WHITE CORN IN KANSAS

by

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A THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Economics and Sociology

KANSAS STATE COLLEGE
OF AGRICULTURE AND APPLIED SCIENCE

1955

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INTRODUCTION

Purpose

White corn has recently turned out to be a specialized crop. Man's natural preference for purity in his food has undoubtedly been the cause of the belief that white corn is preferable to other corn for human consumption. It was the purpose of this study to analyze trends in prices and production of white corn.

Since about 1920 when it was found that yellow corn contained beta-carotene-pro-vitamin A, the production of yellow corn grown has increased with a subsequent decrease in the production of white corn. Despite the notable decrease in the production of white corn, the utilization of white corn products has been held more or less constant because of the traditional or customary requirements for food made from white corn. No great change has come about in the eating habits of people especially in the South who consume a large proportion of white corn products.

Since the demand for white corn has remained constant while supply decreased, a definite and concerted effort on the part of the white corn miller has been necessary in order to assure an adequate supply of their raw material - white corn. It was assumed that the result of this investigation would serve as a guide if it would be more profitable for Kansas farmers to grow white corn instead of yellow corn.

In planning their businesses, farmers have to make many estimates. They have to consider the yielding ability of the variety to be planted as well as whether it commands a price premium in the market. Another important decision is to determine the most profitable season of the year to market

corn. Such decisions are made by the farmers individually and as members of producers' marketing organizations. This study was made to help farmers answer such questions.

Review of Literature

Despite its importance in American agriculture, the author was unable to find a single publication specifically pertaining only to white corn. The most useful information on white corn was found in a M. S. report, Department of Agronomy, Kansas State College, 1947 (Kohr, 6). Personal correspondence with state and federal officials gave valuable information.

Historical

The American Indian, oftentimes called the first plant breeder, may be held responsible for early widespread use of white corn. The first corn seen by white settlers in the United States was multicolored. When the grinding of corn into meal and flour first occurred, it can be assumed that a preference was given for a pure (white) product. Much of the early corn planted in the United States was for human consumption and therefore, white corn became established.

In the 1920's, with the discovery that yellow corn contained beta-carotene (Morrison, 9) production of yellow corn increased with decreased production of white corn. The South, seemingly imbedded in the white corn tradition more deeply then many parts of this country, has continued its preference for white corn as a human food. There seems to be no distinct advantage of white corn over other colors for human food. Nevertheless, custom and tradition has prevailed and there is a great demand for food products made from white corn.

Corn has been widely adopted as a feed to livestock and about 80 to 95 per cent of the corn raised in the United States is fed in the locality in which it is produced (3). Because most of the corn is utilized as feed, major emphasis of the corn breeders has been on the development of yellow corn hybrids. It was natural that yellow hybrids be developed first because their superiority was proved previous to widespread research work on hybrid corn. Since the early development of yellow hybrids, work has been done on the development of white hybrids which indicated in several instances that some white hybrids outyielded their closest yellow competitors (Kehr, 6). This brings up the question of just what is needed in order to have white corn as popular a livestock feed as yellow corn.

Comparison of Feeding Value

The authorities in animal nutrition agree that if white corn is the sole source of nutrition for growing animals, it is inferior to yellow corn. (Morrison, 9) However, if pasture or hay can be fed with white corn, yellow corn has no advantage over white. In other words, the two types of corn are of equal feeding value with the exception of beta-carotene contained in yellow corn. Since corn is an expensive source of vitamin A, it seems desirable for feeders of livestock to use a cheap source of vitamin A like hay or pasture rather than depend upon corn for its source. Thus, it may be argued that in value as feed, white and yellow corn are on a nearly equal basis. White corn has the added advantage over yellow that human consumers of corn products still demand a white product.

Various yellow-red pigments have been termed collectively the "carotinoids". This group generally includes two types of pigments that are

similar in chemical composition. These types are carotins, or carotenes, and the xanthophylls. Of these two types, the carotenes are generally referred to as having importance in nutrition. It is yellow corn that contains carotene.

The controversy of yellow versus white corn for feeding purposes has existed for a long while. Previous to 1920, all corn was generally considered to be of equal nutritive value. Langworthy and Hunt (7) gave the analysis of corn presented in Table 1 in 1914.

Table 1. Composition of corn.

Kind of Material	Water	Protein	Fat	Carbo-hydrates	Crude Fibre	Minerals	Calories Per Pound
Corn, whole grain	10.8	10.0	4.3	71.7	1.7	1.5	1,795
Corn, white	11.4	10.8	5.0	68.8	2.5	1.5	1,690
Corn, yellow	11.9	10.7	4.8	68.9	2.2	1.5	1,690

Their conclusion was that "varieties of corn, on the average, are practically identical in composition, and differ very little in nutritive value."

Blackshaw (1) ran chemical analyses in 1923 on eight varieties of corn to determine any difference in the chemical composition of white and yellow corn. His data are given in Table 2.

Blackshaw's conclusion (1) varified the statement in Feeds and Feeding by Morrison (9) that,

> .....experience opposes the assertion often heard that yellow corn maize is more nutritious than white, or the opposite. While a certain strain or variety may be superior to any particular strain or variety in a given locality, there is no uniform difference between white and yellow maize in productiveness or feeding value.

Table 2. The chemical composition of white and yellow maize (in part).[1]

	Yellow Corn Varieties						White Corn Varieties	
	German Yellow	Red Cob Cango	Minn. 13	Chester County	Palins Cornflake	Natal Yellow	Salisbury White	Hickory King
Percentage composition								
Water	9.9	9.4	9.4	9.4	9.3	9.3	10.2	9.8
Oil	4.9	5.0	4.5	4.7	4.4	4.6	4.7	4.4
Crude protein	11.0	10.3	9.9	10.5	9.5	9.4	9.3	9.3
Carbohydrates								
Soluble	71.3	72.3	72.9	71.9	73.8	73.8	72.9	73.9
Fiber	1.5	1.6	1.8	2.0	1.7	1.5	1.5	1.4
Ash	1.4	1.4	1.5	1.5	1.3	1.4	1.4	1.2
True protein	10.6	9.7	9.5	10.2	9.2	8.8	9.0	8.8
Amount (in pounds) of digestible nutrients in 100 pounds dry matter								
True protein	8.7	7.9	7.7	8.4	7.5	7.2	7.4	7.2
Other protein	0.3	0.5	0.4	0.2	0.3	0.5	0.2	0.4

[1]Adapted from G. N. Blackshaw. Rodesia Agr. Jour. 20:457-460. Aug. 1923.

Morrison (9), p. 470, in his Feeds and Feeding, 1951, summarizes the present views concerning the nutritive value of yellow and white corn as follows:

> Yellow varieties of corn and varieties with yellow endosperm contain considerable carotene and also related compounds that have vitamin A value. Yellow corn is therefore an important source of vitamin A in stock feeding. However, it has much less vitamin A value than green forage or even well-cured hay. Part of the yellow color in yellow corn is due to xanthophyll, which has no vitamin A value. White corn or other corn with white endosperm has practically no vitamin A value.
>
> Whether or not yellow corn will have a higher value than white corn for stock feeding, will depend on whether the other feeds in the ration provide plenty of vitamin A value. In general white corn, is equal to yellow corn for all stock on green, actively-growing pasture and also for dairy cattle, beef cattle, sheep or horses which are fed a reasonable amount of good-quality hay or silage. For swine or poultry that are not on pasture, the difference in vitamin A value of yellow and white corn may make all the difference between profit and failure, unless care is taken to provide sufficient of the vitamin in other feeds.

Farmers generally show a preference for yellow corn. They grow white corn largely as a cash crop. Therefore, provided yield and agronomic characteristics are equal, the type of farming practiced will largely determine the color of corn one raises. Kernel characteristics are not of great concern to most farmers. The dry-corn miller is highly interested in kernel characteristics. The dry miller wants a wide, thick, and plump kernel with a large germ and with a high percentage of hard starch (Kehr, 6). The availability of improved white hybrid corn with the desired milling qualities becomes the work and responsibility of corn breeders.

Comparison of Production Methods

In order to grow white corn successfully, it is necessary to have the field free from contamination by corn of other colors. According to U. S. Federal Grain Standards (17), white corn may contain not more than two per

cent of corn of other colors. Pollen is indeed very delicate. Humidity, temperature and other factors determine the length of life of a given pollen grain. Topography combined with other factors determines the distance which pollen will travel and still maintain its vitality. Standards have been set up for the isolation necessary in the production of hybrid corn. Most crop improvement associations and commercial producers of seed corn require that a field producing the hybrid seed corn be isolated not less than 40 rods from corn of another kind or color. If a farmer wishes to sell white corn, his crop should be grown under isolated conditions or in a vicinity in which all the farmers grow white corn to the exclusion of corn of other colors. In general, the production and growing methods of white corn in a given locality are identical to that of corn of other colors.

In respect to other agronomic characteristics, such as drying, lodging, dropped ears, disease resistance, etc., white corn is at par with yellow corn. Endosperm color is genetic (Hays and Immer, 5). All desirable agronomic characteristics of yellow corn can be retained while breeding for white color corn.

Production Trends

Shepherd (12), 1942, pointed out that the demand for corn has decreased while the supply has increased. The demand has fallen because of a decrease in the number of horses, mules and cattle. The decreased demand does not mean that profits will be adversely affected. Production efficiency may actually offset the effects of lower prices and result in increased profits. New uses for corn and corn products will probably continue to keep corn the most important American crop.

The production of white corn in this country has decreased continually

since about 1920. Unfortunately, there is no comparable information available for a period of years concerning the percentage of total corn grown which is white. The percentage of white and yellow corn is believed not to have fluctuated greatly during the past ten years. Burkhead[1] has furnished the following information concerning the percentage of yellow and white corn grown in this country:

Table 3. Production of white corn, United States.

Year	Total production of white corn in millions bushels	White corn, per cent of total corn production
1917	1,183	41.0
1918	970	40.0
1942	484	15.5
1943	456	15.0
1944	453	14.0
1946	380	11.6

Burkhead further pointed out that white corn production in the United States centers in two areas. The South (Tennessee, Georgia, North Carolina, Alabama, Mississippi, Kentucky, and South Carolina listed in the order of importance) forms an area in which 55 per cent of all white corn in 1946 was grown. The Corn Belt (Illinois, Nebraska, South Dakota, Missouri, Minnesota and Kansas, listed in the order of importance) contributes 20 per cent of the total. Thus, these two areas produced three-fourths of the white corn grown in 1946.

In Kansas, production of white corn was reported in 1917 at 44 per cent of the total, equivalent to 52,373,000 bushels, and in 1918, at 45 per cent

[1]Personal correspondence with C. E. Burkhead, U. S. D. A., Bureau of Agricultural Economics, Washington, D. C., 1954.

of the total, equivalent to only 19,310,000 bushels. No survey was made again until the 1943 crop, when 22 per cent was white corn. In 1944 about 21 per cent was white. Another survey covering the 1946 crop showed only 15 per cent white corn in Kansas. Thus, the trend towards smaller proportion of white corn was about as marked as in the country as a whole.

