511,210	136,432	4,639,151	88.75
1929	1,791,720	460,926	2,252,646	112,623	225,265	2,325,101	26,747	623,382	104,600	469,987	123,857	4,211,562	88.17
1930	1,260,072	317,538	1,577,612	78,880	157,761	1,646,534	19,719	367,167	76,509	347,054	81,607	2,774,925	70.36
1931	994,752	213,850	1,208,602	60,430	120,860	941,941	15,265	207,123	65,918	233,143	53,081	1,697,761	50.40
1932	897,666	198,660	1,096,326	54,816	109,633	651,077	14,001	115,832	56,961	158,155	35,162	1,195,637	37.57
1933	1,140,340	210,825	1,351,052	67,553	135,105	1,054,932	17,885	143,392	62,907	142,775	49,223	1,673,772	54.27
1934	1,523,340	199,710	1,723,050	86,152	172,305	1,278,225	22,536	134,352	60,964	150,532	57,723	1,962,793	67.93
District II													
1924	4,316,760	1,850,240	6,212,000	310,600	621,200	7,638,306	73,902	1,881,863	263,926	1,268,212	365,175	12,417,187	94.08
1925	4,637,213	1,955,782	6,592,995	329,649	659,299	8,496,367	82,353	1,862,460	258,463	1,231,504	391,478	13,311,573	105.06
1926	4,069,440	1,666,281	5,735,721	286,786	573,572	7,165,149	69,252	1,763,462	257,223	1,224,283	343,593	11,683,320	94.47
1927	3,705,611	1,489,302	5,194,913	259,746	519,491	6,192,389	66,919	1,544,924	250,372	1,135,293	302,064	10,271,198	89.02
1928	3,884,160	1,273,584	5,157,744	257,887	517,774	5,589,997	63,409	1,395,654	226,635	1,030,929	302,064	10,271,198	97.43
1929	3,366,090	1,146,138	4,512,228	225,611	451,223	4,606,162	52,955	1,252,014	207,092	930,499	234,084	7,959,640	84.17
1930	2,530,800	999,342	3,530,142	176,507	353,014	3,562,859	42,669	794,496	165,555	750,974	177,136	6,023,210	70.57
1931	2,051,676	708,384	2,760,060	138,003	276,006	2,097,174	33,987	461,446	146,763	519,079	111,266	3,783,424	50.40
1932	1,818,498	567,084	2,385,582	119,279	238,558	1,383,635	30,049	248,590	122,246	339,421	75,197	2,556,975	37.44
1933	2,301,295	551,655	2,852,930	142,646	285,293	2,225,702	37,723	302,440	132,683	301,139	103,857	3,531,483	54.29
1934	3,061,071	858,130	3,919,201	195,960	391,920	2,857,239	50,376	300,320	136,274	336,478	129,337	4,397,904	68.09

Continued

Table 12. (Continued)

District	Value of horses	Value of mules	Total value of horses and mules	Costs								
				Interest	Depreciation	Feed	Taxes	Shelter	Harness	Labor	Misc	Total	Per head
				(Dollars)									
District III													
1924	3,132,000	1,763,104	4,895,104	244,755	489,510	7,407,434	60,650	1,158,422	160,720	1,017,915	355,177	10,894,583	107.77
1925	3,386,684	1,884,168	5,270,852	263,543	527,085	8,955,357	62,002	1,181,047	162,006	1,019,040	410,131	12,580,211	125.79
1926	2,876,400	1,669,815	4,546,215	227,411	454,621	7,055,848	57,793	1,068,243	154,736	966,639	336,504	10,321,795	110.73
1927	2,725,426	1,558,560	4,283,986	214,199	428,398	6,823,006	79,183	1,010,815	161,508	968,542	325,732	9,991,383	106.35
1928	3,061,632	1,654,224	4,715,856	235,793	471,585	6,785,638	61,181	1,017,141	163,469	979,859	327,384	10,042,050	105.04
1929	2,848,230	1,920,728	4,768,958	238,448	476,898	6,348,597	61,410	1,025,802	167,753	993,987	313,844	9,626,739	99.85
1930	2,327,226	1,892,484	4,219,710	210,985	421,971	5,059,370	59,834	710,420	146,263	875,411	252,219	7,736,473	81.45
1931	1,970,892	1,458,880	3,429,772	171,489	342,977	2,797,346	54,458	490,125	137,053	638,978	161,559	4,793,985	52.80
1932	1,773,783	1,290,344	3,064,127	153,206	306,413	2,029,479	41,879	244,576	118,937	436,384	112,250	3,443,124	41.10
1933	2,249,324	1,304,100	3,553,424	177,676	355,342	3,713,469	34,645	301,331	130,523	390,764	171,996	5,275,746	65.48
1934	2,947,344	1,754,480	4,701,827	235,091	470,827	4,287,595	30,178	282,168	125,994	411,935	196,937	6,040,770	80.06
District IV													
1924	2,878,335	1,602,048	4,480,383	224,019	448,038	7,080,754	45,359	360,101	201,864	722,053	177,102	9,259,290	100.02
1925	2,880,171	1,656,150	4,536,312	226,816	453,632	7,946,712	42,964	343,716	191,621	684,854	192,861	10,083,176	117.34
1926	2,704,320	1,463,532	4,167,852	208,393	416,785	6,731,385	42,886	333,653	194,702	688,749	168,024	8,784,655	102.41
1927	2,600,640	1,372,512	3,973,152	198,658	397,315	6,537,794	45,443	318,980	206,245	699,136	163,889	8,567,460	98.03
1928	2,784,528	1,319,760	4,104,288	205,214	410,429	6,073,365	43,363	301,875	195,134	662,124	153,884	8,045,388	96.47
1929	2,713,095	1,434,108	4,147,203	207,360	414,720	5,800,709	45,059	307,761	204,040	680,136	149,629	7,809,414	89.98
1930	2,186,182	1,518,129	3,704,311	185,216	370,431	4,697,164	44,104	215,435	178,963	605,593	122,789	6,419,695	75.68
1931	2,156,319	1,167,010	3,323,329	166,166	332,333	3,028,008	44,184	146,080	186,658	491,442	85,699	4,380,570	48.57
1932	1,676,862	1,152,228	2,829,090	141,454	282,909	1,991,471	31,820	76,833	151,339	313,544	58,292	3,047,662	39.26
1933	2,119,832	906,255	3,026,087	151,304	302,609	3,241,297	24,065	87,323	153,332	258,533	82,260	4,300,723	62.54
1934	2,989,057	1,412,670	4,401,727	220,086	440,173	4,215,735	23,523	90,530	163,953	301,531	106,382	5,455,531	78.53

