

THE KANSAS WHEAT CROP IN RELATION
TO AVAILABLE STORAGE FACILITIES

by

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INTRODUCTION

Problem in Study of Storage Space

Harvested grain may be stored on the farm where produced or in local elevators or mills, or may be shipped immediately to the terminal markets. If there is not available storage space on the farm and the grain is not dumped or piled on the ground the last named alternative must be adopted without regard to the effect on price that such a movement might have or the ability of the railroads to handle such a surplus.

The situation exists in Kansas that during some years there is a much larger wheat crop than there is available storage space in the counties where produced. This difficulty has existed over a period of several years and in three of the last five years has been especially acute. Shortage of storage space has attracted considerable attention as to probable causes and effects and possible remedies.

During recent years the advent of the combine as a means of harvesting wheat in Kansas has aggravated the problem. Grain that was formerly stored in the shock or stack is now ready for storage or movement to market in a relatively shorter period.

No attempt is made in this thesis to answer any questions regarding the advisability of storing grain with a view toward profit taking.

The Purpose

The purpose of this study is to obtain more specific information regarding the size of the wheat crop and its relation to available storage space in Kansas in order that this information may be used in alleviating some of the difficulties which now arise.

The period from 1920 to 1928 inclusive, is studied for it is in this period that the large regional crop surpluses

over and above the available storage space have occurred. It is in this period that the combine has become a large factor in the handling of the wheat crop and that much of the expansion in the wheat growing territory has occurred. R. M. Green, in Kansas Experiment Station Bulletin No. 244, has published material which contains in part a similar study for earlier years.

The Data

The storage figures used as a basis for determining the excess crop over storage for 1920 to 1924 inclusive were obtained by adding the following three figures: (1) Farm storage space taken from the assessors' rolls by counties in 1923; (2) the mill storage space by counties in 1923 given in the Kansas Grain Dealers' Annual Directory for that year; and (3) the elevator storage space by counties given in the Kansas Grain Dealers' Annual Directory for 1922. The elevator figures were not available for 1923 but the error due to a change from 1923 to 1922 figures is negligible for this was not a period of expansion of storage space.

For the period 1925 to 1928 inclusive, the farm storage figures were taken from rolls of the county assessors for 1928. To these figures were added the mill and elevator storage space as reported by the Trans-Missouri-Kansas Shippers' Advisory Board in May 1928.

Data on the size of the Kansas wheat crop, the number of combines and the acreage of wheat were taken from the Biennial Reports of the Kansas State Board of Agriculture for the period studied.

Data on the price of wheat and the receipts of wheat at the terminal markets were taken from the Kansas City Grain Market Review for the period studied.

The Method

The method of handling the data presented in this study is mainly by graphic presentation, averages, scatter charts, and selective comparison. It is a non-Pearsonian type of analysis. An informal statistical method was used in interpreting the results.

This thesis is concerned with the Kansas wheat crop for the crop years 1920-21 to 1928-29 inclusive. The crop year begins July 1 and extends to June 30 of the following year.

By storage space is meant both farm bin room and local elevator and mill storage space.

The storage space was taken county by county and subtracted from the year's crop in order to determine the size of the crop exceeding the storage space. The figures for the county crop were obtained from the Biennial Reports of the Kansas State Board of Agriculture for the period studied.

The possibility that there may be storage space on

farms which is not available as a place for storing wheat and yet is incorporated in the data of farm bin room secured from the county assessors' rolls must be recognized. This situation arises when the storage on a farm exceeds the crop produced on this farm. In but few cases would this excess storage room be used by other wheat producers in the locality. As a result the data given in this study relative to the size of the shortage of storage space for wheat are probably smaller than the actual quantity of grain found in the country without available storage space.

To eliminate this error, it would be necessary to compile these data from the individual farms instead of using county wide figures.

Kansas is divided into nine crop reporting districts as shown on the map, Figure 1. These districts are numbered as given on the map and whenever the counties are referred to as belonging to a group the reference is to these crop reporting districts.

SIZE AND LOCATION OF STORAGE SPACE SHORTAGE

Amount of Storage Space

It is evident from Table I that there is not a lack of storage space in Kansas but that this available space is not always in the counties where the wheat is produced.

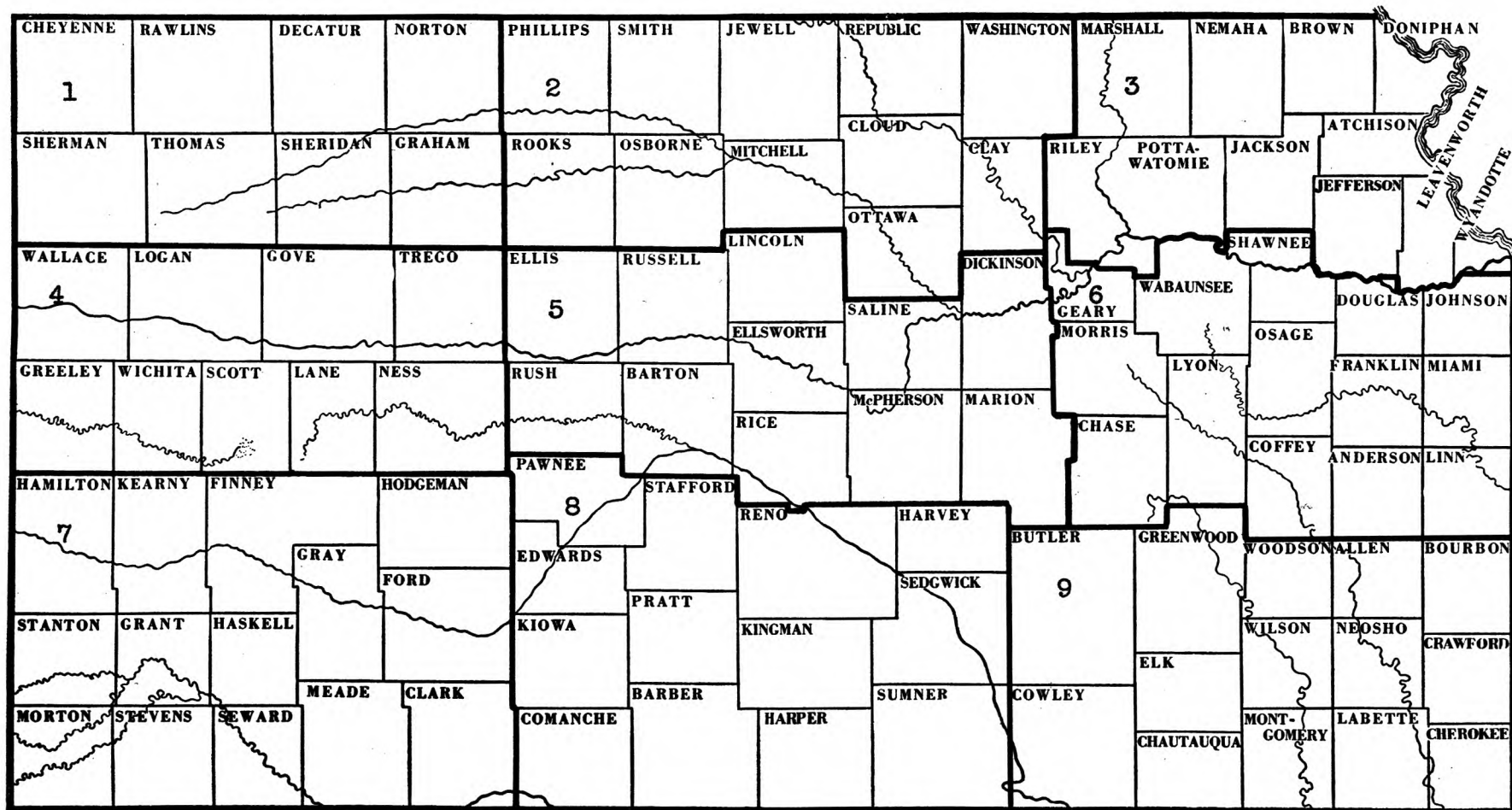


Figure 1.—Crop Reporting Districts of Kansas.

Table I.—Total available storage room for wheat in Kansas
in thousands of bushels.

	1923	1928
Farm storage	161,163	153,179
Mill and elevator storage	<u>60,161</u>	<u>76,878</u>
Total	221,324	230,057

Shifting of Shortage of Storage Space

There has been a decided tendency in recent years for that part of the crop in excess of storage room to shift in location toward the southwestern portion of the state.

R. M. Green/¹ has shown the counties which had a shortage of farm storage space from 1915 to 1920. In the three years, 1915, 1916, and 1917, the shortage was well scattered over the state, there being no group where the problem was especially acute.

However, in 1918 a distinct area in the east had an excess of crop over farm storage space and in 1919 this area had expanded to include more counties. In 1919 the westward trend had begun and there were a few counties in the western third of the state, especially in the northwest corner where

1. Kansas Experiment Station Bulletin No. 244, pages 14 to 15.

the farm storage space was short. In 1920, this area was augmented by the addition of several more counties while that section in the eastern portion of the state was diminishing in size and acuteness of shortage.