Burkhead stated that because of the steady downward trend in the proportion of white corn, further surveys by the Crop Reporting Board were planned only on a periodic basis. But because of the necessity to retrench and reduce the work load, such periodic surveys never became opportune. From personal discussion with staff members, Department of Agronomy at Kansas State College, it was understood that recently the trend of white corn production was rising. No data, however, was available to support this view. Corn breeder at Kansas State College stated that currently more than half of the time, expenditure and attention was devoted to the development of adapted white corn hybrids.

Reasons for Decline of White Corn Production. Besides the two reasons mentioned, i.e. (a) higher feeding value of yellow corn and (b) yellow adapted hybrids being developed earlier than white hybrids, other reasons for the decrease in production of white corn in the past 30 to 35 years are:

(c) There are not enough local outlets for white corn. Many elevator operators are reluctant to pay premiums for white corn because of the small quantities received. It is often necessary to hold small lots of white corn until carload lots may be made up. This complicates the movement of other grains.

(d) By-products made from yellow corn are superior to the same product made from white corn. The vitamin A content of feeds made from yellow corn

makes them more worthwhile to feeders.

(e) Price differentials prevent the use of white corn by wet milling industry.

(f) Extra cost involved in sorting the kernels of white seed corn for purity reduces the amount of white corn produced.

(g) It is believed that white corn has higher moisture content at harvesting than yellow corn, thus has less storability.

Consequently, the white corn production in the United States decreased continually since 1920.

As mentioned, the percentage of white and yellow corn has not fluctuated greatly during the last 10 to 15 years. The main reasons are:

(a) Industrial users of white corn have continued to pay a premium. It is reported (6) that wet corn millers would like to use white corn in the manufacture of starch as it is superior to starch produced from other corn even after the starch has been chemically treated to make it white. However the present price differential prevents the use of white corn by the wet corn miller.

(b) The premium paid in the market for white corn has made it worthwhile for farmers to cooperate with each other to fulfill the conditions of crop improvement associations.

(c) It is also reported (6) that there is a general feeling in the South and in the southern edge of the corn belt that white corn open pollinated varieties outyield yellow open pollinated varieties. There are limited data to support this.

Source of Data

The yield data were obtained from Kansas Corn Tests, as reported by the Kansas Agricultural Experimental Station (Appendix II). The price data used in this study was obtained from the Kansas City Board of Trade Grain Market Review. The 'high' cash corn price for No. 2 white and No. 2 yellow on Wednesday of each week were used in the price comparisons made.

Limitations of Data

The validity of any generalizations drawn from the data depends on the representativeness of the sample. Experiments in the corn tests have shown that differences in yield may be expected between plots planted with the same kind of seed. These differences are called "experimental error" and must be taken into account when comparing the yields of the white and yellow hybrids. It is not possible to indicate the relative yielding ability of various corn hybrids with absolute accuracy. Dr. L. A. Tatum of the Department of Agronomy, Kansas State College, was consulted and his recommendations on the hybrids to include were followed. The hybrids selected in the yield study and calculations for each are listed in the Appendix II. The hybrids included were selected on the following criteria:

(a) Hybrids of similar physical characteristics.

(b) Hybrids that have been included in the Corn Performance Tests rather consistently for the period studied.

(c) Hybrids recommended to be grown in the area under consideration.

It was thought that the samples selected would give a satisfactory basis for comparison for the purpose of study and could be used as a basis for recommendation.

The limitations to the validity of the use of historical prices as a basis for prediction of the future prices must be recognized. The premium offered for white corn will continue to exist as long as special demand for it continues, provided yellow corn is not used as a substitute, and supply does not exceed demand at premium price.

It is rumored that a process has been developed (not published, being a trade secret) by which yellow corn can be used for white corn purposes. The cost of the operation is not definitely known, but if it is successfully perfected and is used on a large scale, the price spread now existing between white and yellow corn will probably become less or disappear. If a surplus of white corn develops, necessitating some of its being used for livestock feeding purposes, white corn will probably be priced below yellow corn as it was prior to 1934.

METHOD OF STUDY

Yield Relationship

Yield data on white and yellow corn hybrids or varieties for comparison were taken from Kansas Corn Tests from 1938 to 1953. Data calculation and statistical analysis used were done by the Statistical Laboratory, Kansas Agricultural Experiment Station. The state has been divided into districts for corn testing purposes as shown in Fig. 1. The comparisons have been made district-wise. To establish the relationship that existed between the acre yields of white and yellow corn graphic correlation method and the Bravais-Pearson coefficient method of correlation analysis were used.

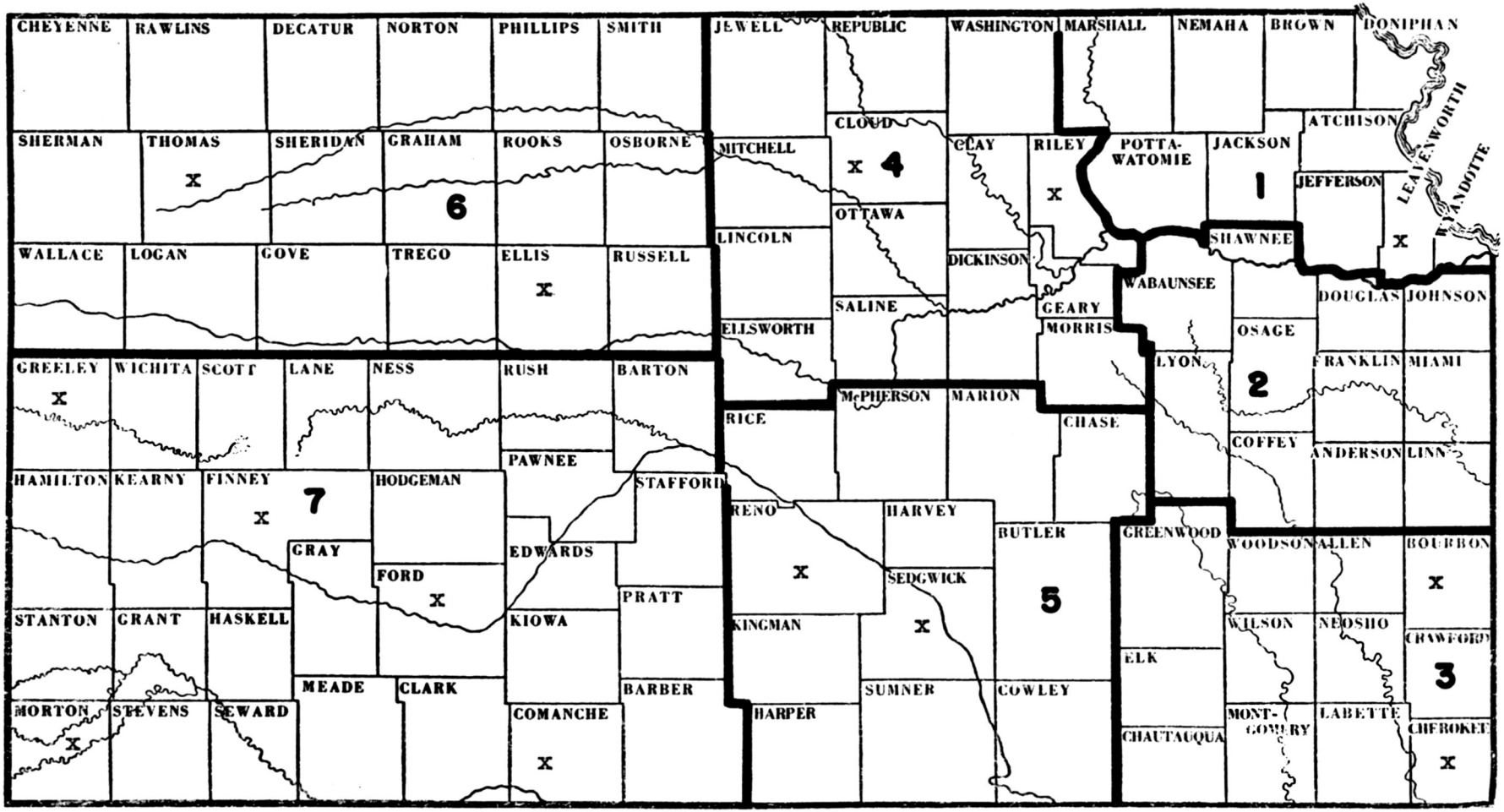

Fig. 1. Kansas corn testing program, indicating the districts and counties in which tests were planted.

Source: Kansas Corn Tests, 1950, Kansas Agr. Expt. Sta. Bull 377, Feb. 1951, p. 8.

Price Relationship

High cash prices of No. 2 white corn and No. 2 yellow corn on each Wednesday of the month from January 1921 to December 1953 were used to obtain the monthly average prices. The monthly prices so obtained were used to determine (a) the trend in prices, (b) the spread between white and yellow corn prices, (c) the seasonal variation in prices, (d) the percentage of times the average and the spread increased, decreased, or remained the same from the base month to the subsequent month, and were used in (e) the study of graphic correlation and the Bravis-Pearson coefficient method of correlation analysis in order to establish the relationship that existed between the various variables.

Seasonal Variation

Of the several methods available for determination of the seasonal price variation, the centered 13-month moving average method was used.[1] This method was preferred because it tended to remove the periodic movements since the moving average had the same number of months as the periodic movements that were sought to be eliminated.

Index of seasonal variation is a convenient way of showing the combined pattern of a large number of seasons. An average month is given an index of 100. Higher months then will have indexes that are greater than 100. Months in which the seasonal lows occur will have less than 100.

Not only is the average for the seasonal price movement important, but

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[1]For more detailed discussion see W. J. Krasiuk's M. S. Thesis (p. 5,6), Department of Economics and Sociology, Kansas State College, 1953.

also the extent to which the individual years conformed to the average seasonal price movement. As a measure of this confirmity an index of irregularity was computed for each month. This index of irregularity is the average deviation of the percentage of trend for particular months about the value of the index of average seasonal variation for that month.

Price Trends

A common way to begin study of an economic variable is to plot the date recording this variable as a time series. In order to eliminate the effects of rising price levels and study the trend, the prices of white and yellow corn were deflated using the U. S. D. A. index numbers[1] for prices received by farmers. Using these deflated prices, the trend in prices and the trend in spread were studied.