Continued

Table 12. (Continued)

District	Value of horses	Value of mules	Total value of horses and mules	Costs									Per head
				Interest	Depreciation	Feed	Taxes	Shelter	Harness	Labor	Misc	Total	
				(Dollars)									
District V													
1924	4,837,590	3,386,880	8,224,470	411,223	822,447	15,133,498	136,065	1,579,030	478,748	1,426,167	385,535	20,372,713	121.27
1925	5,156,172	3,940,600	9,096,772	454,839	909,677	16,403,686	139,258	1,679,598	494,199	1,457,124	415,475	21,952,856	129.26
1926	4,631,580	3,697,704	8,329,284	416,464	832,928	15,638,586	137,592	1,577,282	498,354	1,464,859	396,719	20,882,784	124.45
1927	4,119,400	3,179,085	7,298,485	364,924	729,848	14,167,313	132,833	1,396,332	488,637	1,372,611	359,805	19,012,233	120.22
1928	4,391,280	3,004,560	7,395,840	369,792	739,584	12,962,171	126,875	1,303,083	465,706	1,295,620	333,000	17,595,831	117.88
1929	4,003,380	3,480,928	7,484,308	374,215	748,431	11,959,111	125,961	1,293,698	462,352	1,286,289	313,463	16,563,520	111.77
1930	3,225,889	3,548,260	6,809,149	340,207	680,415	9,528,171	124,435	909,561	408,858	1,162,875	253,750	13,408,272	90.00
1931	2,712,435	2,649,672	5,362,107	268,105	536,211	5,322,511	108,085	548,741	382,455	831,426	154,272	8,151,806	58.82
1932	2,457,147	2,345,392	4,802,539	240,127	480,254	3,822,357	87,722	425,709	328,957	548,262	114,455	6,047,843	46.88
1933	3,035,606	2,371,680	5,407,286	270,364	540,729	6,901,745	69,726	375,546	355,974	505,214	173,982	9,193,280	75.15
1934	4,129,573	3,559,920	7,689,493	384,475	768,949	8,506,147	65,581	372,842	364,341	564,728	212,712	11,239,775	92.54
District VI													
1924	2,237,130	2,493,568	4,730,698	236,535	473,070	6,906,050	56,545	1,080,013	149,844	949,016	331,981	10,183,054	108.52
1925	2,405,802	2,840,160	5,245,962	262,298	524,596	8,565,457	59,303	1,129,626	154,953	974,673	393,309	12,064,215	126.12
1926	2,352,240	2,942,454	5,294,694	264,735	529,469	7,339,072	64,414	1,342,310	172,464	1,077,380	363,617	11,153,461	107.35
1927	2,056,690	2,439,024	4,495,714	224,786	449,571	6,947,348	60,262	1,029,237	164,524	986,192	332,346	10,194,266	106.57
1928	2,172,096	2,392,676	4,564,772	228,239	456,477	6,421,403	58,409	971,059	156,063	935,466	310,953	9,538,069	104.50
1929	2,005,830	2,662,434	4,682,762	234,138	468,276	5,892,784	58,065	965,345	157,866	935,405	293,590	9,005,469	99.25
1930	1,603,728	2,662,434	4,266,162	213,308	426,616	4,697,756	55,736	661,755	153,937	815,693	236,735	7,261,536	82.07
1931	1,326,930	2,024,574	3,351,502	167,575	335,150	2,566,874	45,971	399,772	125,761	586,333	142,442	4,369,218	52.46
1932	1,161,897	1,724,214	2,886,111	144,306	328,611	1,824,687	37,653	219,896	106,935	392,349	102,943	3,157,380	41.92
1933	1,649,475	1,888,560	3,538,035	176,902	353,804	3,757,982	34,314	298,452	129,276	387,030	173,142	5,310,902	66.55
1934	2,034,630	2,661,750	4,696,380	234,819	469,638	4,137,506	29,122	279,571	121,584	397,515	191,070	5,860,825	80.00

Continued

Table 12. (Continued)