The maps accompanying, Figures 2 to 10 inclusive, show the counties that have had an excess of wheat over and above the total storage space, both local and farm. In 1920 the big shortage lay in the northwest group. Since then the trouble has arisen largely in the southwest and south central groups.

Irregularity in the Occurrence of Shortage of Storage Space

It has been stated above that this problem of a crop larger than the available storage space does not occur every year. Table II shows in the years studied, 1920 to 1928, the size of the Kansas crop and the number of bushels for which there was no storage in the counties where produced.

During four of the years studied, there has been a shortage of sizable proportions. In 1920-21, there was a shortage of approximately 10,000,000 bushels of storage room; in 1924-25, the shortage was more than 15,000,000 bushels of storage room; in 1926-27, nearly 22,000,000 bushels had no storage room; and the amount in 1928-29 was nearly 29,000,000 bushels. The lack of storage space has

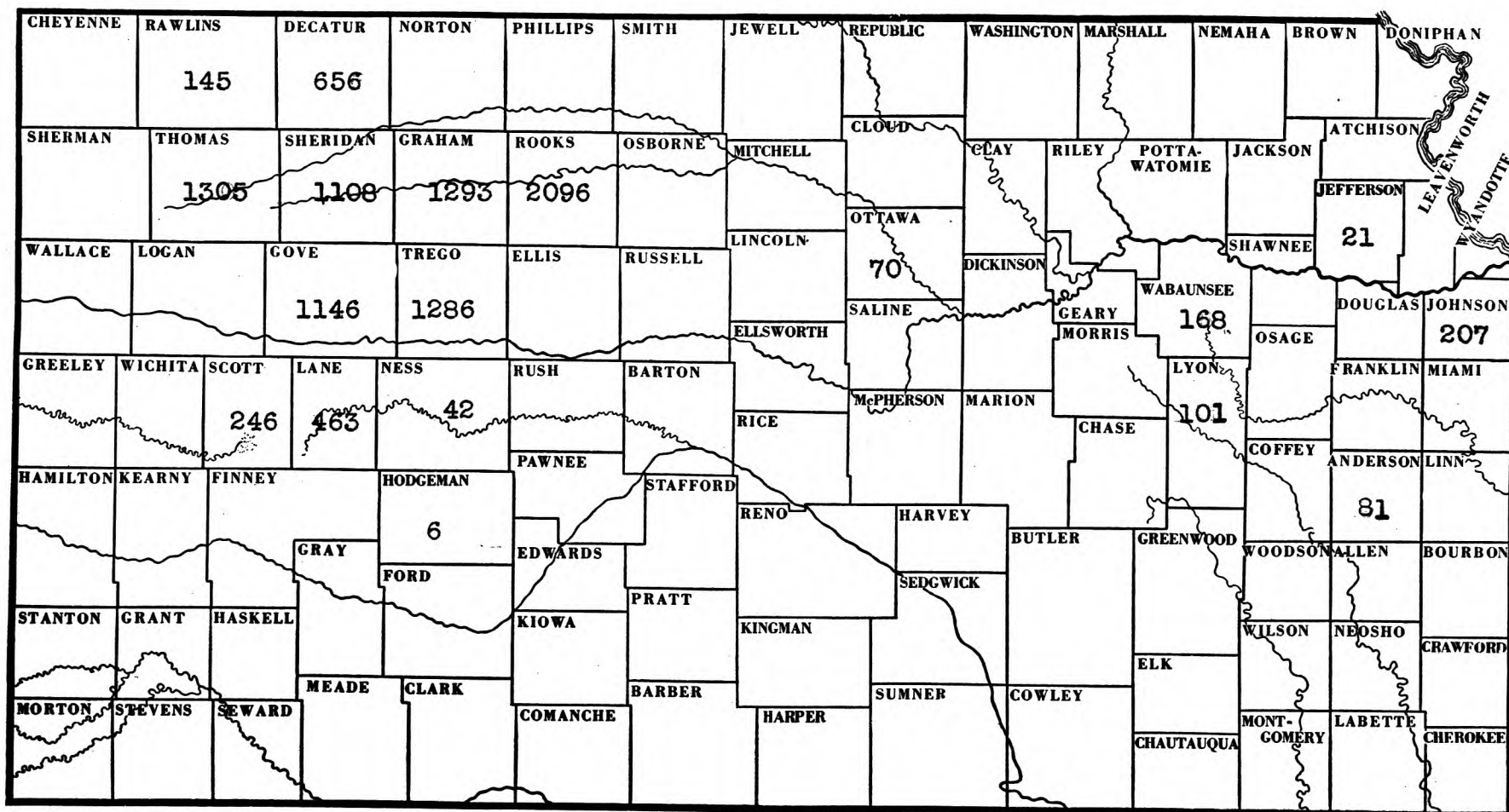


Figure 2.—Crop excess over total storage 1920 in thousands of bushels.

Total Kansas wheat crop for 1920 was 140,840,000 bushels.

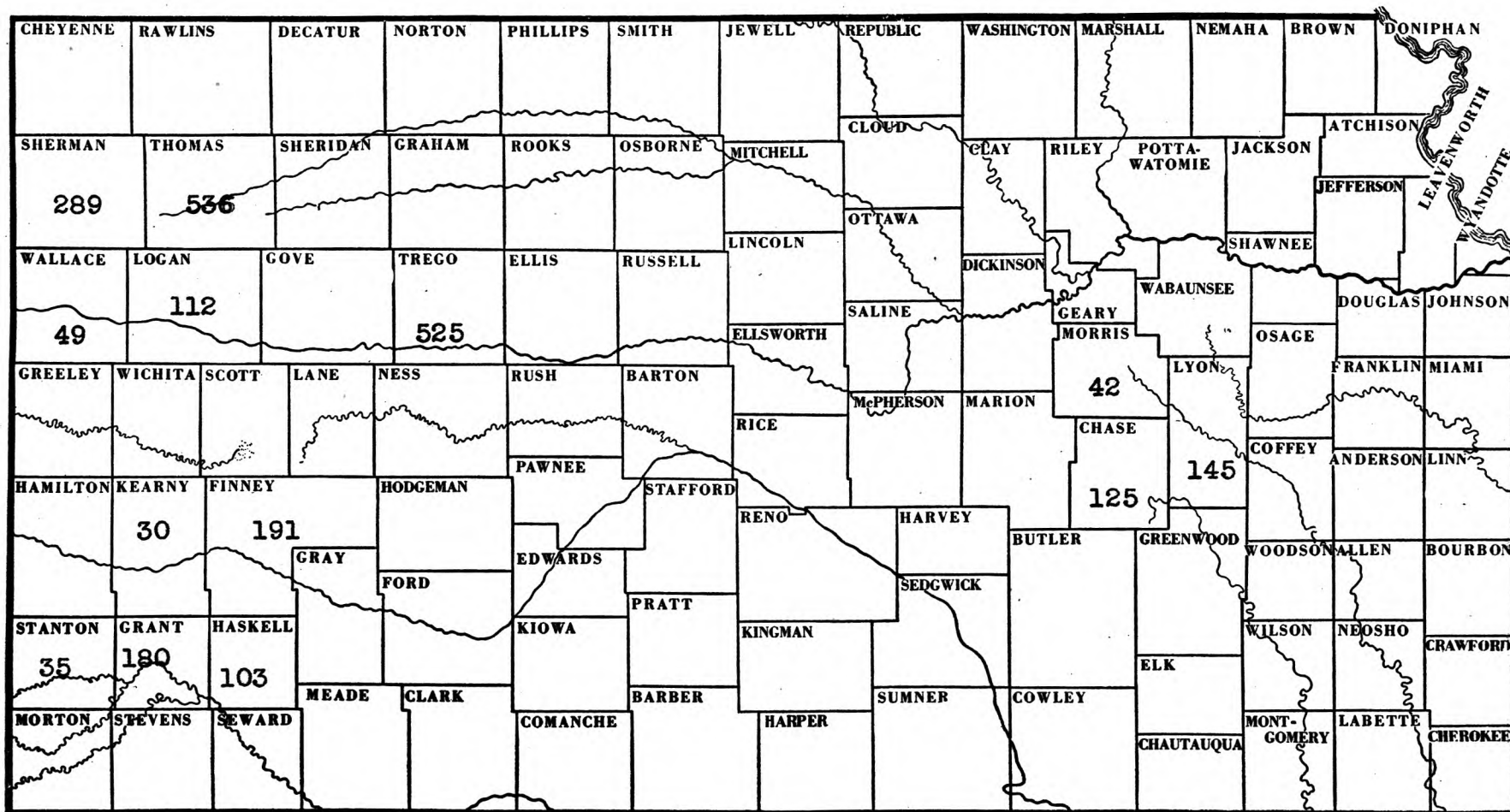
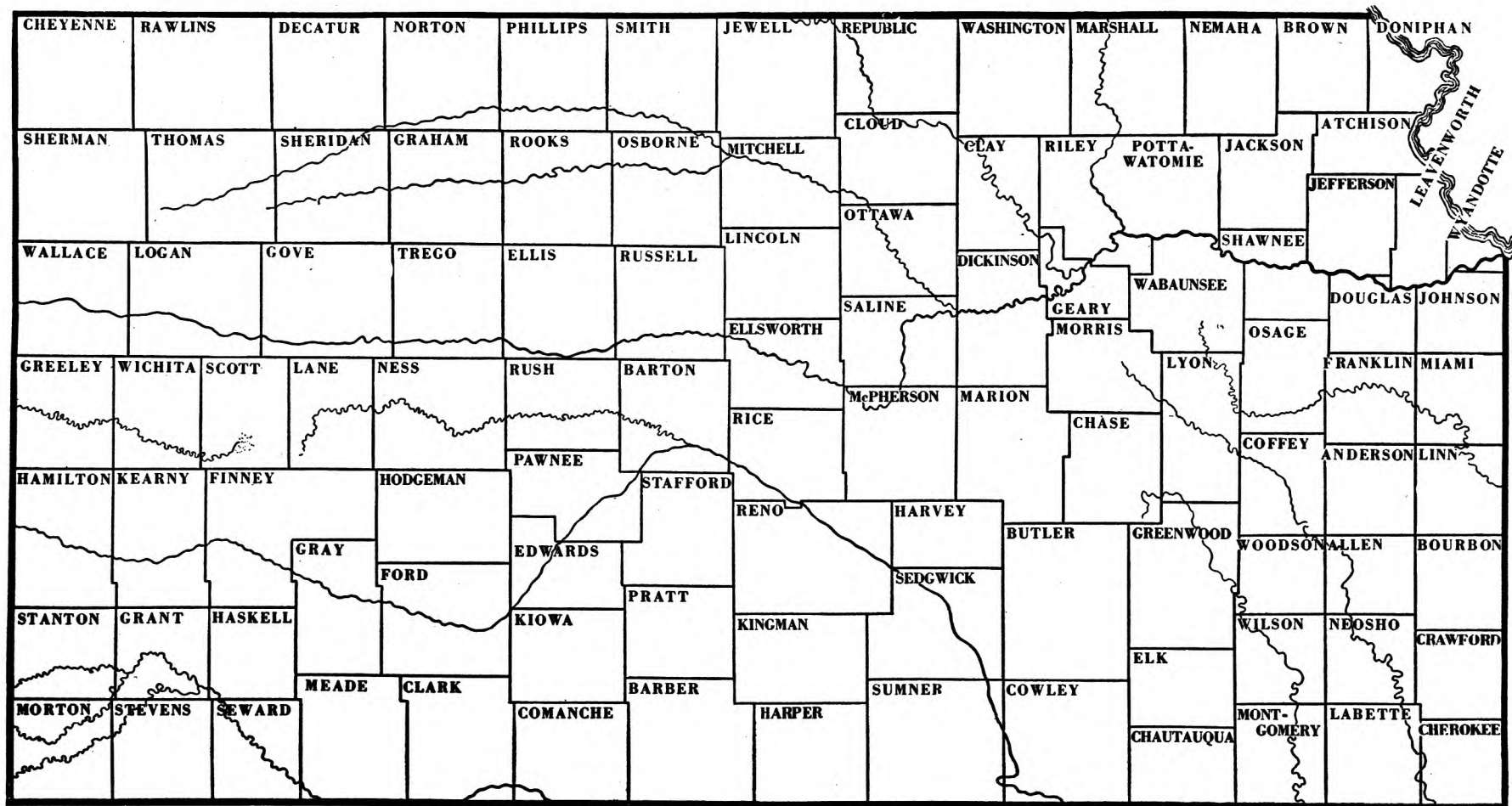