COMPARISON OF YIELD OF WHITE CORN AND YELLOW CORN HYBRIDS OR VARIETIES

It was not possible to determine the relative yielding ability of different hybrids with absolute accuracy. Small differences in yield do not mean one hybrid was superior to another. Experience has shown that differences in yield may be expected among plots planted with the same seed. Such differences called "experimental error" were taken into account while comparing the yields of white and yellow corn hybrids. A figure representing the estimated difference between varieties that is due to chance was calculated. Such a figure is called "significant difference" and is given in Tables 4, 5, and 6 along with acre yield of different hybrids or varieties.

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[1] Agricultural Prices, U.S.D.A., Agricultural Marketing Service, January 1954 to June 1954.

Table 4. Yield per acre of white and yellow corn hybrids in northeastern Kansas (District 1), 1938-1953.

Year	Yellow Hybrids					White Hybrids				Sig. Diff.
	U. S. 13	Kansas 1585	Kansas 1639	Kansas 1646	Av. Yield	U.S. 523 W Kansas 2299	Kansas 2234	Kansas 2275	Av. Yield	
1938					No results					
1939	81.87				81.87					
1940	60.88				60.88					
1941	61.96	51.97			57.0					
1942	61.2	74.9	69.7	63.4	67.3		77.0		77.0	10.3
1943	66.9	65.4			66.2		67.5	69.1	68.3	7.7
1944	49.1	58.6			53.9	53.8	57.0	55.2	55.3	5.7
1945	56.6	61.2		58.1	58.6	53.4	49.4	53.2	52.0	7.4
1946	76.0	65.3	68.9	59.6	67.4	74.0	65.2	76.6	71.9	8.9
1947	67.7	56.5	57.9	66.0	62.0	50.3	64.6	73.0	62.6	11.0
1948	106.9	101.7	101.8	104.9	103.8	113.6	102.1	116.6	110.8	9.2
1949	108.3	93.7	108.4	102.2	103.2	108.9	106.6	114.7	110.1	9.7
1950	110.0		108.6	107.4	108.6	98.6			98.6	8.0
1951	71.1	76.6	67.9		71.9	71.7			71.7	12.2
1952	63.5	42.7	52.2		52.8	51.7			51.7	10.7
1953					No results					

Source: Kansas Corn Tests, Kansas Agricultural Experiment Station Bulletins, (See Appendix II).

Table 5. Yield of white and yellow corn hybrids in southeastern Kansas (District 3), 1938-1953.

Year	Yellow Hybrids									White Hybrids				Sig. diff.
	U. S. 13	Kansas 1585	Kansas 1639	Kansas 1646	Kansas 1830	Funk G711	Keystone 222	Av. Yield	Kansas 2299	Kansas 2234	Kansas 2275	Av. Yield	
1938													
1939						No results							
1940	57.21							57.21					
1941	21.26	19.10						20.2					
1942	41.6	47.2		39.4				42.7		51.6		51.6	7.5
1943						No results							
1944	68.7	73.8				76.6		73.0	82.0	70.5	87.2	79.9	12.6
1945						No results							
1946	51.3	42.5	47.7	43.5		39.9		45.0	44.8	45.1	43.5	44.5	11.1
1947	74.3	71.9	69.7	75.2		78.6	81.0	75.1	74.7	66.6	73.7	71.7	10.7
1948	76.6	74.9	76.4	72.4		86.5	90.8	79.6	86.0	79.6	84.7	83.4	7.5
1949	92.8	86.9	86.0	87.9		103.9	93.4	91.8	95.8	86.2	98.8	93.6	10.4
1950	89.1	76.8	82.8	86.8		89.3	91.2	86.0	89.0	91.2		90.1	11.1
1951						No results							
1952	53.5	52.2	49.6		49.0	39.7	51.0	49.2	46.8	56.8		51.8	9.0
1953	62.2	62.9			75.8	71.1		68.0		65.7		65.7	7.8

Source: Kansas Corn Tests, Kansas Agricultural Experiment Station Bulletins, (See Appendix II).

Table 6. Yield of white and yellow corn hybrids in southcentral Kansas (District 5), 1938-1953.

Year	Yellow Hybrids							White Hybrids				Sig. Diff.
	U. S. 13	Kansas 1585	Kansas 1636	Kansas 1639	Funk G.721	Keystone 222	Av. Yield	U. S. 523 Kansas 2239	Kansas 2234	Kansas 2275	Av. Yield	
1938												
1939	10.65											
1940	28.48											
1941							No results					
1942							No results					
1943	28.5	19.3					23.9		27.7	26.1	26.9	7.8
1944	41.6	52.3			56.3		50.1	45.5	50.6	46.2	47.4	5.7
1945	68.5	71.4	60.8		80.0		70.2	74.5	72.1	68.0	71.5	8.1
1946	36.1	39.0	31.8	26.7	37.6		34.2	38.8	36.9	34.6	36.7	4.8
1947							No results					
1948	29.4	33.2	45.9	36.8	63.8		41.8	56.2	59.9	47.7	54.6	7.3
1949	70.2	76.8	72.2	67.3	83.0	78.2	74.2	89.5	80.5	88.7	86.2	12.5
1950							No results					
1951	52.9	63.8		63.0	73.5	59.8	62.6	68.5	80.9		74.7	16.9
1952							No results					
1953							No results					

Source: Kansas Corn Tests, Kansas Agricultural Experiment Station Bulletins, (See Appendix II).

Although the data indicated a slightly higher average yield for white corn hybrids compared to average yield of yellow corn hybrids studied in this investigation, the differences were not great enough to be significant.

In the bar graph Fig. 2, the average annual difference between the yields of white and yellow corn hybrids is shown for the three districts studied. The average yield of yellow hybrids each year was considered the base, so the graph shows the amount that white corn hybrids differed from the yellow corn hybrids. The computations are given in Table 7.

In Northeastern Kansas (District 1), the average yield of white hybrids was higher than the average yield of the yellow hybrids seven out of eleven years for which data were available on the hybrids selected for study.

In Southeastern Kansas (District 3), the average yield of white corn hybrids was above the average yield of yellow corn hybrids six out of nine years for which results on Corn Performance Tests in Kansas were available.

In South Central Kansas (District 5), results were not reported in 1941, 1942, 1947, 1950 and 1952 because of adverse weather conditions or some other reasons which made the trials unsuccessful. The computation of data for years in which the tests were successful indicated that the average of white corn hybrids exceeded the average of the yellow corn hybrids seven out of the eight years.

In Figs. 3, 4, and 5 for Districts 1, 3, and 5, respectively, yellow corn has been used as one of the variables and white corn as the other. By inspection, these figures revealed that a relationship existed between the two. The coefficients of correlation between the yields of two were $+.96$, $+.97$, and $+.96$ for Districts 1, 3, and 5, respectively, which were significant.

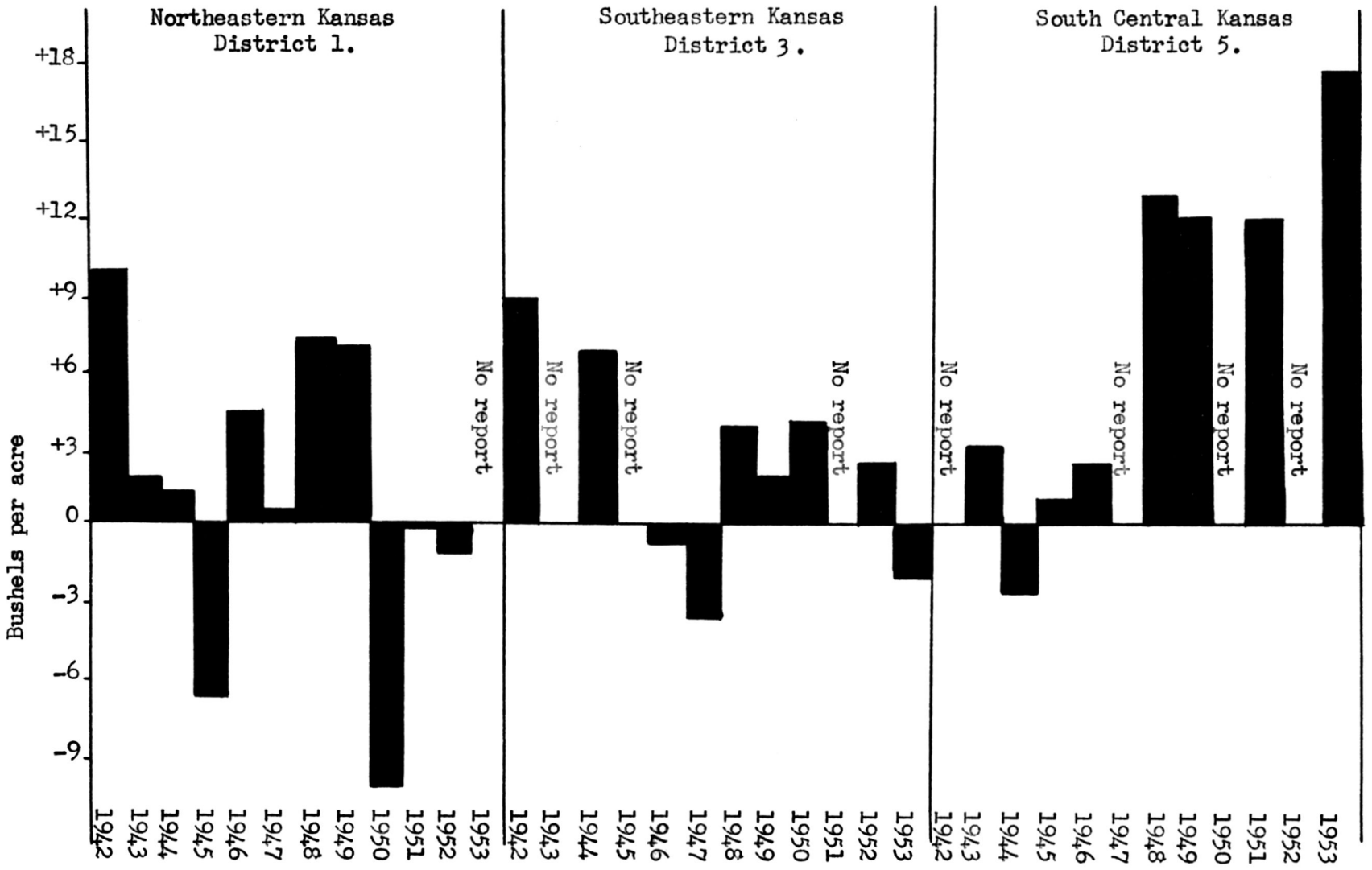

Fig. 2. Difference in yield of white and yellow corn (yellow as base) in Kansas, 1942-1953.

Table 7. Difference in yield of white and yellow corn in Kansas for Districts 1, 3, and 5, 1942-1953.