District	Value of horses	Value of mules	Total value of horses and mules	Costs									
				Interest	Depreciation	Feed	Taxes	Shelter	Harness	Labor	Misc	Total	Per head
				(Dollars)									
District VII													
1924	3,253,635	2,340,800	5,594,435	279,722	559,444	10,393,601	92,423	1,072,568	325,194	968,734	281,220	14,928,100	130.83
1925	3,380,265	2,851,506	6,231,771	311,589	623,177	11,178,456	94,899	1,144,579	336,777	992,971	281,903	14,964,350	129.30
1926	2,867,265	2,623,824	5,491,089	274,554	549,109	10,228,606	89,994	1,031,640	325,954	958,108	258,392	13,716,357	124.97
1927	2,757,117	2,210,085	4,967,202	248,360	496,720	9,626,803	90,261	948,818	332,032	932,700	244,640	12,920,334	120.24
1928	3,098,160	2,617,472	5,715,632	285,782	571,563	9,975,865	97,648	1,002,911	351,535	991,423	254,913	13,531,640	117.78
1929	2,922,885	2,706,048	5,628,933	281,447	562,893	8,960,112	94,867	974,346	348,220	968,766	235,279	12,425,930	111.33
1930	2,329,483	2,698,129	5,027,612	251,381	502,761	6,990,940	91,299	667,356	299,984	853,216	186,377	9,843,251	90.56
1931	1,948,980	1,968,454	3,917,434	195,872	391,743	3,877,181	78,734	399,730	278,599	605,652	114,064	5,941,575	58.86
1932	1,788,501	1,717,162	3,505,664	175,283	350,566	2,789,100	64,009	310,632	240,034	400,056	83,562	4,413,242	46.88
1933	2,066,771	1,535,625	3,602,396	180,120	360,240	4,599,809	46,470	250,290	237,246	336,710	115,408	6,126,293	75.14
1934	2,885,044	2,391,200	5,276,244	263,812	527,624	5,846,238	45,073	256,252	250,410	388,135	145,488	7,723,032	92.52
District VIII													
1924	2,636,550	3,089,856	5,726,356	286,318	572,636	10,249,178	93,288	1,069,400	324,233	965,873	261,268	13,822,194	121.49
1925	2,800,105	3,546,540	6,346,645	317,332	634,664	11,136,529	94,533	1,140,168	335,479	989,145	282,703	14,903,553	129.50
1926	2,462,805	3,099,432	5,562,237	263,112	556,224	10,562,455	90,557	1,025,587	324,041	952,486	265,854	14,040,676	128.68
1927	2,492,882	2,875,176	5,368,058	268,403	536,806	10,271,436	96,052	1,009,692	353,335	992,540	259,742	13,788,006	120.57
1928	2,481,072	2,836,288	5,317,360	265,868	531,736	9,285,386	90,908	922,830	323,466	912,260	236,783	12,569,236	118.90
1929	2,212,380	2,997,150	5,209,530	260,476	520,953	8,080,228	85,713	880,324	314,617	875,282	212,639	11,230,232	111.36
1930	1,819,808	3,048,825	4,868,633	243,432	486,863	6,425,258	84,721	619,274	278,370	791,743	171,449	9,101,110	90.23
1931	1,654,422	2,472,012	4,126,434	206,322	412,643	3,946,886	81,156	406,810	283,534	617,407	114,965	6,071,723	59.10
1932	1,528,890	2,135,982	3,664,872	183,244	366,487	2,854,198	67,622	323,413	249,910	416,517	85,658	4,547,049	47.36
1933	1,893,724	2,539,530	4,433,254	221,663	443,325	5,582,849	57,341	303,512	287,694	408,308	140,058	7,434,750	75.20
1934	2,769,039	3,133,060	5,902,099	295,105	590,210	6,451,043	50,650	282,722	276,276	428,227	160,785	8,535,018	92.67

Continued

Table 12. (Continued)

District	Value of horses	Value of mules	Total value of horses and mules	Costs									Per head
				Interest	Depreciation	Feed	Taxes	Shelter	Harness	Labor	Misc	Total	
District IX				(Dollars)									
1924	1,156,680	1,486,296	2,642,976	132,149	264,298	3,828,512	31,347	598,727	83,069	526,107	184,143	5,648,352	108.11
1925	1,122,590	1,682,380	2,804,970	140,248	280,497	4,521,379	31,303	596,286	81,793	514,493	207,794	6,373,793	126.23
1926	1,076,850	1,629,858	2,706,708	135,335	270,671	3,972,388	32,564	601,925	87,189	544,673	190,227	5,834,972	111.09
1927	907,988	1,310,088	2,218,076	110,904	221,808	3,399,373	29,486	503,611	80,502	482,549	162,711	4,930,944	105.35
1928	1,062,480	1,439,984	2,502,464	125,123	250,247	3,505,756	31,888	530,148	85,202	510,716	169,814	5,208,814	104.53
1929	911,925	1,724,340	2,636,265	131,813	263,626	3,247,174	31,996	531,946	86,991	515,448	162,063	4,971,057	99.43
1930	674,024	1,517,126	2,191,155	109,558	219,117	2,332,735	27,676	328,003	67,653	405,043	117,605	3,607,390	82.11
1931	660,165	1,252,503	1,912,668	95,633	191,267	1,437,276	27,992	223,939	70,447	328,444	80,037	2,455,035	52.62
1932	593,406	973,176	1,566,582	78,329	156,659	984,075	20,307	118,592	57,671	211,598	54,837	1,682,068	41.41
1933	737,886	1,148,940	1,886,826	94,341	188,683	1,947,796	18,256	158,785	68,778	205,911	90,394	2,772,727	65.30
1934	928,863	1,577,800	2,506,663	125,333	250,666	2,183,294	15,367	143,683	64,158	209,762	100,835	3,092,998	80.50

CHAPTER V

Total Power Costs

Total power costs by districts varied greatly in different parts of Oklahoma because of the type of farming, the kind of soil and topography of the soil. District five showed the greatest amount of power cost for the entire state. (See Table 13). The total costs to farmers in district five for 1924 was more than twenty million dollars. This amount was decreased to twelve million dollars by 1934, which was about a forty percent decrease. District five is one of the most important districts in the utilization of tractor power as well as animal power. The farmers of district five saved more than three million dollars on the 1934 basis. One of the principal causes for this saving was the change to mechanical power. It would have cost the farmers of this district almost sixteen million dollars to farm with the same porcentage of horses of mules and tractors as was in 1924. It actually cost them about twelve and one-half million dollars. This is also assuming that the price of feed remained the same as it was in 1934, which was comparatively cheap. Should the number of horses and mules have been the same in 1934 as in 1924, there would probably have been a greater demand for feed, which would make the above saving more. Statistics would probably lend support to the fact that the price of feed would have been higher; this of course would increase the power cost for animal power, thus making an even greater saving to the farmers by the use of mechanical power.