Figure 4.—Crop excess over total storage 1922 in thousands of bushels.

Total Kansas wheat crop for 1922 was 116,865,000 bushels.



NONE

Figure 5.—Crop excess over total storage 1923 in thousands of bushels.

Total Kansas wheat crop for 1923 was 76,172,000 bushels.

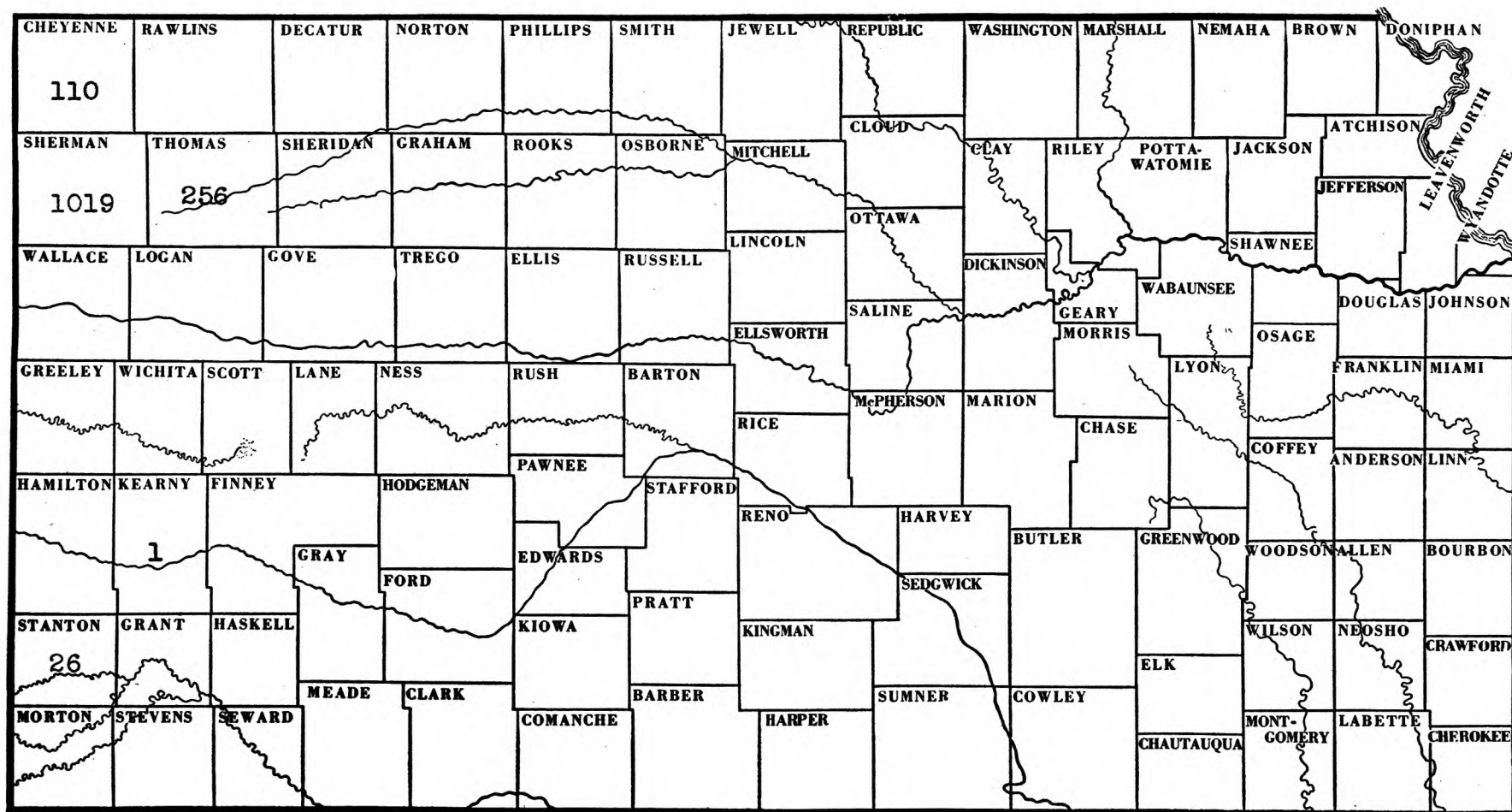


Figure 7.—Crop excess over total storage 1925 in thousands of bushels.

Total Kansas wheat crop in 1925 was 74,265,000 bushels.