Year	District 1				District 3				District 5			
	Yellow Average	White Average	Actual Difference	Sig. Dif.	Yellow Average	White Average	Actual Difference	Sig. Dif.	Yellow Average	White Average	Actual Difference	Sig. Dif.
1942	67.3	77.0	± 9.7	10.3	42.7	51.6	± 8.9	7.5				
1943	66.2	68.3	± 2.1	7.7					23.9	26.9	± 3.0	7.8
1944	53.9	55.3	± 1.4	5.7	73.0	79.9	± 6.9	12.6	50.1	47.4	- 2.7	5.7
1945	58.6	52.0	- 6.6	7.4					70.2	71.5	± 1.3	8.1
1946	67.4	71.9	± 4.5	8.9	45.0	44.5	- 0.5	11.1	34.2	36.7	± 2.5	4.8
1947	62.0	62.6	± 0.6	11.0	75.1	71.7	- 3.4	10.7				
1948	103.8	110.8	± 7.0	9.2	79.6	83.4	± 3.8	7.5	41.8	54.6	±12.8	7.3
1949	103.2	110.1	± 6.9	9.7	91.8	93.6	± 1.8	10.4	74.2	86.2	±12.0	12.5
1950	108.6	98.6	-10.0	8.0	86.0	90.1	± 4.1	4.1				
1951	71.9	71.7	- 0.2	12.2					62.6	74.7	±12.1	16.9
1952	52.8	51.7	- 1.1	10.0	49.2	51.8	± 2.6	9.0				
1953				6.2	68.0	65.7	- 2.3	7.8	63.0	80.9	±17.9	16.9
Av.	70.56	75.45	± 4.89		67.82	70.26	± 2.44		52.88	59.86	± 6.98	

Source: Computed from basic data in Tables 4, 5, and 6.

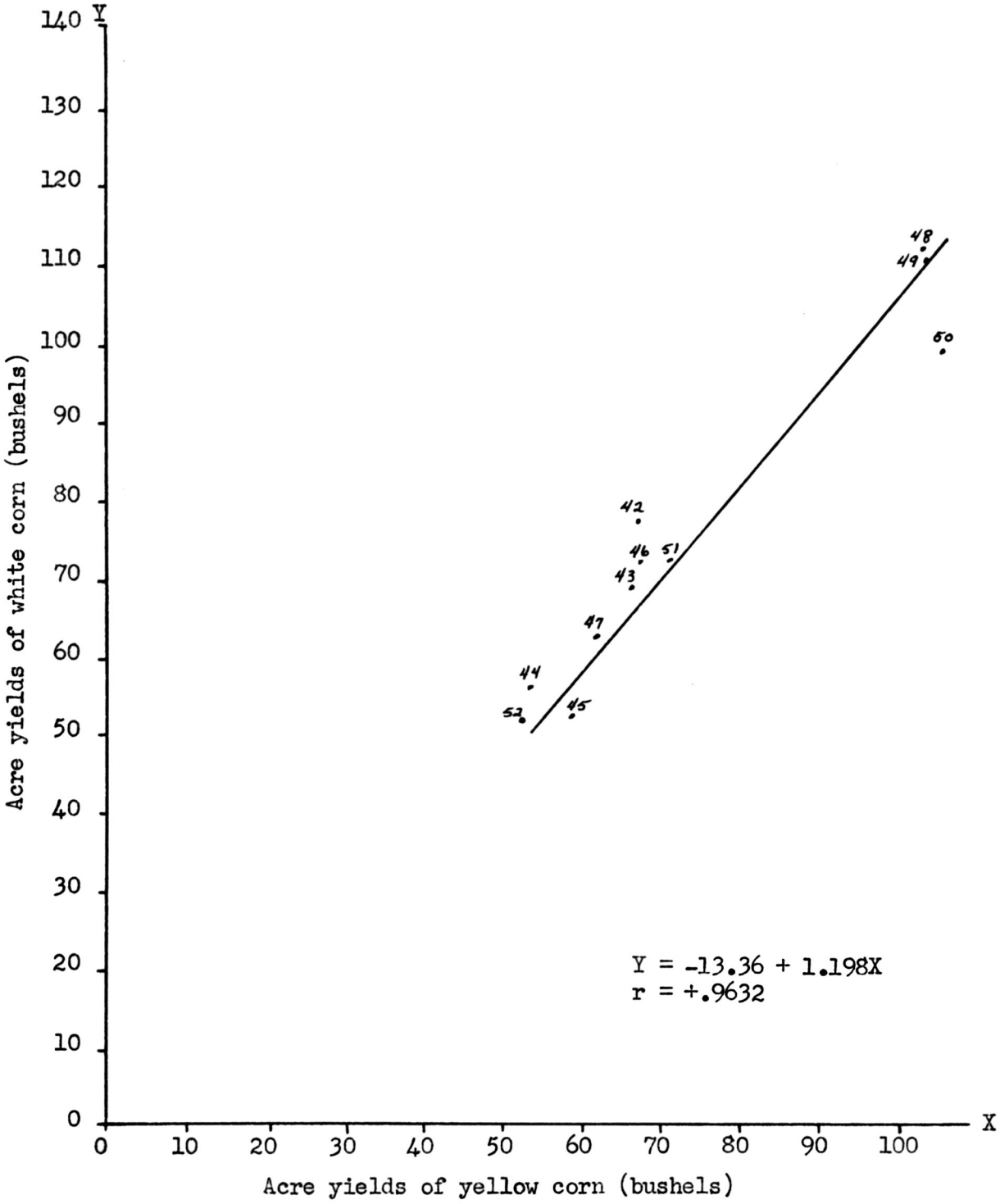

Fig. 3. Relationship between the acre yields of yellow and white corn, District 1, Northeastern Kansas, 1942-1952.

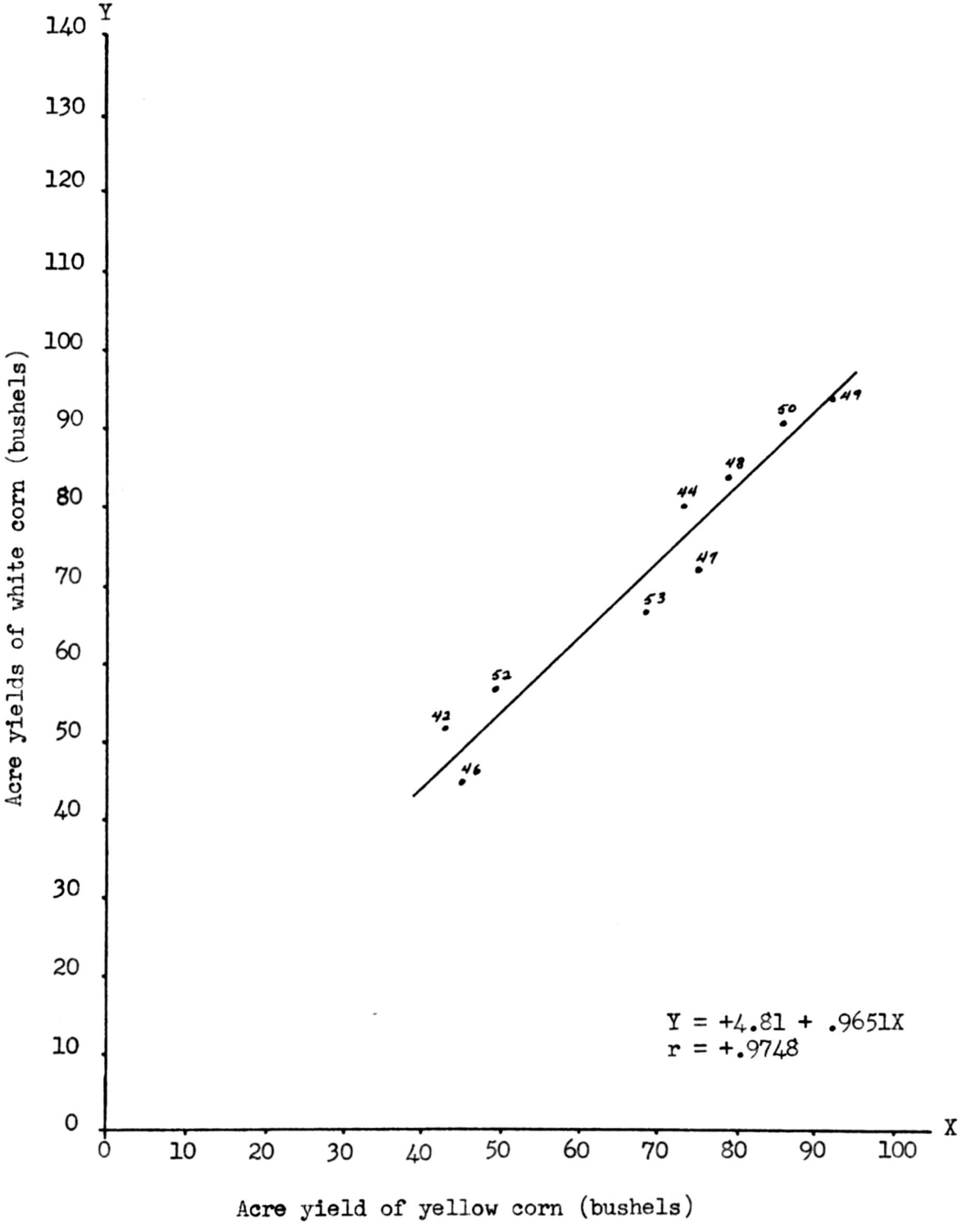

Fig. 4. Relationship between the acre yields of white and yellow corn in District 3, Southeastern Kansas, 1942-1953.