District seven was second high in the cost of operating power. It also showed a remarkable decrease in the amount of animal power. District seven decreased in total cost for power from over fifteen million to slightly over nine million. Tractor costs increased from about four-

tenths of a million dollars to one and one-half million.

Districts two and eight were comparatively close together in the amount of power costs. However, two showed a greater amount of mechanical power than did eight. This difference is probably due to the type of crop grown in the different districts. District two is one of the leading grain sections in the state, while district eight in the south central part of Oklahoma would be more diversified as far as crops are concerned, being, however, predominantly for cotton. (See Table 13).

Districts three, four and six compared similarly in total amount of cost, but differed in the decrease or increase in the type of power. Three and six did not increase as much in mechanical power as did number four. Three showed about a twenty-five percent increase in mechanical power costs, and six was even smaller with approximately a 20 percent increase. District four showed a fifty percent or more increase in the amount of mechanical power cost. The increase in the number of tractors was much more in district four. Three and six seemed to hold to the horse and mule as a source of farm power. (See Table 13).

In making a comparison of two of the typical districts as they are suited to mechanical power and animal power, the reader should think of district one in the northwestern part of Oklahoma and district nine in the southeast part of Oklahoma. These two districts differ in topography throughout. One is a plains area with less rainfall, the other a hilly, rough country with more rainfall. One is a typical tractor district while nine is more suited to animal power. There was a greater percent decrease in the operating costs of district one than in district nine. District one showed a marked change to mechanical power. In the five year period from 1924 to 1929 there was an increase from 1186 tractors to 4454

tractors on farms in district one. District nine showed 25 tractors in 1924 and 68 in 1929. By 1934 district one showed a reduction in the total number of tractors, the number at that time being 3573. District nine showed an increase to 75 tractors.

The cost per tractor has tended to reduce in district one, while the cost in district nine did not vary greatly. The cost per tractor was much more in district one than in district nine. The chief reason being that in district one the tractor was in use much more of the time than the tractor in district nine. Fuel is a major cost in mechanical power, and causes the total tractor cost to vary as the machine is used. The cost of operating a tractor in district one reduced from $615.00 in 1924 to $476.00 in 1934, while the costs in district nine only reduced from $291.00 in 1924 to $251.00 in 1934. The estimated number of hours a tractor was used in 1924 in district one was 900 hours, making a power cost per hour of 53 cents. The estimated number of hours a tractor was used in district nine was 285 with an expense of $1.01 per hour. 1/

District one had a total of 72,698 horses and mules in 1924. It would cost $5,019,073 to keep that number under 1934 prices. The farmers actually spent $1,962,793 on animal power in 1934 and $1,699,520 on mechanical power, making a total of $3,662,313 power cost. (See Figure XV). In 1934, assuming conditions were the same, the amount of expenditures would have been $5,583,609. (1924 numbers times 1934 cost per unit, both animal and mechanical). Then $5,583,609 minus $3,662,313 would give a saving of $1,921,296. This amount would result in a 34.3 saving in power cost for farmers in district one.

In district nine where the continued use of animal power was used,

1/ Comparable with cost analyses in Table 27, p. 34 of Experiment Station Bulletin 199, "Systems of Farming in Oklahoma," by P. H. Stephens.

the saving was not as great. It would have cost $4,205,722 to keep the 52,245 horses and mules, that is, 1924 numbers at 1934 cost. Tractor costs found by the same method would cost $6,275. Making a total of $4,311,007 that the farmers would have spent. They actually spent $3,111,854 in 1934, which left a saving of $1,100,143 or a saving of 26.2 percent. If the cost for keeping a horse or mule per head had been the same in both districts in 1934, there would only have been a saving of 12.4 percent. (See Figure XVI). Farmers in district nine are not generally able to take the advantage of the saving made through large scale farming, due to the small size of their farms and the inconvenience of former tractor power to such types of farms. This condition may not be a permanent factor in rugged areas. Some of the leading manufacturers of farm implements are trying to get a type of tractor and equipment suited for small scale farming in the rough areas. If improvements in these small power units continue they may be as important in our self-sufficing areas as our large tractors are in our plains area.

Total Animal and Mechanical Power Costs

District I
(1924 - 1934)