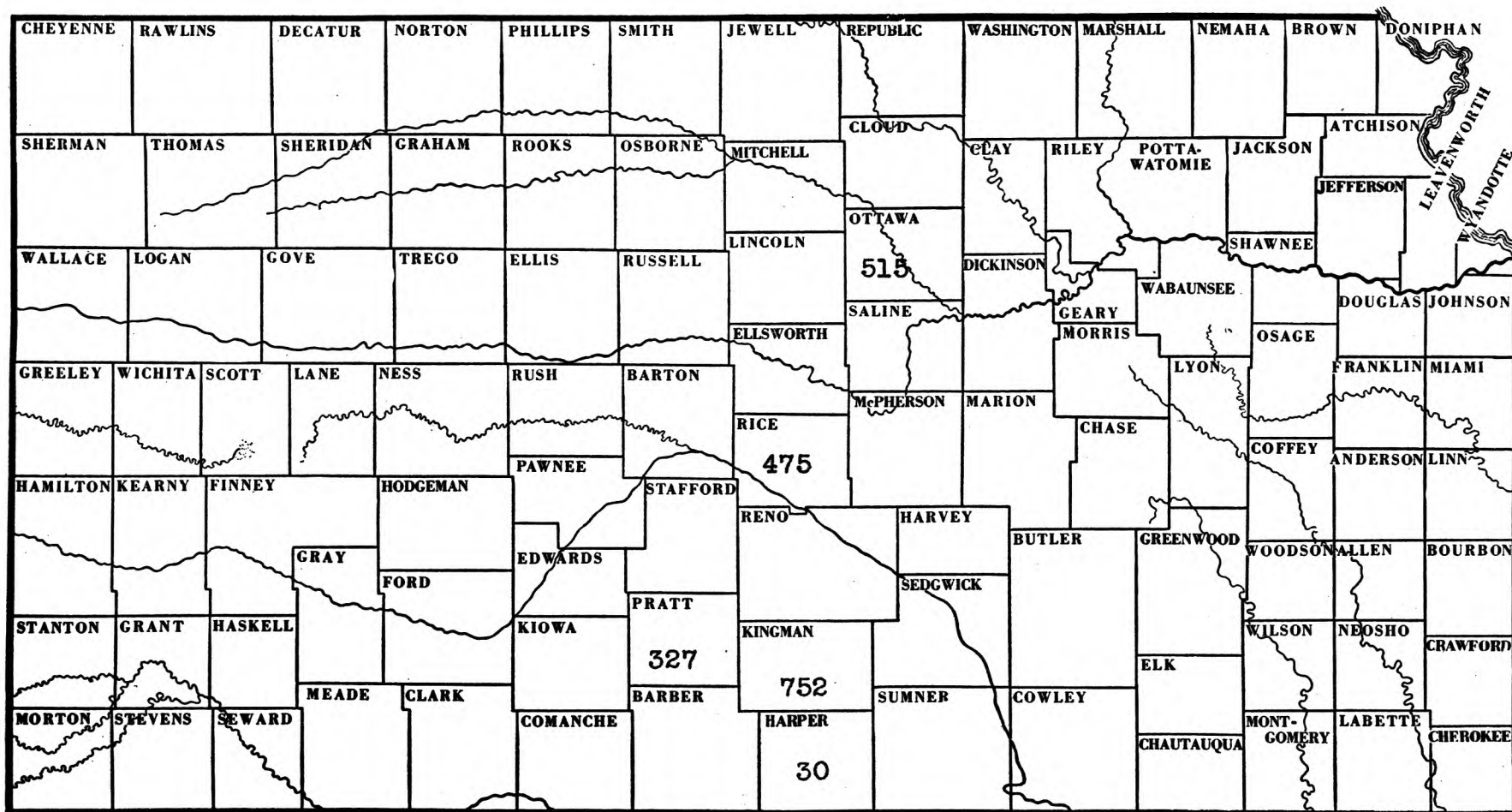


Figure 9.—Crop excess over total storage 1927 in thousands of bushels.

Total Kansas wheat crop in 1927 was 111,407,000 bushels.

been increasing with each good crop of wheat. The acuteness of this problem is more pronounced when it is considered that these surpluses of wheat over storage space are not spread out over the state but are regional surpluses, located in definite sections as shown on the maps, Figures 2 to 10.

Table II.—Kansas wheat crop, shortage of storage space, and per cent the shortage is of total crop for 1920-28.

Year	Kansas crop (thousands of bushels)	Crop above storage space (thousands of bushels)	Per cent shortage is of total crop
1920-21	141,000	10,400	7.7
1921-22	128,000	1,764	1.3
1922-23	117,000	2,362	2.0
1923-24	76,000	none	-
1924-25	154,000	15,094	9.8
1925-26	75,000	1,412	1.9
1926-27	149,000	21,554	14.4
1927-28	111,000	2,099	1.9
1928-29	178,000	28,797	16.2

THE EFFECT OF THE COMBINE

In recent years the storage problem has become more pressing through the increased use of the combine as a means of harvesting.

Formerly much of the grain that now necessarily must move to market or be stored in bins or elevators as soon as harvested was stored for a short period in the shock or

stack before threshing, thus lengthening or extending the time of movement to market or putting off the date when storage in bins or elevators must take place. This increased use of the combine has undoubtedly had an effect on the early movement of grain to the central markets which will be discussed later.

The effect of this new method of harvesting is not measurable mathematically but the tendency for this factor to influence the situation is evident.

The number of combines in each county was taken from the Biennial Reports of the Kansas State Board of Agriculture for 1923 to 1927 inclusive and from the Trans-Missouri-Kansas Shippers' Advisory Board report in May for 1928. The increase in the number of combines in 1928 over the number in 1924 was figured in per cent of increase by counties. The groups 3, 6, and 9 were not figured for there was little or no storage shortage in these counties and also the number of combines was small. Groups 7 and 8, having the largest excess crop over storage space, also had the largest percentage increase in number of combines. These percentage figures alone do not indicate the actual volume of increase in number but merely the relative increase.

Scatter diagrams, as shown in Figures 11 and 12, having a horizontal axis representing the number of combines in the counties in 1928 and a perpendicular axis representing the

percentage increase in number of combines by counties from 1924 to 1928 were made. The counties were divided into two groups: (1) Those having no excess crop over storage and (2) those counties that have had a crop larger than available storage room for at least one year during the period 1920-28. These data do not include those counties in groups 3, 6, and 9, which constitute the eastern one-third of the state.

Figure 11 shows that the number of combines in the counties having plenty of storage space was small in most cases and as a result a high percentage increase in number as shown by a few counties does not necessarily indicate a large increase in number of combines.

In Figure 12, however, there is a tendency for more frequencies to be scattered in a trend toward higher number of combines and higher percentage of increase in number.

This tendency corroborates the statement made that the greatest increase in combines has occurred in those counties that are short of storage space. This would tend to make the problem of storage and early rushing of grain to market more acute and more pronounced in these groups of counties.

ALLOCATING THE CAUSE OF THE INCREASED CROP

From the table of counties (See appendix Table X)

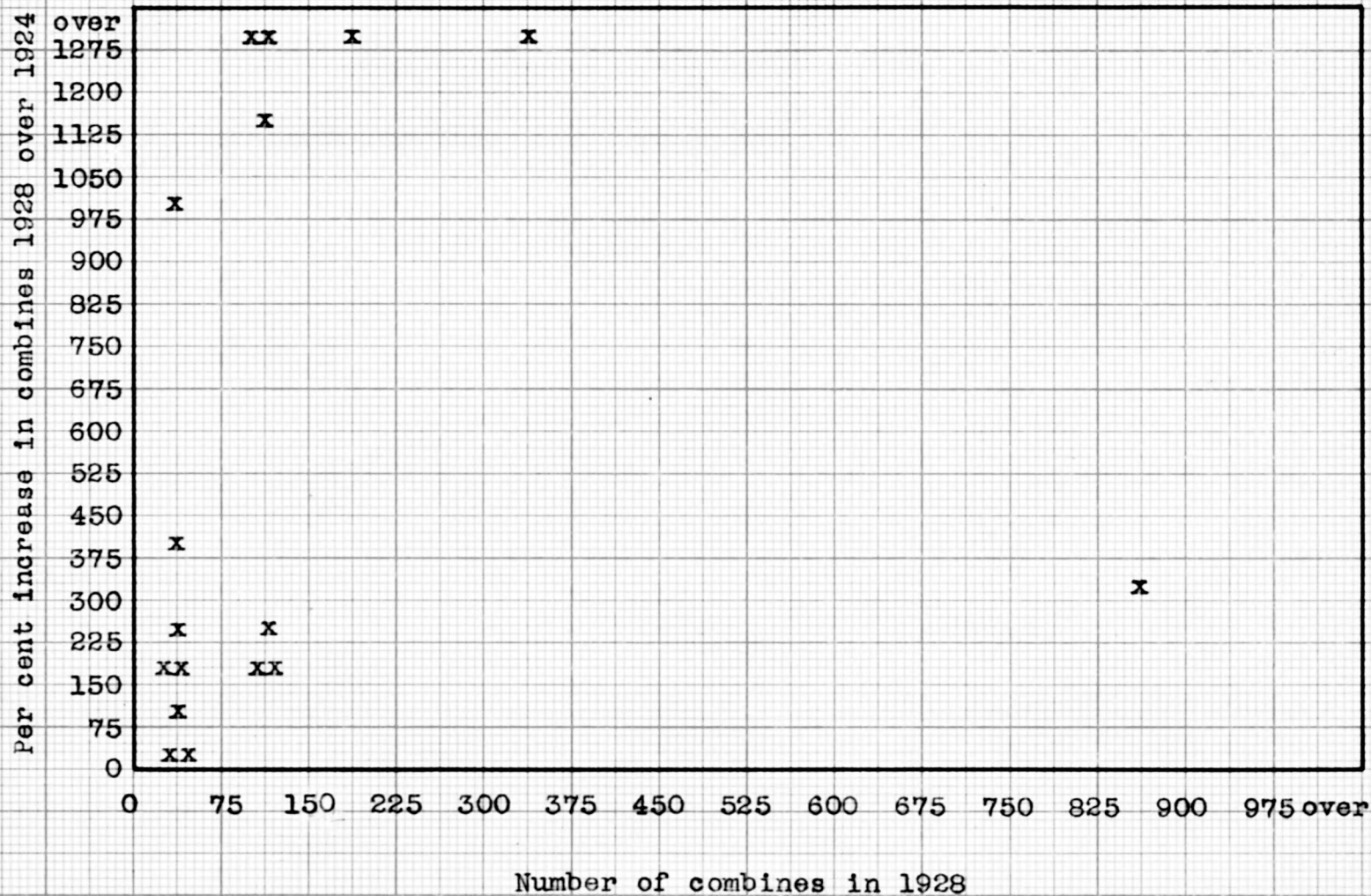


Figure 11.—Relationship of increase in number of combines 1928 over 1924 compared with actual number of combines in 1928 in counties having crop smaller than storage space 1920-28.