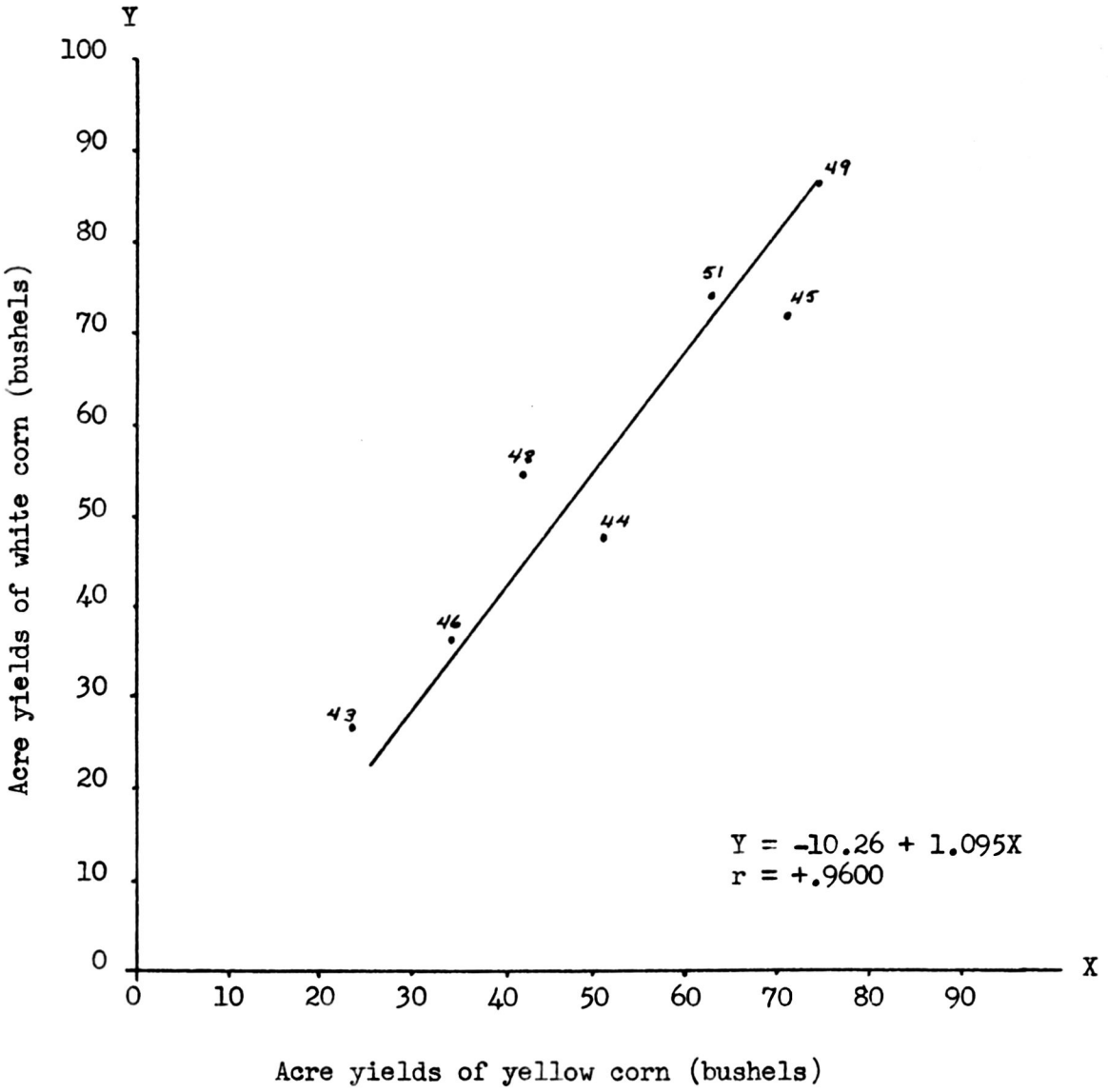

Fig. 5. Relationship between the acre yields of white and yellow corn in District 5, South Central Kansas, 1942-1953.

It may be summarized that white corn hybrids studied outyielded the yellow corn hybrids; but in general the yield differences were not great enough to be statistically significant. There were three instances in which significant differences occurred. The average yield of yellow corn hybrids exceeded the average yield of white corn hybrids by 10 bushels in 1950 in Northeastern Kansas (District 1) and a difference of 8 bushels was considered significant. In Southeastern Kansas (District 3), in 1942, the white corn hybrids averaged 8.9 bushels higher than yellow corn hybrids and a 7.5 difference was considered to be significant. In South Central Kansas (District 5), in 1948, the average yield of white corn hybrids was 12.8 bushels higher than the yield of yellow corn hybrids and a difference of 7.3 bushels was considered significant.

In view of the fact that the significant differences were small and that they occurred so seldom, and that the data available were limited, it may be stated that no safe conclusion can be drawn other than that the yields of two colors of corn are comparable.

COMPARISON OF WHITE AND YELLOW CORN PRICES

Spreads

Prior to 1934 yellow corn was generally priced above white corn on the cash market in Kansas City sometimes by as much as by five to eight cents per bushel. The yearly average prices, however, show some exceptions. In 1921, 1930 and 1931 white corn was priced higher than yellow corn by an average of $0.0012, $0.002, and $0.0021 respectively (Table 8). But this difference being less than $.01 per bushel may be considered negligible. The higher price for yellow corn during this period may be attributed to livestock

Table 8. Average yearly actual and deflated prices of white and yellow corn in Kansas City market, 1921-1954.

Year	Actual Prices			Index No.[1]	Deflated Prices		
	White	Yellow	Spread		White	Yellow	Spread
	Cents per bushel						
1921	53.09	52.97	∠00.12	124	42.90	42.7	∠ 0.20
1922	58.24	60.05	- 1.81	131	44.4	45.8	- 1.40
1923	82.43	82.44	- 0.01	142	58.00	58.00	0
1924	93.18	93.89	- 0.71	143	65.1	65.6	- .50
1925	101.51	103.28	- 1.77	156	65.0	66.2	- 1.20
1926	77.82	76.92	- 0.90	145	53.6	53.7	- .10
1927	86.86	88.00	- 1.14	140	62.0	62.8	- .80
1928	91.72	93.99	- 2.27	148	61.9	63.5	- 1.60
1929	91.24	92.54	- 1.30	148	61.6	62.5	- .90
1930	82.05	81.85	∠ 0.20	125	65.6	65.4	∠ .20
1931	50.79	50.58	∠ 0.21	87	58.3	58.1	∠ .20
1932	31.31	32.97	- 1.56	65	48.1	50.72	∠ 2.62
1933	40.10	39.24	∠ 0.86	70	57.2	58.44	- 1.24
1934	69.94	65.20	∠ 4.74	90	77.7	72.44	∠ 5.26
1935	89.07	85.69	∠ 3.38	109	81.7	78.61	∠ 3.09
1936	94.68	89.69	∠ 4.99	114	83.0	78.69	∠ 4.71
1937	111.34	107.50	∠ 3.84	122	91.2	88.11	∠ 3.09
1938	54.96	53.73	∠ 1.23	97	56.6	55.39	∠ 1.21
1939	55.00	51.99	∠ 3.01	95	57.8	54.73	∠ 3.07
1940	66.68	63.90	∠ 2.78	100	66.68	63.90	∠ 1.78
1941	71.94	68.13	∠ 3.81	124	58.00	54.94	∠ 3.06
1942	95.62	82.44	∠13.18	159	60.1	51.85	∠ 8.15
1943	116.20	102.50	∠13.70	193	60.2	53.11	∠ 6.09
1944	128.74	114.60	∠14.14	197	65.3	58.17	∠ 7.13
1945	127.40	114.7	∠12.70	207	61.5	55.41	∠ 6.09
1946	178.48	149.5	∠28.98	236	75.6	63.35	∠12.25
1947	229.51	205.3	∠24.21	276	83.1	74.38	∠ 8.72
1948	232.94	204.1	∠28.84	287	81.1	71.11	∠ 9.99
1949	149.05	133.4	∠15.65	250	59.6	53.36	∠ 6.24
1950	184.00	144.6	∠39.40	258	71.3	56.05	∠15.25
1951	199.69	178.3	∠21.39	302	66.1	59.04	∠ 7.06
1952	221.61	183.2	∠38.41	288	76.9	63.61	∠13.29
1953	208.66	159.3	∠49.36	258	80.8	61.74	∠19.06

[1]Index number of prices received by farmers, United States.

Sources: Kansas City Board of Trade, Grain Market Review.
Agricultural Prices, U.S.D.A., Agricultural Marketing Service, January 1954 to June 1954.

feeders' preference to feed yellow corn; because vitamin A activity in carotene was discovered in the 1920's (Moore, 8).

During March 1933 white corn was priced higher than yellow corn by an average of $0.006 per bushel and by 0.0137 per bushel in April and September respectively, and by $0.082 for the yearly average.

The price relationship reversal continued in 1934 when white corn was priced higher than yellow corn by an average of $0.007 per bushel in January to $0.0683 per bushel in December. From January 1934 to December 1953 white corn was nearly always priced higher than yellow corn by a monthly average of from $0.0006 per bushel in January 1939 to $0.91 per bushel in August 1952. During the 20 year period, 1934-1953, yellow corn has been priced higher only twice, i.e., in August 1935 by an average of $0.006 per bushel and in November 1936 by an average of $0.005 per bushel. The average price of white and yellow corn was equal in February 1939.

Seasonal Movement of Prices

Spread: Seasonal price movements refer to ups and downs that regularly occur during certain seasons of the year. The absolute price spread between the prices of white and yellow corn varies during the year. To determine an average variation in terms of absolute magnitude of the variables, one of the simplest methods was to average the various months for the period January 1934 to December 1953. It was found that a higher premium was paid for white corn during the months of July, August, and September. Figures 6 and 7 show the seasonal relationship graphically. The data and calculation are given in Table 9.