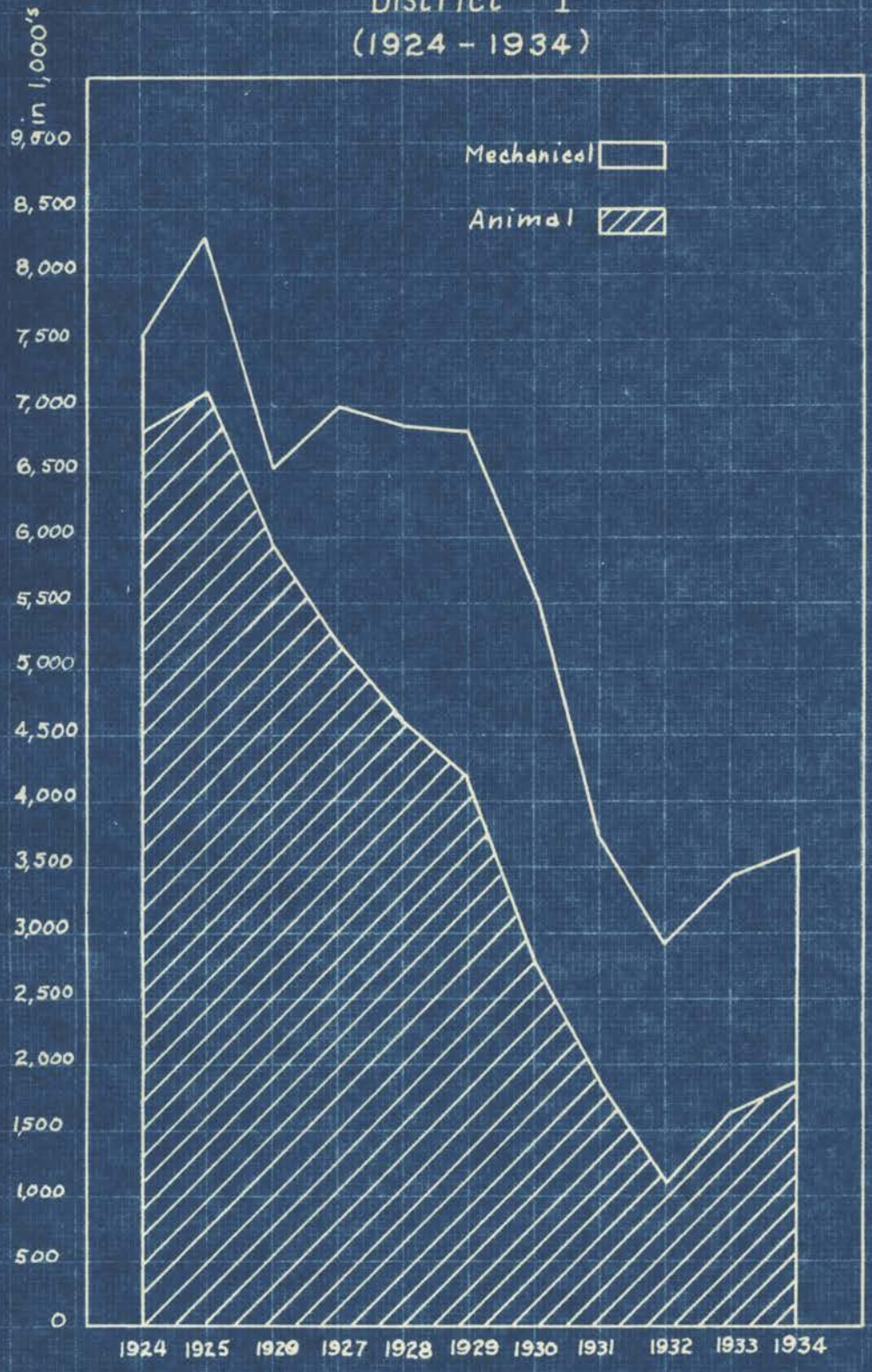

Figure XV shows the total animal and mechanical power cost in district one. Note the decrease in the amount of animal power cost.

Total Animal and Mechanical Power Costs

District IX

(1924 - 1934)