Figure 12.- Relationship of increase in number of combines 1928 over 1924 compared with actual number of combines in 1928 in counties having crop larger than storage space 1920-28.

giving the quantity that these counties are short of storage space for the wheat they produced, it can be seen that the largest shortage is recurrent in certain groups. However, shortages do not occur annually and not always in the same counties. This variation in the size of the crop could be due to either of three factors: (1) An increase in yield per acre; or (2) an increase in the acreage of wheat; or (3) a combination of the above. An attempt was made to determine the relative importance of the factors to which could be attributed the increase in crop and the consequent shortage of storage space. This study was made for the counties in crop reporting groups 4, 7, and 8 in which shortage of storage space occurred in 1924, 1926, and 1928. It was the increased portion of the crops produced in these years for which the relative importance of the effect of increases in yield and acreage or a combination of both as factors causing this increase were determined.

The procedure followed is given below. Each county was worked separately. The increase in acreage over the previous year was multiplied by the yield per acre grown in that county the previous year. That portion of the increased crop was due to an increase in acreage. The increase in yield per acre over the previous year was multiplied by the acreage in wheat in that county the previous year. That portion of the increased crop was due to yield. The increase in yield per

acre over the previous year's yield was multiplied by the increase in acres of wheat harvested over the previous year's acreage to determine the portion of the increased crop that was due to the combination of both factors. Due regard was paid to algebraic signs, a decrease in one factor causing a reduction in crop which might be made up by an increase in the other factor. The portions allocated to each factor for all the counties in a group were added and the per cent of the increased crop in that group of counties caused by increasing the yield or acreage or the combination of both was determined. Table III shows the results.

From this table it can be seen that yield has played a much more important part in causing an increase of crop over the previous year than has an increase in the number of acres.

The result in the northwest (group 4) in 1926, showing the negative effect of both factors, yield and acreage, is due to the fact that one of the two counties short of storage space that year had a decrease in acreage giving the negative effect of this factor. Yield and acreage in the other county overcame this negative effect to produce an increased crop over the year previous.

The effect of increased acreage is less for 1926 than it was in 1924. With the exception of the south central

Table III.—Table showing relative percentage of the increased crop over the crop of the previous year for 1924-25, 1926-27, and 1928-29 that was due to increase in acreage, yield or combination of both factors in the counties having a shortage of storage space.

	South Central Group Number 8			Southwest Group Number 7			Northwest Group Number 4		
	Per cent due to increase in acreage	Per cent due to increase in yield	Per cent due to combina- tion of both factors	Per cent due to increase in acreage	Per cent due to increase in yield	Per cent due to combina- tion of both factors	Per cent due to increase in acreage	Per cent due to increase in yield	Per cent due to combina- tion of both factors
1924	13.7	74.8	11.4	24.8	16.4	58.7	19.6	15.9	64.4
1926	5.3	89.1	5.4	7.4	74.7	17.7	12.1	91.1	-3.2
1928	9.3	86.6	4.0	6.8	64.6	28.4	3.4	72.7	23.8

(group 8) it is less in 1928 than in 1926. This trend indicates that the expansion of acreage is going to be of less importance as a causative factor in producing crops for which there is not available storage room in the future.

COST OF STORAGE

Figures on the cost of storage of wheat were secured from F. C. Fenton, Head of the Agricultural Engineering department, Kansas State Agricultural college. He estimates the yearly cost of investment in a thousand bushel metal bin at 2.5 cents per bushel and for a three thousand bushel metal bin at 2.28 cents per bushel. These costs are figured on the basis of 15 years for depreciation of the bin and 6 per cent interest on the capital invested. This would make the yearly cost of storage, in one thousand bushel metal bins, of wheat which has on an average exceeded the available storage space in the crop years 1924-25, 1926-27, and 1928-29, a sum of \$545,200. The cost of storage on this basis in three thousand bushel metal bins would be \$497,222. However, it can be seen from Table II showing the shortage of storage space that this extra storage would not be used every year and as a result the cost borne per bushel of grain the years in which it was stored would be materially increased. Hence, it is problematical whether the farmer would profit by this investment in more storage

space. (See later reference to decline in price in years of heavy marketing).

MOVEMENT TO MARKET OF THE WHEAT CROP

Increased Earlier Movement of Grain

Whether the marketing of the Kansas wheat crop evenly through the 12-month period is desirable or not is questionable². There does seem to be a distinct tendency for the Kansas farmer to hurry the movement of his wheat to market as soon after harvest as possible.

Table IV.—Per cent of year's receipts at Kansas City in July and August, 1920-28.

1920	1921	1922	1923	1924	1925	1926	1927	1928
17.45	36.89	29.27	35.12	48.53	36.55	50.97	45.06	49.65(a)

a. Based on actual receipts from July to May, inclusive, plus estimate for June. (See Plate I)

Table V.—Per cent of year's receipts at Wichita in July, 1920-28.

1920	1921	1922	1923	1924	1925	1926	1927	1928
7.35	16.62	15.01	27.39	29.27	22.56	38.23	25.73	44.56(a)

a. Based on actual receipts up to last month and estimate for remainder.