The seasonal movements of spread for the period 1934-53 were character-

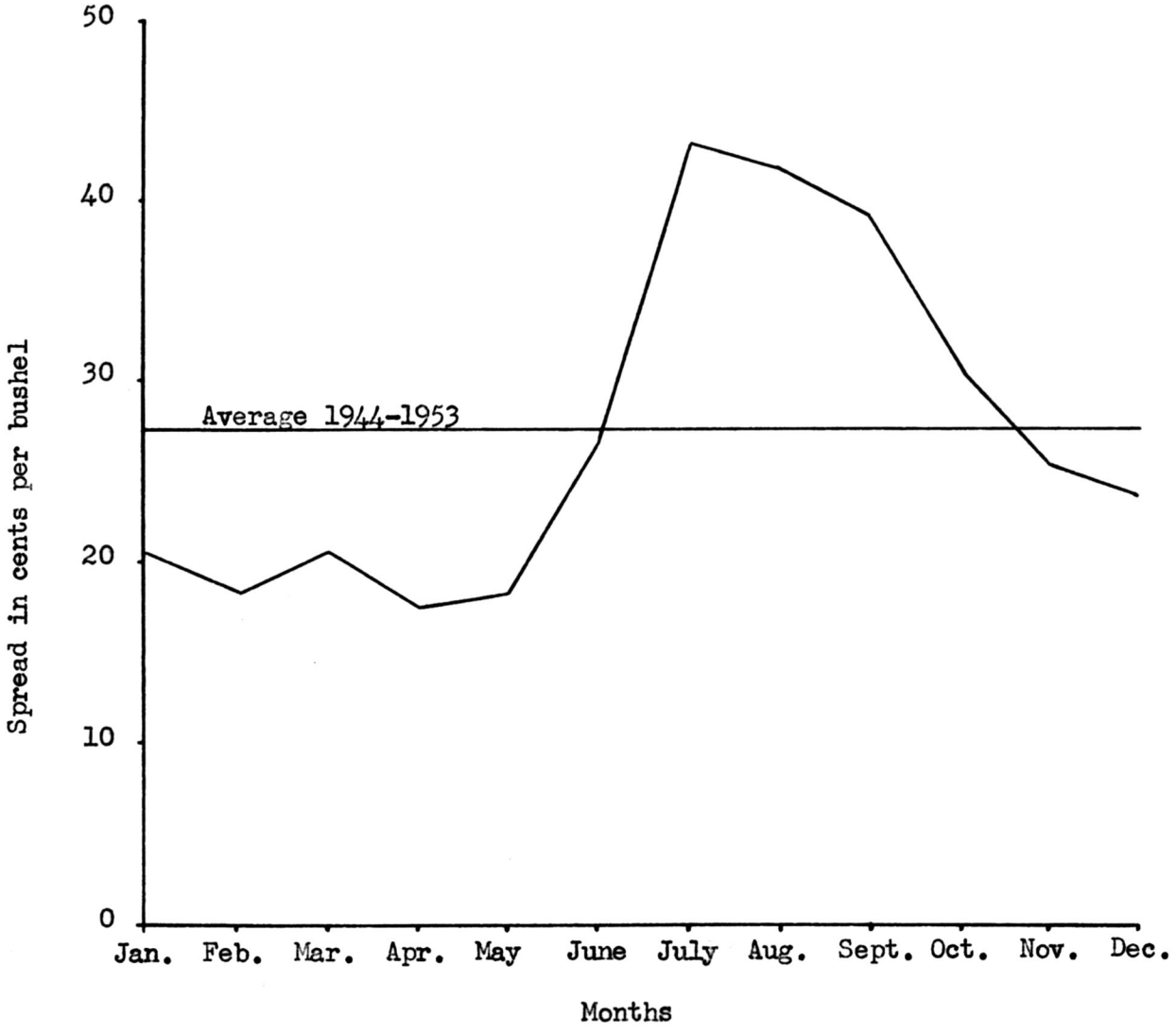

Fig. 6. Average monthly corn price spread, yellow as base, Kansas City, 1944-1953.

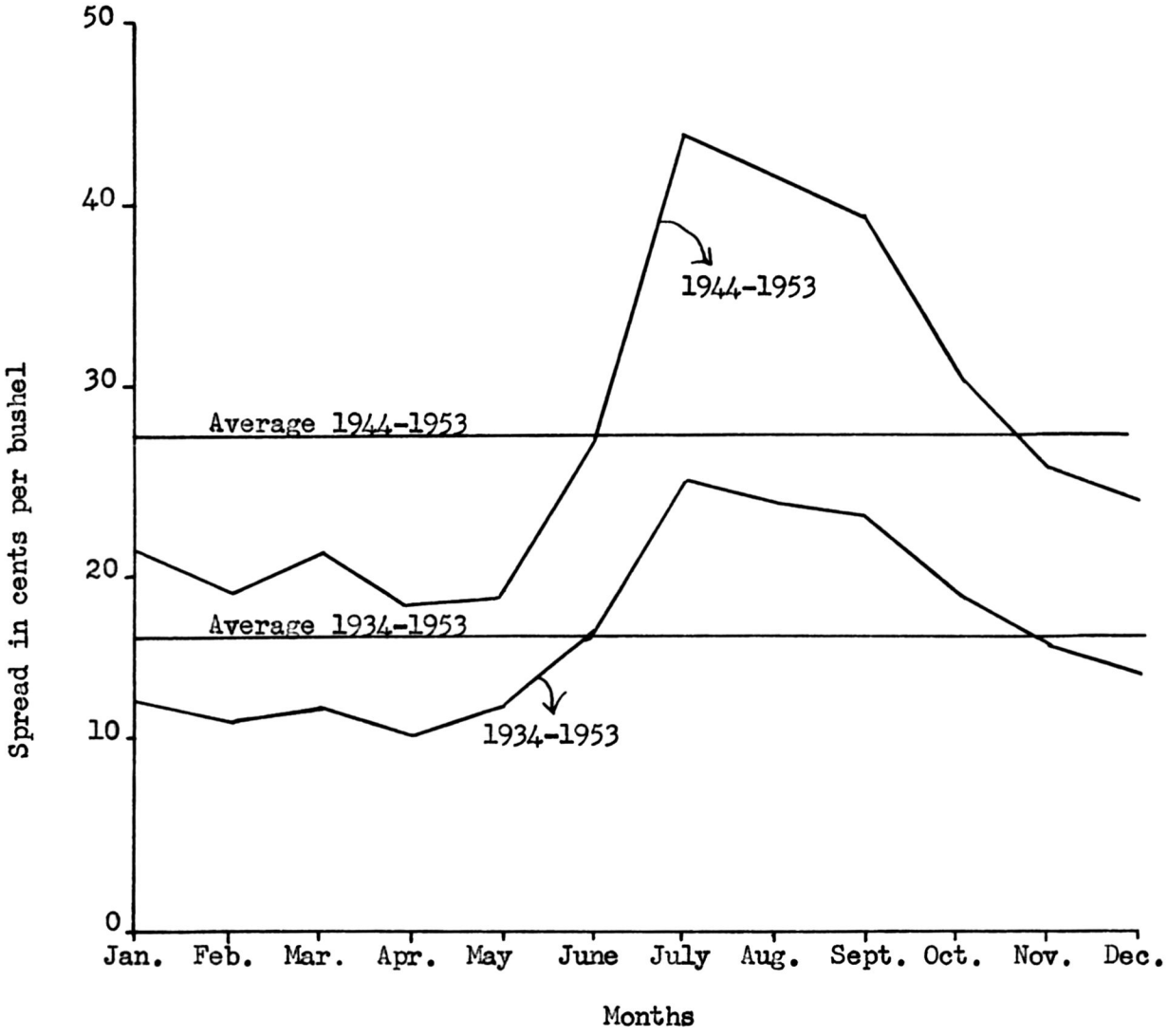

Fig. 7. Average monthly corn price spreads, yellow as base, Kansas City, 1944-1953 and 1934-1953.

Table 9. Average monthly corn price spread between number 2 white and number 2 yellow corn (Yellow as base), Wednesday high price, Kansas City, 1933-53.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly Average	Per cent Spread
						Cents per bushel								
1933	-0.06	-0.06	0.06	1.37	1.25	0.56	1.31	1.00	1.37	1.25	1.30	0.50	0.82	2.2%
1934	0.70	1.00	0.83	1.75	2.50	3.25	2.67	2.40	4.25	5.50	5.75	6.83	3.12	4.6
1935	6.70	6.10	6.00	3.10	3.35	2.20	0.70	-0.60	0.25	1.50	5.25	7.25	3.46	4.7
1936	6.80	4.75	2.25	1.70	6.25	7.75	9.80	10.62	8.25	1.87	-0.50	1.60	5.10	5.6
1937	3.75	1.37	0.40	3.50	5.56	8.40	7.12	0.87	3.10	5.37	3.12	2.75	3.76	3.7
1938	2.38	2.69	2.70	2.19	1.25	2.60	2.81	0.50	0.75	1.25	1.30	0.87	1.77	3.7
1939	0.06	0.00	0.95	1.56	3.25	4.44	5.56	6.50	9.75	7.38	5.65	2.63	3.98	7.7
1940	2.25	1.75	3.60	2.19	2.35	4.63	4.70	2.00	3.00	4.00	2.10	1.63	2.85	4.7
1941	1.25	1.00	0.75	1.10	3.06	6.75	10.20	5.63	3.75	4.10	4.38	3.10	3.76	5.9
1942	5.25	8.81	9.60	9.38	8.12	9.30	13.63	14.19	20.30	23.56	20.38	15.90	13.20	15.7
1943	14.25	13.75	14.40	11.25	10.00	10.25	10.25	10.25	10.25	10.25	10.25	14.00	11.60	16.5
1944	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	19.00	15.00	15.33	13.4
1945	13.50	10.90	11.00	5.20	6.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.59	13.9
1946	15.00	15.00	15.00	15.00	15.00	15.00	25.00	36.70	56.70	59.60	50.20	26.70	28.84	19.3
1947	20.90	16.90	13.70	5.00	9.10	14.70	52.90	53.10	36.00	37.00	22.00	14.00	24.61	12.2
1948	14.70	17.00	36.60	25.80	23.20	30.50	66.00	40.00	32.80	21.00	19.50	15.40	28.54	14.2
1949	11.20	12.50	11.30	8.70	8.00	13.10	25.10	19.10	16.70	24.60	24.10	15.00	15.78	11.9
1950	14.60	13.10	16.70	18.40	25.90	36.00	77.50	71.70	95.40	44.20	25.70	31.40	39.22	26.9
1951	21.50	18.40	22.40	16.70	13.50	18.70	20.10	29.20	22.50	26.40	19.40	28.20	21.42	11.7
1952	22.40	8.20	10.60	17.70	14.10	23.20	47.20	90.90	81.70	41.80	37.90	51.90	37.30	20.2
1953	58.40	58.80	54.80	51.10	54.30	87.10	87.50	48.70	21.30	21.10	20.70	25.70	49.13	30.8
20 yr. Av.														
1934-53	12.53	11.35	12.43	10.82	11.49	16.39	24.94	23.59	22.83	18.52	15.58	14.47		
10 yr. Av.														
1944-53	20.72	18.58	20.71	17.86	18.40	26.83	43.13	41.94	39.10	30.57	25.35	23.83		

Source: Kansas City Board of Trade, Grain Market Review.

ized by violent fluctuations. The index of seasonal variation reached its low of 67.06 in April and then rose to a high of 146.6 in July and then declined almost regularly (Table 10 and Fig. 8). The range of the movement of spread between the price of white and yellow corn was 79.6, while the index of irregularity was 36.6. A count was made of the actual number of times that the average monthly spread was high or low for a particular year. The results are given in Table 10.

No definite reasons for this violent variation can be assigned. But it may be stated that like most other agricultural produce markets, it is subject to somewhat erratic and unpredictable price movements. Another probable reason may be that dry millers do not store enough white corn for their requirements. In the months of June, July, August, and September they sometimes offer higher premiums to secure supplies of white corn.

Prices: In planning their production and marketing the farmers have to make estimates of future prices. One of the most important and common decisions of this type is to determine the most profitable season of the year to sell their corn. Both white and yellow corn prices fluctuate with a fair degree of regularity from one season of the year to another. Price movement in the past may be used as a guide to prospective changes in prices. Tables 11 to 13 indicate the percentage of times prices of white corn have been higher, lower or have remained the same after a given month for a period of 20 years, i.e., from 1935-1954. Similar information is presented on yellow corn and the spread between Number 2 white corn and Number 2 yellow corn in Tables 14 to 19. These tables may be used as follows.

If the price change in white corn from March to April is being studied, first find the base month, March, in the first column of Table 11. Then

Table 10. Average seasonal movement of spread between white and yellow corn prices (Yellow as base), Kansas City, 1934-53.