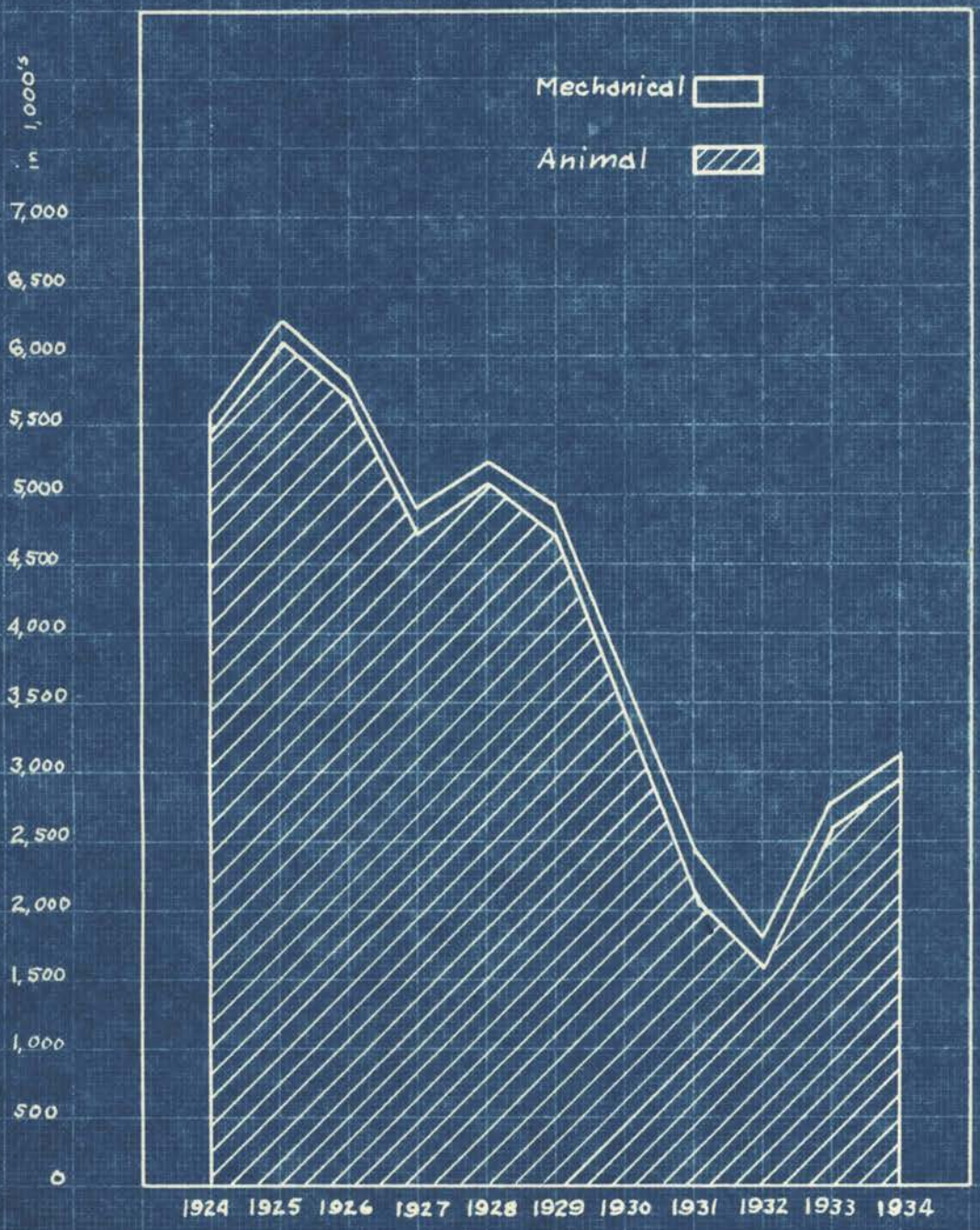

Figure ___ shows the total animal and mechanical power for , district number nine. Note the small amount of mechanical power used in this district.

Table 13. Total Power Costs by Crop Reporting Districts in Oklahoma, 1924-1934

District	Total tractor costs	Total horse and mule costs	Total operating costs
District I			
1924	729,322	6,853,944	7,583,266
1925	1,172,167	7,176,579	8,348,756
1926	1,634,517	5,963,062	6,597,579
1927	1,887,517	5,201,866	7,089,383
1928	2,258,465	4,639,151	6,897,616
1929	2,669,626	4,211,562	6,881,188
1930	2,255,214	2,774,925	5,030,139
1931	1,801,311	1,697,761	3,499,072
1932	1,736,526	1,195,637	2,932,163
1933	1,741,647	1,673,772	3,415,419
1934	1,699,520	1,962,793	3,662,313
District II			
1924	1,633,342	12,417,187	14,050,529
1925	1,993,449	13,311,573	15,305,022
1926	2,358,590	11,683,320	14,041,910
1927	2,513,480	10,271,198	12,784,678
1928	2,794,043	10,271,198	13,065,241
1929	3,101,946	7,959,640	11,061,586
1930	2,441,582	6,023,210	8,464,792
1931	2,003,624	3,783,424	5,787,048
1932	2,181,838	2,556,975	4,737,813
1933	2,344,012	3,531,483	5,875,495
1934	2,689,925	4,397,904	7,087,829
District III			
1924	308,280	10,894,583	11,202,863
1925	352,238	12,280,211	12,632,449
1926	396,621	10,321,795	10,718,416
1927	410,825	9,991,383	10,402,208
1928	443,704	10,042,050	10,485,754
1929	479,522	9,626,739	10,106,261
1930	486,151	7,736,473	8,222,624
1931	378,036	4,793,985	5,172,021
1932	347,927	3,443,124	3,791,151
1933	327,373	5,275,746	5,603,119
1934	399,604	6,040,770	6,440,374

Continued

Table 13. (Continued)

District	Total tractor costs	Total horse and mule costs	Total operating costs
District IV			
1924	448,654	9,259,290	9,707,944
1925	629,528	10,083,176	10,712,704
1926	814,429	8,784,655	9,599,084
1927	929,222	8,567,460	9,496,682
1928	1,083,337	8,045,388	9,128,725
1929	1,246,790	7,809,414	9,056,204
1930	854,420	6,419,695	7,274,115
1931	831,433	4,308,570	5,139,903
1932	895,008	3,047,662	3,942,670
1933	889,344	4,300,723	5,190,067
1934	977,942	5,455,531	6,433,473
District V			
1924	585,193	20,372,713	20,957,906
1925	722,175	21,952,856	22,675,031
1926	861,381	20,882,784	21,744,165
1927	940,448	19,012,233	19,952,701
1928	1,054,093	17,595,831	18,649,924
1929	1,175,029	16,563,520	17,738,549
1930	1,108,382	13,408,272	14,516,654
1931	891,453	8,151,806	9,043,259
1932	882,693	6,047,843	6,930,536
1933	1,171,244	9,193,280	10,364,524
1934	1,266,818	11,239,775	12,506,593
District VI			
1924	60,728	10,183,054	10,243,882
1925	69,726	12,064,215	12,133,941
1926	78,756	11,153,461	11,232,217
1927	84,033	10,194,266	10,278,299
1928	91,423	9,538,069	9,629,492
1929	99,045	9,005,469	9,104,514
1930	98,007	7,261,536	7,359,543
1931	78,216	4,369,218	4,447,434
1932	77,008	3,157,380	3,234,388
1933	84,751	5,310,902	5,395,652
1934	73,659	5,860,825	5,933,484

Continued

Table 13. (Continued)