2. Kansas Experiment Station Bulletin No. 244.

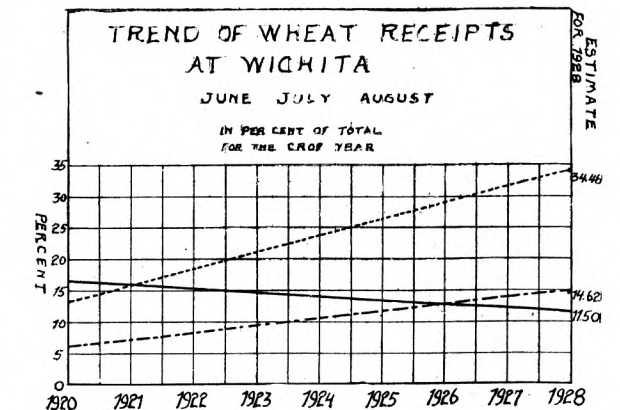
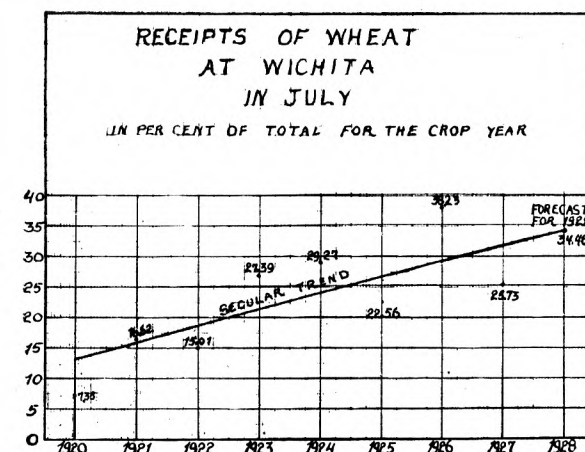
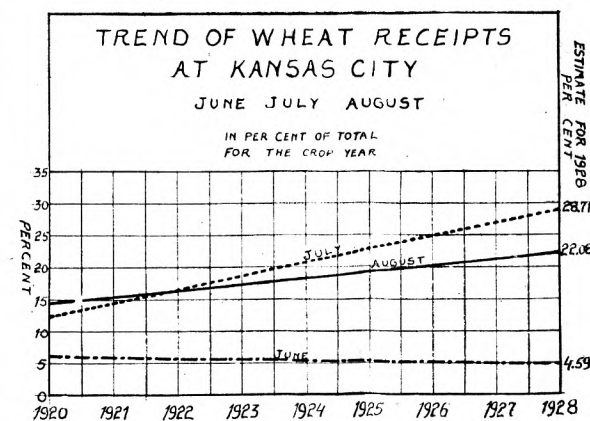
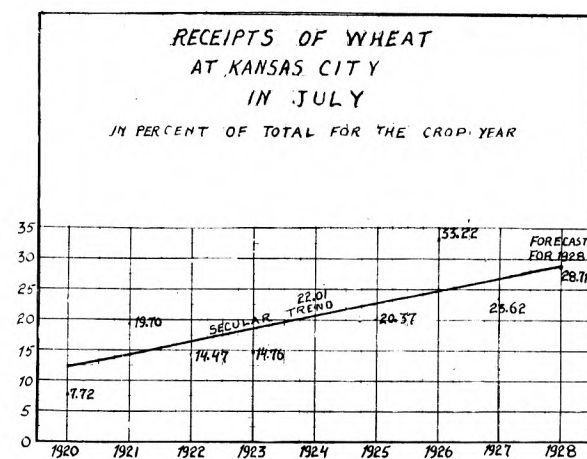
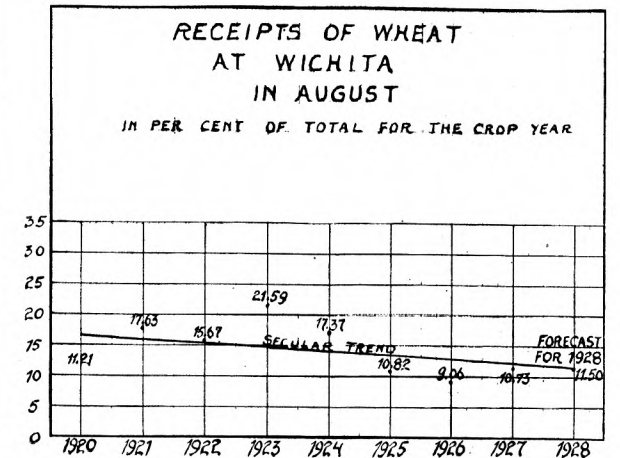
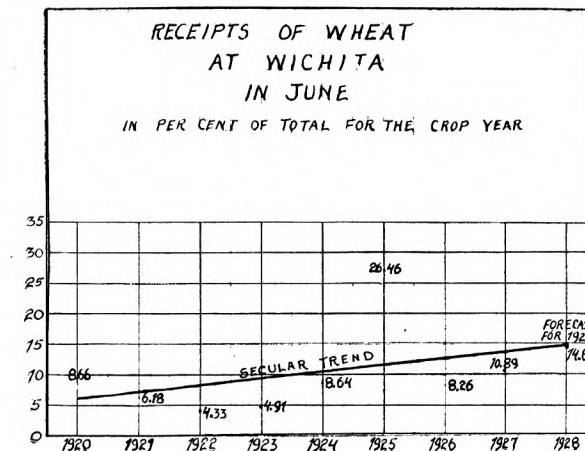
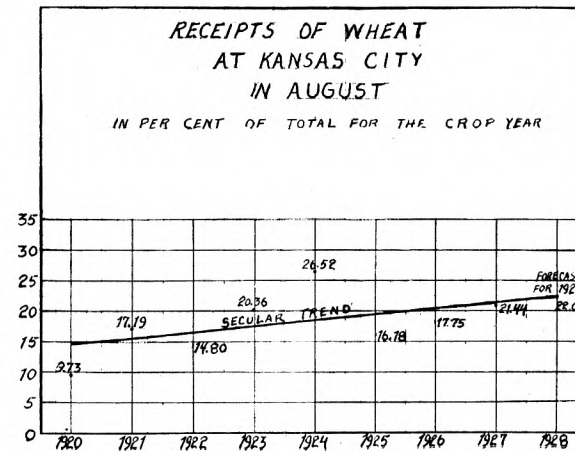
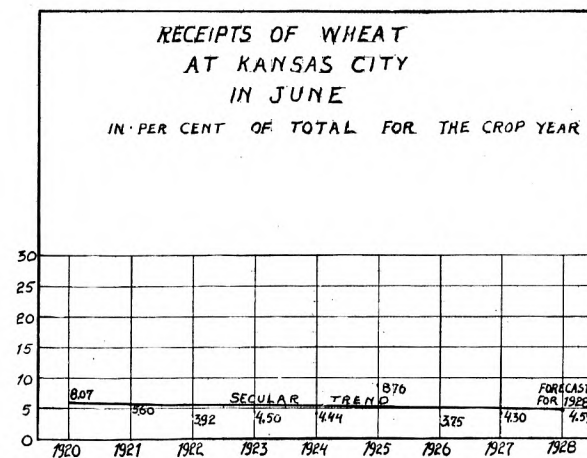
Tables IV and V show the trend toward earlier marketing. Further evidence in support of this conclusion is given in Plate I which was prepared by Mr. E. A. Stokdyk, formerly of the Department of Agricultural Economics, Kansas State Agricultural college. On this plate the secular trend is shown for the receipts at both Wichita and Kansas City. The downward trend in the August receipts at Wichita is more than offset by the upward July trend for this market when considering the two months together.

This increased early movement of wheat to market is concomitant with the increased use of the combine and the development of the large shortage of storage space in the southwestern portion of the state of Kansas. It is not improbable that these factors have exercised a direct influence causing at least in part this early movement of grain to market.

Data concerning the origin of wheat shipments were not available. A study was made determining the railroad lines over which these shipments were made for the crop years 1924-25, 1926-27, and 1928-29/3. These data showed that on the Santa Fe, a road serving the southwestern part of the state, the shipments had been increased for July as shown in

3. Data from the Kansas City Grain Market Review.

Plate I.—Secular trend of receipts of wheat at Kansas City and Wichita for June, July, and August, 1920-27 with forecast for 1928.



Submitted by Mr. E. A. Stokdyk, Kansas State Agricultural College.

Table VI. This table shows the increased movement of grain into Kansas City during July, an increasing portion of which the Santa Fe railroad is carrying. These figures are significant for they reflect in a general way the trend of the wheat movement, particularly of southwest Kansas, for this is a section of the state which the Santa Fe serves.

Table VI.—Portion of carload shipments of wheat into Kansas City received over Santa Fe railroad in July, 1924, 1926, and 1928. (a)

Year	Per cent of all grain shipments into Kansas City received over Santa Fe in July	Number of carloads of wheat received at Kansas City in July
1924	30.86	14,613
1926	43.10	22,867
1928	50.20	24,817

a. Data from Kansas City Grain Market Review.

Position of the Railroads in Moving the Surplus Crop

As can be seen in Table II, the crop exceeding storage space for 1924 was about 15 million bushels; for 1926, 22 million bushels; and for 1928, 29 million bushels. This quantity must necessarily move as soon as harvested for it has no bin room and as a result will place an added burden on the railroads in order to move it to market.

The number of cars necessary to move this grain would have been around 12,000 for 1924; 18,000 for 1926; and 24,000 for 1928. Data secured from the Santa Fe and Rock Island lines as to the number of cars available show that these two railroads had as the maximum number of grain boxes stored any week in 1924, 16,520 cars; in 1926, 18,561; and in 1928, 22,838. These lines cover the southwestern wheat belt territory and the figures of available cars given above include not only those for Kansas but also for the adjoining wheat belt states. It can easily be seen that an impossible burden would be placed on the railroads to move this grain immediately after harvest or handle these seasonal surpluses merely by an increased car supply.

EFFECT OF THE EARLY MOVEMENT OF GRAIN ON PRICE

Shown in Market Reports

The question arises as to how much this increased early movement of wheat to market affects the price during this period. To say that there is no effect would be as absurd as to say that this movement is the only price making factor which is operating.

These extracts from the Kansas City Grain Market Review show the influence that heavy receipts have on the market.

"The largest arrivals on the crop and more than re-

ceived since late July, 1924, caused buyers of hard and dark hard to reduce ideas on premiums today, and prices did not follow strength in futures." /4

"The largest receipts on record for a single day was broken here and the heavy offerings served to impart independent weakness to prices and premiums for hard and dark hard." /5

"The huge arrivals and early weakness in futures resulted in a disposition on the part of sellers to push supplies of hard and dark hard at the outset of trading, while buyers were rather complacent." /6

"Sharply downward tendency in prices and premiums which has been in progress ever since movement of new wheat got started was further accelerated in today's local market for carlots of hard and dark wheat owing to huge receipts and weak futures." /7

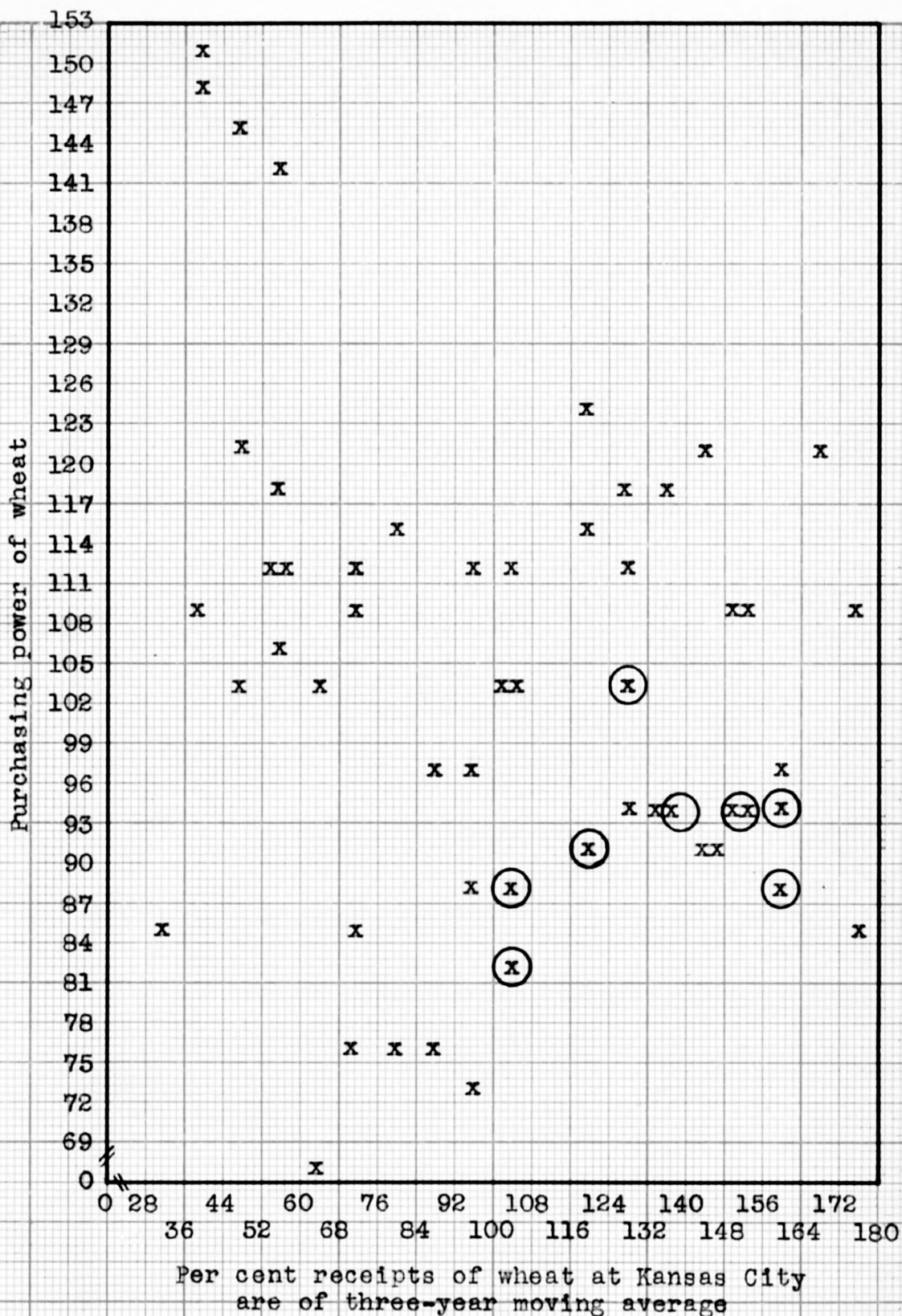
"More wheat was received here today than ever before in the history of the market and probably more than ever recorded at any primary center in the United States. The huge supply and violent declines in futures carried prices for hard and dark wheat down 1 to 7 cents." /8