Month	Seasonal Variation		Times high or low		Monthly Movement[1]	
	Index of seasonal variation	Index of Irregularity	Times month is high of year	Times month is low of year	Times up from preceding month	Times down from preceding month
January	80.64	29.4	3	17	6	14
February	70.38	32.8	4	16	6	12
March	77.75	34.3	6	14	8	10
April	67.06	24.4	2	18	5	13
May	78.73	32.2	3	17	11	7
June	113.39	42.6	9	11	17	1
July	146.63	53.8	13	7	14	3
August	122.15	45.1	11	9	7	10
September	127.41	43.7	12	8	10	7
October	119.67	37.1	12	8	11	6
November	103.83	31.5	8	12	5	13
December	92.27	32.5	6	14	8	11
Total or Average	100.00	36.6	89	151	108	107

[1] No entry for months of no change from preceding month.

Source: Computed from basic data which were taken from the Kansas City Board of Trade Grain Market Review.

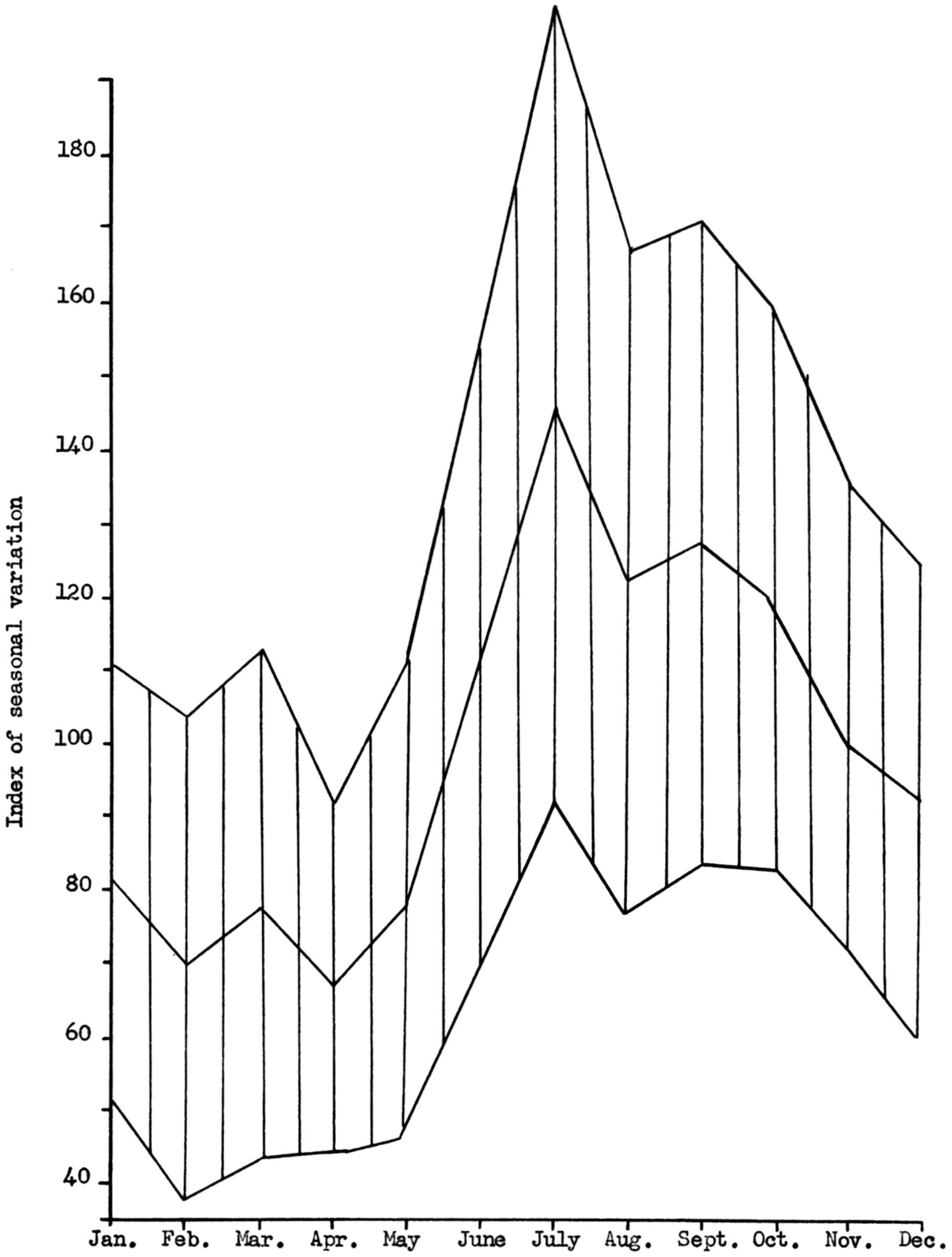

Fig. 8. Index of average seasonal variation of price spread between white and yellow corn, Kansas City, 1934-1953.

Table 11. No. 2 White Corn, Kansas City, Monthly Average of Wednesday "High" Prices, 1935-1954
Per cent of Times the Average Increased from Base Month to Subsequent Month.

Base Month	Subsequent Month																					
	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
January	20	42	47	47	63	79	63	63	58	58	53	58											
February		68	63	68	74	89	68	68	68	63	58	63	58										
March			42	63	68	84	58	58	58	47	58	58	58	61									
April				63	68	79	63	53	53	47	58	58	58	61	56								
May					79	74	53	58	58	47	58	58	58	67	67	72							
June						68	47	53	42	42	58	53	53	61	61	67	78						
July							32	37	32	26	37	37	26	44	39	50	61	78					
August								26	16	16	26	32	21	33	44	56	61	72	67				
September									16	11	21	32	26	39	44	56	61	72	61	61			
October										32	58	53	37	50	56	61	72	94	78	72	72		
November											63	63	47	56	67	61	78	94	78	72	72	67	
December												63	53	56	56	61	78	89	72	72	67	67	67

Table 12. No. 2 White Corn, Kansas City, Monthly Average of Wednesday "High" Prices, 1935-1954
Per cent of Times the Average Decreased from Base Month to Subsequent Month.

Base Month	Subsequent Month																						
	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
January	70	53	47	47	32	16	32	32	37	42	42	42											
February		26	32	26	21	5	26	26	26	37	37	37	42										
March			42	26	21	5	32	32	32	47	37	42	42	39									
April				26	21	11	26	37	37	47	37	42	42	39	39								
May					11	16	37	32	32	47	37	42	42	33	33	28							
June						21	42	37	47	53	37	47	47	39	39	33	22						
July							53	47	53	63	53	58	68	56	61	50	39	22					
August								58	68	74	63	63	74	67	56	44	39	28	33				
September									68	79	68	63	68	61	56	44	39	28	39	39			
October										53	32	42	58	50	44	33	28	6	22	28	28		
November											32	32	47	44	33	39	22	6	22	28	28	33	
December												32	42	44	44	39	22	11	28	28	33	33	33

Table 13. No. 2 White Corn, Kansas City, Monthly Average of Wednesday "High" Prices, 1935-1954
Per cent of Times the Average Remained the Same from Base Month to Subsequent Month.

Base Month	Subsequent Month																							
	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
January	10	5	5	5	5	5	5	5	5	0	5	0											
February		5	5	5	5	5	5	5	5	0	5	0	0										
March			16	11	11	11	11	11	11	5	5	0	0	0									
April				11	11	11	11	11	11	5	5	0	0	0	6								
May					11	11	11	11	11	5	5	0	0	0	0	0							
June						11	11	11	11	5	5	0	0	0	0	0	0						
July							16	16	16	11	11	5	5	0	0	0	0	0					
August								16	16	11	11	5	5	0	0	0	0	0	0				
September									16	11	11	5	5	0	0	0	0	0	0	0			
October										16	11	5	5	0	0	6	0	0	0	0	0		
November											5	5	5	0	0	0	0	0	0	0	0	0	
December												5	5	0	0	0	0	0	0	0	0	0	0

Table 14. No. 2 Yellow Corn, Kansas City, Monthly Average of Wednesday "High" Prices, 1935-1954
Per cent of Times the Average Increased from Base Month to Subsequent Month.

Base Month	Subsequent Month																					
	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
January	40	58	63	63	58	68	58	63	53	53	53	58											
February		68	68	74	74	63	53	58	53	58	58	58	58										
March			63	63	47	68	58	58	47	42	47	53	53	67									
April				68	68	68	63	63	47	47	53	53	58	61	67								
May					21	47	37	32	26	37	53	47	58	61	67	72							
June						53	37	42	37	42	47	47	53	61	67	72	72						
July							21	26	21	26	42	42	47	56	50	67	67	67					
August								21	16	32	37	42	42	61	56	72	78	67	67				
September									11	21	37	37	42	56	61	61	67	72	67	72			
October										42	58	58	58	61	67	67	72	78	72	72	67		
November											74	79	58	78	78	78	72	89	72	72	67	67	
December												63	63	67	78	78	72	78	67	72	67	61	67

Table 15. No. 2 Yellow Corn, Kansas City, Monthly Average of Wednesday "High" Prices, 1935-1954
Per cent of Times the Average Decreased from Base Month to Subsequent Month.

Base Month	Subsequent Month																						
	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
January	50	37	32	32	37	26	37	32	42	47	42	37											
February		26	21	21	21	26	42	37	42	42	37	37	42										
March			26	32	47	21	32	32	42	53	42	37	42	33									
April				26	26	21	32	32	47	53	42	42	42	39	33								
May					74	47	58	58	68	63	42	47	37	39	33	28							
June						37	53	47	53	53	47	47	47	39	33	28	28						
July							63	58	63	63	47	47	47	44	50	33	33	33					
August								63	68	58	53	47	53	39	44	28	22	33	33				
September									74	68	53	53	53	44	39	39	33	28	33	28			
October										47	32	32	37	39	33	33	28	22	28	28	33		
November											21	16	37	22	22	22	28	11	28	28	33	33	
December												26	32	33	22	22	28	22	33	28	33	39	33

Table 16. No. 2 Yellow Corn, Kansas City, Monthly Average of Wednesday "High" Prices, 1935-1954
Per cent of Times the Average Remained the Same from Base Month to Subsequent Month.