District	Total tractor costs	Total horse and mule costs	Total operating costs
District VII			
1924	467,603	14,928,100	15,395,703
1925	688,689	14,964,350	15,653,039
1926	915,960	13,716,357	14,632,317
1927	1,066,757	12,920,334	13,986,091
1928	1,262,552	13,531,640	14,794,192
1929	1,464,870	12,425,930	13,890,800
1930	1,275,039	9,843,251	11,118,290
1931	1,032,389	5,941,575	6,973,964
1932	1,115,029	4,413,242	5,528,261
1933	1,277,653	6,126,293	7,403,946
1934	1,452,328	7,723,032	9,175,360
District VIII			
1924	133,447	13,822,194	13,955,641
1925	159,170	14,930,553	15,089,723
1926	174,794	14,040,676	14,215,470
1927	197,063	13,788,006	13,985,069
1928	217,202	12,569,236	12,786,438
1929	239,180	11,230,232	11,469,412
1930	252,030	9,101,110	9,353,140
1931	193,813	6,071,723	6,265,536
1932	193,426	4,547,049	4,740,475
1933	170,060	7,434,750	7,604,810
1934	212,336	8,535,018	8,747,354
District IX			
1924	7,264	5,648,352	5,655,616
1925	10,043	6,373,793	6,383,836
1926	12,576	5,834,972	5,847,548
1927	14,727	4,930,944	4,945,745
1928	16,961	5,208,814	5,227,775
1929	19,521	4,971,057	4,990,578
1930	21,784	3,607,390	3,629,174
1931	28,629	2,455,035	2,483,664
1932	19,377	1,682,068	1,701,445
1933	17,576	2,772,727	2,790,303
1934	18,856	3,092,998	3,111,854

From 1924 to 1929 in district on there was a 38.6 percent decrease in total costs for animal power. During the same period there had been an increase of 72.7 percent in mechanical power costs. The reduction in the animal power cost and the corresponding increase in tractor power was to a great extent due to increased mechanization. (See Table 14).

The percentage decrease in animal power was not so great in district nine. District nine showed a decrease in the cost of animal power of only 25.5 percent over the 1924-1929 period, and showed an increase in tractor power costs of 62.8 percent.

During the 1929-1934 period, district one showed a much greater reduction in animal power costs than did district nine. District one had a nuduction of 53.4 percent while district nin had only a reduction of 38.8 percent which was largely due to the decreaded cost of feed. (See index page 72).

Total your costs for district one decreased 51.8 percent from 1924 to 1934. In district nine total power costs decreased 45 percent. In district one the percentage decrease in animal power was much more than in district nine. (See Table 16). District one also showed a greater percentage increase in tractor power costs, yet over the entire 1924-1934 period, the total power costs decreased a greater percent than did the power costs of district nine. (See Table 15).

Table 14. Total Cost of Animal Power and Percent Decrease

Year	District I		District IX	
	Amount spent	Percent decrease of previous year	Amount spent	Percent decrease of previous year
1924	6,853,944		5,648,352	
1929	4,211,562	38.6	4,971,057	25.5
1934	1,962,793	53.4	3,092,998	38.8

Table 15. Total Cost of Mechanical Power and Percent Decrease

Year	District I		District IX	
	Amount spent	Percent decrease of previous year	Amount spent	Percent decrease of previous year
1924	729,322		7,264	
1929	2,669,626	72.7	19,521	62.8
1934	1,699,520	-36.4	18,854	4.

Table 16.
Total Cost of both Animal and Mechanical Power and Percent Decrease

Year	District I		District IX	
	Amount spent	Percent decrease of previous year	Amount spent	Percent decrease of previous year
1924	7,583,266		5,655,616	
1929	6,881,188	9.3	4,990,578	11.8
1934	3,662,313	46.8	3,111,852	37.8

Table 17. Total Animal and Mechanical Power Costs, Districts One and Nine, 1924-1929-1934

	1924		1929		1934	
	District I	District IX	District I	District IX	District I	District IX
			Horse and Mule			
Interest	173,919	132,149	112,623	131,813	86,152	125,333
Depreciation	347,839	264,298	225,265	263,626	172,305	250,666
Feed	4,209,213	3,828,512	2,325,101	3,247,174	1,278,225	2,183,294
Taxes	40,710	31,347	26,747	31,996	22,536	15,367
Shelter	1,036,673	598,727	623,382	531,946	134,352	143,683
Harness	145,396	83,069	104,600	86,991	60,964	64,158
Labor	698,627	526,107	469,987	515,448	150,532	209,762
Miscellaneous	201,567	184,143	123,857	162,063	57,723	100,835
Total Animal	6,853,944	5,648,352	4,211,562	4,971,057	1,962,793	3,092,998
			Tractor			
Interest	59,199	1,227	220,107	3,360	166,152	3,488
Depreciation	145,498	3,067	550,267	8,401	415,380	8,719
Tag	5,040	106	20,711	316	9,290	195
Tools	605	13	2,272	35	1,822	38
Repairs	40,836	861	154,442	2,358	116,583	2,447
Fuel	376,674	1,494	1,273,042	3,554	710,348	2,650
Oil and grease	102,470	496	448,785	1,497	279,945	1,317
Total Tractor	729,322	7,264	2,669,626	19,521	1,699,520	18,854
Total animal and mechanical power costs	7,583,266	5,655,616	6,881,188	4,990,578	3,662,313	3,111,852

CONCLUSION

One of the most important factors in regard to power costs is the type of power that will render the most efficient service and be the most useful for the smallest amount of expense. There are advantages and disadvantages to both animal and mechanical power. The type to be used in farm operations must be carefully studied to see if it best suits that particular need. The different districts of Oklahoma vary greatly in the types of farms and the size of each. The size of the farm varies from the large farms in district one, ranging from 600 acres downward, to district nine in the southeast part of the state with its small self-sufficing farms.

In 1908, the average size of the farm in district one was 245 acres. There was a great increase in the average size of the farm in district one which was partially made possible through the increased use of machinery. Indications are also that increased size of the farm was made necessary due to the high cost of machinery.