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4. Grain Market Review. Kansas City, Mo., July 19, 1926.
 5. Grain Market Review. Kansas City, Mo., July 23, 1926.
 6. Grain Market Review. Kansas City, Mo., July 24, 1926.
 7. Grain Market Review. Kansas City, Mo., July 9, 1928.
 8. Grain Market Review. Kansas City, Mo., July 23, 1928.

Effect as Shown on Purchasing Power

To determine if there were any tendency for receipts at the market to affect the price of wheat a scatter chart was made as shown in Figure 13. This study covered the months July, August, and September for the years 1911 to 1928 inclusive. The horizontal axis measured the per cent that the monthly receipts were of a three-year moving average of receipts at Kansas City. The other axis measured the purchasing power based on the United States Labor Board Index using 1910-14 as a base. The per cent that receipts were of the monthly moving average was used to get away from the effect of the trend towards larger crops and increased receipts. The use of purchasing power figures eliminated the effect of changing price levels that would be present if actual prices were used.

This chart does not establish a definite trend line, yet it contains some significant facts. The frequencies encircled represent the months July, August, and September for the years 1924, 1926, and 1928. These years are ones of heavy marketing during these particular months and they all fall in the lower right hand quadrant showing in these instances that large receipts are concomitant with low purchasing power. The upper left hand quadrant of the chart



contains four frequencies of years with light receipts during these months. The wide scattering of the other occurrences reflect the fact that there are many influences affecting the price during these months and that the receipts on the market are not the sole price making factor.

Figure 14 shows the relationship between the purchasing power of wheat in September and the per cent which the July receipts are of the total receipts for that year for each year of the period 1920-28. The instances are too few to be definite. However, there is a tendency to establish a trend toward lower purchasing power with large receipts early in the crop year. In two years, 1922 and 1923, the purchasing powers showed no close correlation with receipts and are not near the trend line on the chart. Their position here is due to the influence of other factors than receipts. The other instances support the theory that heavy receipts force price downward. The purchasing power in September was used for each of the three months, July, August, and September, for it usually is the lowest in price and would likely best indicate the effect of the early marketing.

Effect on Average Prices

To further study the effect of large receipts on the price during July and August, Tables VII and VIII were prepared. The years were separated into two groups: (1) those

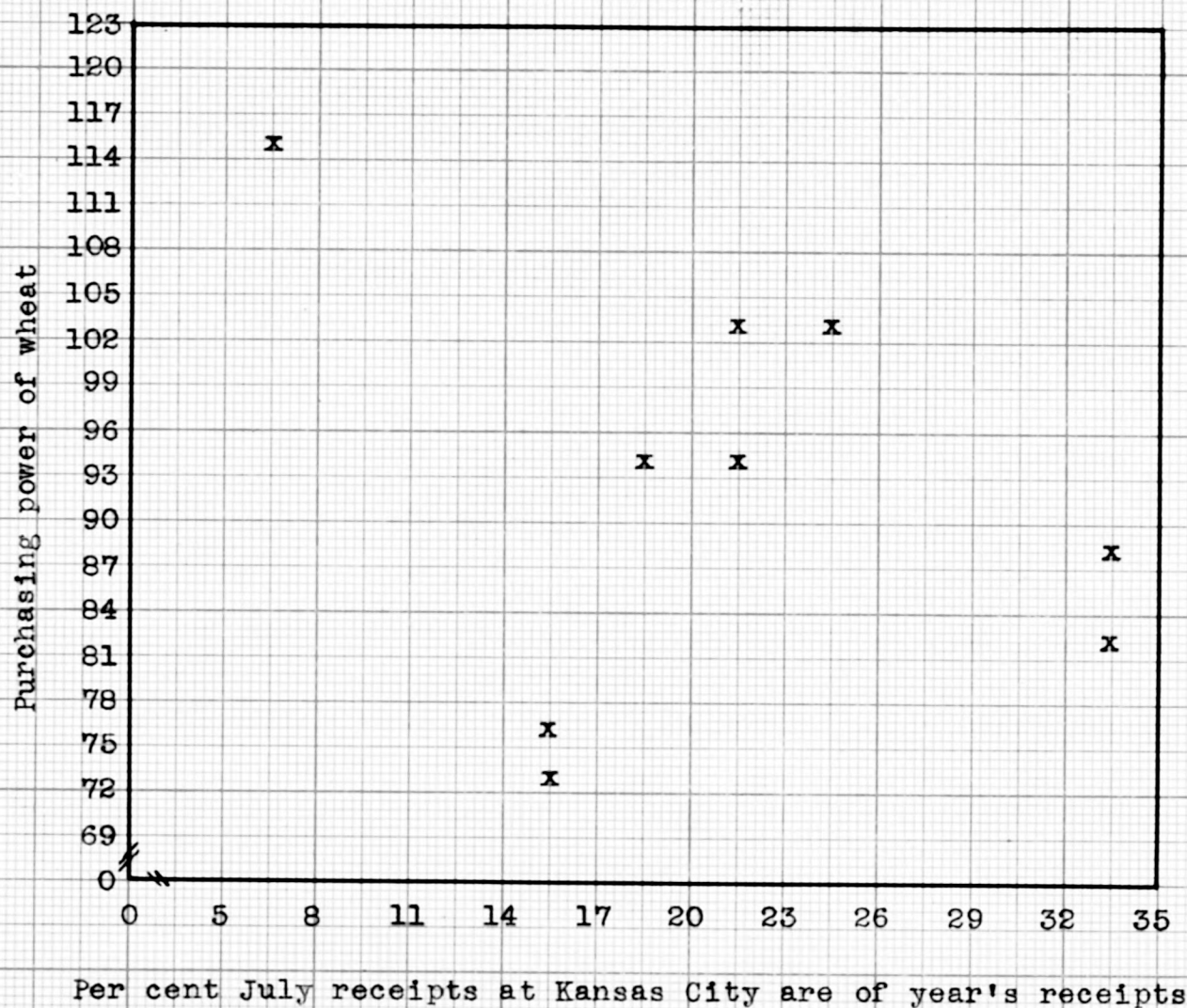


Figure 14.—Relationship between the purchasing power of wheat in September and the per cent July receipts are of the year's receipts at Kansas City for 1920-28.

above the trend of receipts according to the trend worked out by Mr. E. A. Stokdyk given on Plate I, and (2) those below this trend. The average price for each of these two groups of years was figured and the price decline between July and August calculated. According to Table VII, the price decline in years when the receipts were above the secular trend for the last nine years was 23 cents. In years when the receipts were below this trend at Kansas City the price decline for the same months was 7 cents.

This is further shown in Table VIII where August was grouped in the same category as the previous July in relation to the receipts for July being above or below the secular trend. This was done because of the effect that the July market carries over into the following month. This alignment of the months shows a decline between July and August of 13 cents for those years above the secular trend in receipts at Kansas City and only 6 cents decline in the years below the trend line. The latter figures correspond more closely to the decline in average price for the years 1920-28 as shown in Table IX. The average decline that has been realized during July, August, and September, 1920-28, amounts to 8 cents from June to July, 9 cents from July to August, and 3 cents from August to September. These data are computed from the top price of No. 2 hard red winter wheat at Kansas City.