The cost per tractor in both districts one and nine has declined, but in district one the decline has been much greater in later years. In district one there was about a three percent decline from 1924 to 1929 in the cost of operation per tractor. District nine showed a slightly greater percentage decrease than district one for that particular period. The decline in district nine for the 1924-1929 period was about four percent. From 1929 to 1934 district one showed a much greater decline in the cost of operation per tractor. (See Table 11).

The situation was reversed in connection with horse and mule power costs. In district one from 1924-1929 there was a reduction in horse and mule operating costs of six percent while in district nine for the cor-

responding period there was a decline of eight percent. Horse and mule costs for the period 1929-1934 in district one decreased about thirteen percent, and in district nine they decreased almost 20 percent. (See Table[18]). This condition of reduction of cost of power has been opposite in these districts for later year. Tractor costs have decreased much more per tractor in district one and horse and mule costs have decreased more in district nine.

Tractors have seemed to replace animal power in Oklahoma where it has been possible. The change to mechanical power has saved the farmers in each district considerable expense. It is very doubtful that mechanization will ever be as important in Districts III, VI and IX as it is in other sections due to the topography of the land and the types of farms, unless our small type of tractors can be economically operated and made to render profitable power. If the small tractors could be made to render profitable power, assuming other offsetting factors did not enter in, it would be possible for Oklahoma to be mechanized as far as power is concerned. In some cases, however, it would be best to use animal power in order that the operator be kept employed a greater number of days during the year. Districts III, VI and IX are very rough and are self-sufficing areas of the state. The present tractors and tractor equipment would give them an excess of power, and as a result the operating power costs would be too great.

District number one showed a decline in the operating cost per tractor of twenty-one percent as compared with the thirteen percent decline in district nine for the same period. The greater decline in district one was due to the hours the tractor was employed. (See Table 4).

Table 18. Operating Cost Per Tractor in District One and Nine

Year	District I Cost	District I Percent decrease	District IX Cost	District IX Percent decrease 1/& 2/
1924	$615.00		$299.00	
1929	599.00	3.0	287.00	4.0
1934	476.00	21.0	251.00	13.0
	Operating Cost of Horses and Mules in District One and Nine			
1924	94.27		108.11	2/
1929	88.17	6	99.43	8
1934	67.93	13	80.50	19

1/ Fractions were rounded off to nearest percent.
2/ Ibid.

It is doubtful under these conditions that some of the districts in Oklahoma will ever use tractors as a major source of power; however, it seems impossible for other districts to return to the use of animal power. This is more true in our highly mechanized districts. Several reasons will cause them not to return to animal power. In district one, as mentioned before, the size of the farm unit has increased too much to be handled with animal power. The seasonal demand for farm power will keep the tractors on the wheat farms. Many times the tractors do not stop day or night. Under such conditions animal power on farms would tend to raise the labor requirements too much at the time when farm labor is in demand. Under cooperative farming, however, it could be possible for such a condition not to exist.

An increase in the number of horses and mules on farms in Oklahoma probably would not displace any of the mechanical power that already exists. An increase in the number of horses and mules might only mean that there will be a greater supply of animal power per farm, thus decreasing the number of hours for a horse or mule to work. Should a dis-

placement of tractor power take place, it would be in such cases as the using of tractor power as a minor rather than a major source of power. The production of horses and mules as a source of power will depend largely on the development of our new mechanical sources of power. The time for colts to mature, causes horses and mules to be produced for a potential market rather than a present one.

Choosing the best type of power for the farm is not a simple problem. Each district must be considered individually, and this may be applied to a single farm unit, as to the type of power that is most efficient, cheapest and most desirable. Some other things to consider in the choosing of the type of power is the size of the farm unit, the kind of enterprise to be undertaken on the farm, and the personal likes and dislikes and native ability of the occupants.

The efficiency with which tractors are operated depends upon the number of hours they are used annually. Ordinarily, maximum efficiency in farm machinery is reached at the maximum capacity. In general, it is possible for the farmer to select his equipment for both capacity and efficiency to meet his particular situation. In district six and nine where the average use of the tractor is small the cost per hours of operation is more than in district one and two where the average use of the tractor is much greater. Animal power cost has tended to decline until 1932. Since that time there has been a slight increase in operating costs. The trend for mechanical power cost per tractor has been generally downward throughout the state. Some districts, however, showed a greater percentage of decrease in per tractor costs than did others.

Tractor costs per acre have decreased in district one and likewise did animal power costs per acre. The reduction in power costs per acre in district one was more under mechanization than it would have been had

animal power continued to be the major source of power. The cost per acre for power varied throughout the state due to the types of farming in different sections, topography of farms, and size of farm units. The costs per acre in the plains districts were much less than those in the self-sufficing areas. Per acre costs have tended to decline throughout the state during the 1924-1934 period. The cost per acre in district nine for mechanical power has tended to remain approximately the same. However, there has been a great reduction in the cost per acre for animal power.

Apparently it is not a question of the tractor completely displacing the horse and mule, neither is it a question of the horse and mule displacing the tractor. The farmer is confronted by the fact that he must use the type of power that will be best and most economical at that time if it is possible for him to do so. On many farms in Oklahoma, especially in our eastern section, it is doubtful that there is any need for tractor power on them, yet in some of our grain counties there is little use for the horse and mule as a source of power. In many cases it is not necessary for the farmer to own a tractor, because at the time when he needs tractor work it may be more economical for him to hire a tractor to do the work for him. On some of the farms in Oklahoma there is need for both animal and mechanical power. Certain types of work will be done better by the kind of power best suited to its nature. It is a matter of studying carefully the types of work that can be done with each of the kinds of power, and conform to that as nearly as possible. The use of both animal and mechanical power will continue at present in Oklahoma, each serving as a major source of power in the area best suited to its use.

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