Table VII.—Average decline of top prices of No. 2 hard winter wheat from July to August, 1920-28, segregated depending on receipts at Kansas City being above or below normal. (a)

Year	July		August	
	Price when receipts were above normal trend	Price when receipts were below normal trend	Price when receipts were above normal trend	Price when receipts were below normal trend
1920		\$3.02		\$2.75
1921	\$1.60		\$1.35	
1922		1.53		1.21
1923		1.07	1.19	
1924	1.41		1.35	
1925		1.73		1.82
1926	1.47			1.41
1927		1.63		1.70
1928	1.60			1.44
Average	\$1.52	\$1.79	\$1.29	\$1.72
Average price decline from July to August			.23	.07

a. Data from Kansas City Grain Market Review.

Table VIII.—Average decline of top prices of No. 2 hard winter wheat from July to August, 1920-1928, segregated depending on alignment of August with July receipts at Kansas City. (a)

Year	July		August	
	Price when receipts were above normal trend	Price when receipts were below normal trend	Price when receipts were above normal trend	Price when receipts were below normal trend
1920		\$3.02		\$2.75
1921	\$1.60		\$1.35	
1922		1.53		1.21
1923		1.07		1.19
1924	1.41		1.35	
1925		1.73		1.82
1926	1.47		1.41	
1927		1.63		1.70
1928	1.60		1.44	
Average	\$1.52	\$1.79	\$1.39	\$1.73
Average price decline from July to August			.13	.06

a. Data from Kansas City Grain Market Review.

Table IX.—Average decline in prices from preceding month for top No. 2 hard red winter wheat at Kansas City for July, August, and September, 1920-28. (a)

Year	Price in June	Price in July	Price in August	Price in September
1920	\$3.04	\$3.02	\$2.75	\$2.70
1921	1.68	1.60	1.35	1.38
1922	1.57	1.53	1.21	1.17
1923	1.17	1.07	1.19	1.25
1924	1.30	1.41	1.35	1.46
1925	1.90	1.73	1.82	1.71
1926	1.71	1.47	1.41	1.425
1927	1.59	1.63	1.70	1.59
1928	1.85	1.60	1.44	1.34
Average	\$1.75	\$1.67	\$1.58	\$1.55
Average price decline from preceeding month		.08	.09	.03

a. Data from Kansas City Grain Market Review.

CONCLUSIONS AND SUMMARY

There is a shortage of available storage space for wheat in some sections of Kansas, while in other parts of the state there is an excess of storage room. The available room taking the state as a whole is larger than any of the past crops.

The regions of the state having an excess of crop over the available storage space have been shifting in recent years. The excess before 1920 was in the eastern part of the state. In 1920, it was in the northwest section and since has shifted to the southwest as in 1928.

The occurrence of this excess crop over storage is irregular occurring to a marked extent four out of the nine years studied.

The effect of the combine has been to shorten the period in which the grain is threshed and made ready for movement to market or storage. This speeding up has tended to cause a rush of grain to market. The increase in the number of combines has occurred largely in the territory where there is likely to be a shortage of storage space and in a territory that has increased its early shipments of grain to market. The increase in number of combines, therefore, has a greater effect on the seasonal surplus of wheat

than if the increase had been scattered over the state.

The study of increases of acreage and increases of yield affecting the size of the crop revealed the fact that the most likely cause for regional surplus of wheat over storage space was an increased yield over the previous year on the old acreage. Of the crop increase over the previous year, two-thirds to more than three-fourths was due to larger yields in this way. There has been an increase in wheat acreage and a portion of the increased crop is due to this factor. Especially was this the case in the southwest in 1924. The larger share, however, is due to yield.

The yearly cost of storage in one thousand bushel metal bins of the average amount of wheat which has exceeded the storage space in 1924, 1926, and 1928 would be \$545,200. The cost in three thousand bushel metal bins would be \$497,222. The cost borne by the quantity stored during the years of shortage of storage space would include that cost of upkeep and interest on the bins which would accrue during years of excess storage space. Idle storage space about half the time would double the cost estimated above. This makes the profitableness of the investment in bins to cover all seasonal surpluses questionable.

The Kansas wheat crop has been moving to central markets earlier in the crop year than formerly. Receipts at

Kansas City and Wichita indicate this trend of the movement of wheat to market. A larger proportion of the receipts at Kansas City that come from the southwestern section of Kansas over the Santa Fe is coming to market in July. This is a section which has had a large crop over storage in three out of the last five years.

Expecting the railroads to be able to handle the crop excess over storage space immediately after harvest is untenable for they cannot furnish sufficient cars. Surplus wheat above local storage space would have required 12,000 cars in 1924, 18,000 cars in 1926, and 24,000 cars in 1928 against a maximum grain car storage in the whole southwest on the Santa Fe and Rock Island lines of 16,520, 18,561, and 22,838 in these respective years.

The early movement of grain to market has had its influence on price during this period of movement. The tendency is in the direction for heavy receipts to force down the price. The average drop of price in those years when the heaviest movements have occurred has been larger than those years when the movement was more uniform throughout the year.

ACKNOWLEDGMENT

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REFERENCES

Green, R. M. Effects of Shortage of Farm Storage Space and Inability to Get Local Bank Credit on the Movement of Kansas Wheat to Market. Bulletin No. 244, Agricultural Experiment Station, Kansas State Agricultural College, Manhattan, Kansas, 1927.

Kansas Grain Dealers' Annual Directory, 1922 and 1923.

Kansas Weekly Crop Report. U. S. Department of Agriculture cooperating with the Kansas State Board of Agriculture. 1928.

Mohler, J. C. Biennial Report of the Kansas State Board of Agriculture. Twenty-second to 25th reports, inclusive, 1919 to 1926 inclusive.

Mohler, J. C. Report of the Kansas State Board of Agriculture for the quarter ending December, 1927.

Trans-Missouri-Kansas Shippers' Advisory Board Reports, April 10, 1928, and May 1, 1928.

Table X.—Crop excess by counties in thousands of bushels
over total available storage space 1920-28.

Dis- trict	Counties	Crop Excess over Storage								
		1920	1921	1922	1923 (a)	1924	1925	1926	1927	1928
1	Cheyenne						110			
	Decatur	656								
	Graham	1293								
	Norton									
	Rawlins	145								
	Sheridan	1108								
	Sherman			289		147	1019			
	Thomas	1305		536			256			561
4	Gove	1146				280				
	Greeley		102			132		116		194
	Lane	463				522		102		1427
	Logan			112		313				
	Ness	42				579				965
	Scott	246				49				
	Trego	1286		525		1185				
	Wallace			49		23				
7	Wichita									
	Clark		118			1201		1047		1382
	Finney			191		347		421		818
	Ford					1006		2694		2551
	Grant		47	180		474		1052		1344
	Gray					1063		1225		2782
	Hamilton							30		82
	Haskell		293	103		555		1465		1694

Continued on next page

Table X continued.

District	Counties	Crop Excess over Storage								
		1920	1921	1922	1923 (a)	1924	1925	1926	1927	1928
7	Hodgeman					375		9		1039
	Kearny	6		30		17	1	231		206
	Meade					1075		1971		1550
	Morton							356		124
	Seward					111		1722		735
	Stanton		19	35			26	287		205
	Stevens		59			110		1485		384
2	Clay									
	Cloud									
	Jewell									
	Mitchell									437
	Osborne									185
	Ottawa	70							515	287
	Phillips									
	Republic									
	Rooks	2096								
	Smith									
	Washington									
5	Barton					771				
	Dickinson									
	Ellis					711				
	Ellsworth									
	Lincoln									
	McPherson									
	Marion									
	Rice							133	475	57
	Rush					867		92		1645
	Russell					344				541

Continued on next page

Table X continued

District	Counties	Crop Excess over Storage								
		1920	1921	1922	1923 (a)	1924	1925	1926	1927	1928
5	Saline									
8	Barber					249		620		253
	Comanche					354		676		945
	Edwards					129		383		708
	Harper		356					1268	30	917
	Harvey									
	Kingman					51		1543	752	783
	Kiowa		66					1150		1049
	Pawnee					872				1494
	Pratt		556			1182		1117	327	1034
	Reno									
	Sedgwick									
	Stafford							359		398
	Sumner									
3	Atchison									
	Brown									
	Doniphan									
	Jackson									
	Jefferson	21								
	Leavenworth									
	Marshall									
	Nemaha									
	Pottawatomie									
	Riley									
	Wyandotte									
6	Anderson	81								
	Chase			125						21
	Coffey									

Continued on next page

Table X continued

Dis- trict	Counties	Crop Excess over Storage								
		1920	1921	1922	1923 (a)	1924	1925	1926	1927	1928
6	Douglas									
	Franklin									
	Geary									
	Johnson	207								
	Linn									
	Lyon	101	148	145						
	Miami									
	Morris			42						
	Osage									
	Shawnee									
	Wabaunsee	168								
9	Allen									
	Bourbon									
	Butler									
	Chautauqua									
	Cherokee									
	Cowley									
	Crawford									
	Elk									
	Greenwood									
	Labette									
	Montgomery									
	Neosho									
	Wilson									
	Woodson									
TOTALS		10,440	1,764	2,562		15,094	1,412	21,554	2,099	28,797

(a) No crop excess over storage.