Base Month	Subsequent Month																						
	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
January	10	5	5	5	5	5	5	5	5	0	5	5											
February		5	11	5	5	11	5	5	5	0	5	5	0										
March			11	5	5	11	11	11	11	5	11	11	5	0									
April				5	5	11	5	5	5	0	5	5	0	0	0								
May					5	5	5	11	5	0	5	5	0	0	0	0							
June						11	11	11	11	5	5	5	0	0	0	0	0						
July							16	16	16	11	11	11	5	0	0	0	0	0					
August								16	16	11	11	11	5	0	0	0	0	0	0				
September									16	11	11	11	5	0	0	0	0	0	0	0			
October										11	11	11	5	0	0	0	0	0	0	0	0		
November											5	5	5	0	0	0	0	0	0	0	0	0	
December												11	5	0	0	0	0	0	0	0	0	0	0

Table 17. Spread between No. 2 White Corn and No. 2 Yellow Corn, Kansas City, 1939-1954
Average of Wednesday Top Prices (Yellow as Base)
Per cent of Times Spread Increased from Base Month to Subsequent Month

Base Month	Subsequent Month																						
	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
January	25	53	27	40	67	80	73	80	80	73	67	67											
February		60	47	40	73	87	80	80	80	87	67	67	67										
March			27	27	60	80	73	67	73	67	67	67	67	64									
April				47	73	87	73	80	73	73	73	73	60	64	64								
May					87	93	80	87	80	73	67	60	53	57	57	64							
June						80	60	60	53	53	40	40	40	43	43	43	64						
July							40	40	27	27	33	27	20	21	14	21	36	64					
August								33	33	33	13	13	13	21	14	29	29	57	50				
September									47	27	20	20	13	21	21	29	43	57	50	43			
October										13	27	27	20	21	21	29	36	64	57	36	50		
November											33	33	20	29	29	43	50	71	71	50	57	50	
December												33	27	43	29	43	50	79	64	71	71	57	50

Table 18. Spread between No. 2 White Corn and No. 2 Yellow Corn, Kansas City, 1939-1954
Average of Wednesday Top Prices (Yellow as Base)
Per cent of Times Spread Decreased from Base Month to Subsequent Month

Base Month	Subsequent Month																					
	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
January	57	33	60	47	20	13	20	13	13	27	27	33											
February		27	40	47	13	7	13	13	13	13	27	33	33										
March			60	60	27	13	20	27	20	33	27	27	33	36									
April				40	13	7	20	13	20	27	20	27	33	36	36								
May					0	0	13	7	13	27	27	40	47	43	43	36							
June						0	20	20	27	33	47	47	47	50	50	50	21						
July							40	40	53	60	53	67	73	71	79	71	50	29					
August								47	47	53	73	80	80	71	79	64	57	36	43				
September									33	60	67	73	80	64	71	64	43	36	43	50			
October										73	60	67	73	71	71	64	50	29	36	57	43		
November											60	60	73	64	64	50	43	29	29	50	43	50	
December												60	67	50	64	50	36	14	29	21	21	36	43

Table 19. Spread between No. 2 White Corn and No. 2 Yellow Corn, Kansas City, 1939-1954
Average of Wednesday Top Prices (Yellow as Base)
Per cent of Times There was No Change in Spread from Base Month to Subsequent Month

Base Month	Subsequent Month																							
	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	
January	12	13	13	13	13	7	7	7	7	0	7	0												
February		13	13	13	13	7	7	7	7	0	7	0	0											
March			13	13	13	7	7	7	7	0	7	7	0	0										
April				13	13	7	7	7	7	0	7	0	7	0	0									
May					13	7	7	7	7	0	7	0	0	0	0	0								
June						20	20	20	20	13	13	13	13	7	7	7	14							
July							20	20	20	13	13	7	7	7	7	7	14	7						
August								20	20	13	13	7	7	7	7	7	14	7	7					
September									20	13	13	7	7	14	7	7	14	7	7	7				
October										13	13	7	7	7	7	7	14	7	7	7	7			
November											7	7	7	7	7	7	7	0	0	0	0	0		
December												7	7	7	7	7	14	7	7	7	7	7	7	

read over to the April column on the same line. This figure is 42. This means that in 42 per cent or a little less than half of 20 years studied, white corn prices were higher in April than in March. This, of course, does not mean that prices will definitely behave the same way in the future. Many other factors have to be considered. The seasonal movement of average prices of white and yellow corn received by farmers for the period 1934 to 1953 was characterized by a rather significant fluctuation. The index of seasonal variation of white corn reached as low as 93.5 in February and then rose to a high of 109.3 in July. Yellow corn reached its minimum of 96.0 in February and then rose to its high of 104.7 in July and subsequently gradually declined to the February low. (Table 20 and Fig. 9)

The range of seasonal price variation was 16.9 for white corn and 8.64 for the yellow corn. The index of irregularity was 7, 6, and 7.2 respectively. The results of the count made of the actual number of times that the average monthly prices of white and yellow corn received by farmers was high or low for a particular year are given in Table 20.

Price Trends

Trend of Spread Between Actual Prices. Since 1934, there appears to be a definite rising trend on the Kansas City market in price spreads between the two. In Table 9 is given the yearly average of the spread in cents, yellow corn as base, from 1933 to 1953. Figure 10 shows this trend graphically.

In Table 9 is the percentage of spread (yellow corn as base) from 1933 to 1953. Figure 11 shows this information graphically.

Trend of Spread Between the Deflated Prices. In Table 8 is given the spread after deflating the yearly average prices of white and yellow corn.

Table 20. Average seasonal movement of white and yellow corn, Kansas City, 1921-1953, and 1934-1953.

Month	Index of seasonal variation				Index of irregularity				Times high or low							
	White Corn		Yellow Corn		White Corn		Yellow Corn		High				Low			
									White Corn		Yellow Corn		White Corn		Yellow Corn	
	1921-1953	1934-1953	1921-1953	1934-1953	1921-1953	1934-1953	1921-1953	1934-1953	1921-1953	1934-1953	1921-1953	1934-1953	1921-1953	1934-1953	1921-1953	1934-1953
January	96.27	97.36	96.36	99.12	7.2	8.8	8.1	8.5	12	7	12	9	21	13	21	11
February	93.65	93.50	94.87	96.01	6.3	6.2	6.4	5.9	10	5	9	5	23	15	24	15
March	96.46	95.92	95.95	97.31	5.9	4.9	5.8	4.7	12	7	13	9	21	13	20	11
April	96.74	97.16	100.0	100.35	6.5	7.1	7.3	5.6	11	7	13	8	22	13	20	12
May	101.48	100.77	101.58	102.23	10.2	10.5	6.1	5.2	15	8	20	12	18	12	13	8
June	102.51	101.95	102.49	101.68	6.1	6.2	4.9	4.3	19	12	22	14	14	8	11	6
July	110.00	109.28	111.15	104.65	7.7	9.6	8.7	10.4	27	17	30	18	6	3	3	2
August	107.31	106.93	105.69	104.58	8.4	8.7	7.2	7.0	22	14	20	14	11	6	13	6
September	106.33	107.22	104.68	104.16	7.8	9.0	6.3	6.7	20	13	19	12	13	7	14	8
October	99.62	98.31	97.84	96.64	7.0	6.5	9.8	10.6	19	11	13	8	14	9	20	12
November	98.32	95.15	96.53	96.39	6.6	6.6	7.1	7.1	14	8	15	10	19	12	18	10
December	92.33	96.46	95.69	96.82	7.5	7.5	7.5	7.5	14	9	11	10	19	11	22	10
Average or Total	100.00	100.00	100.2	100.00	7.3	7.6	7.1	7.2	195	118	197	129	201	122	199	110

Source: Compiled from basic data which were taken from the Kansas City Board of Trade Grain Market Review.

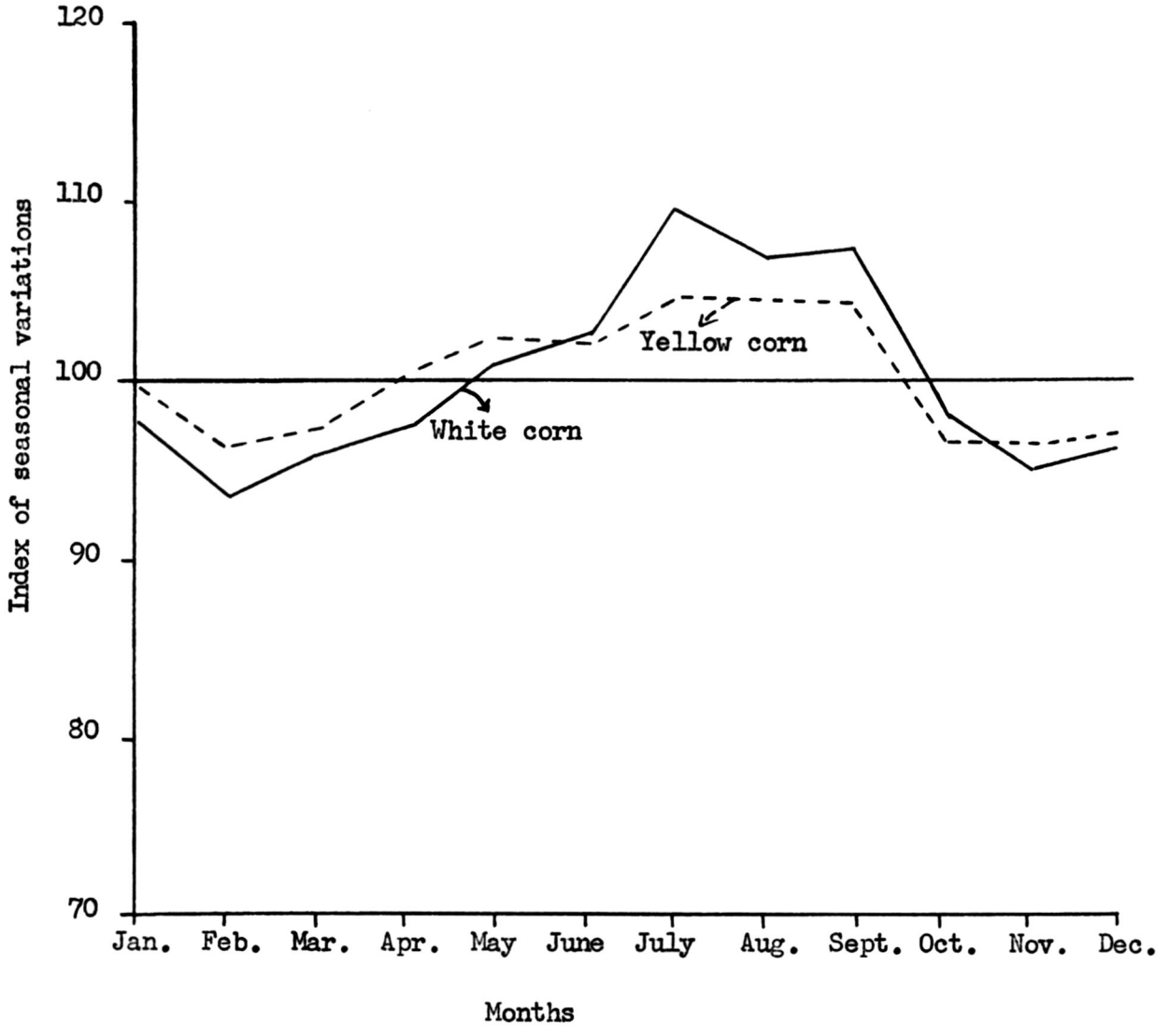

Fig. 9. Index of average seasonal variation of prices for white and yellow corn, Kansas City, 1934-1953.

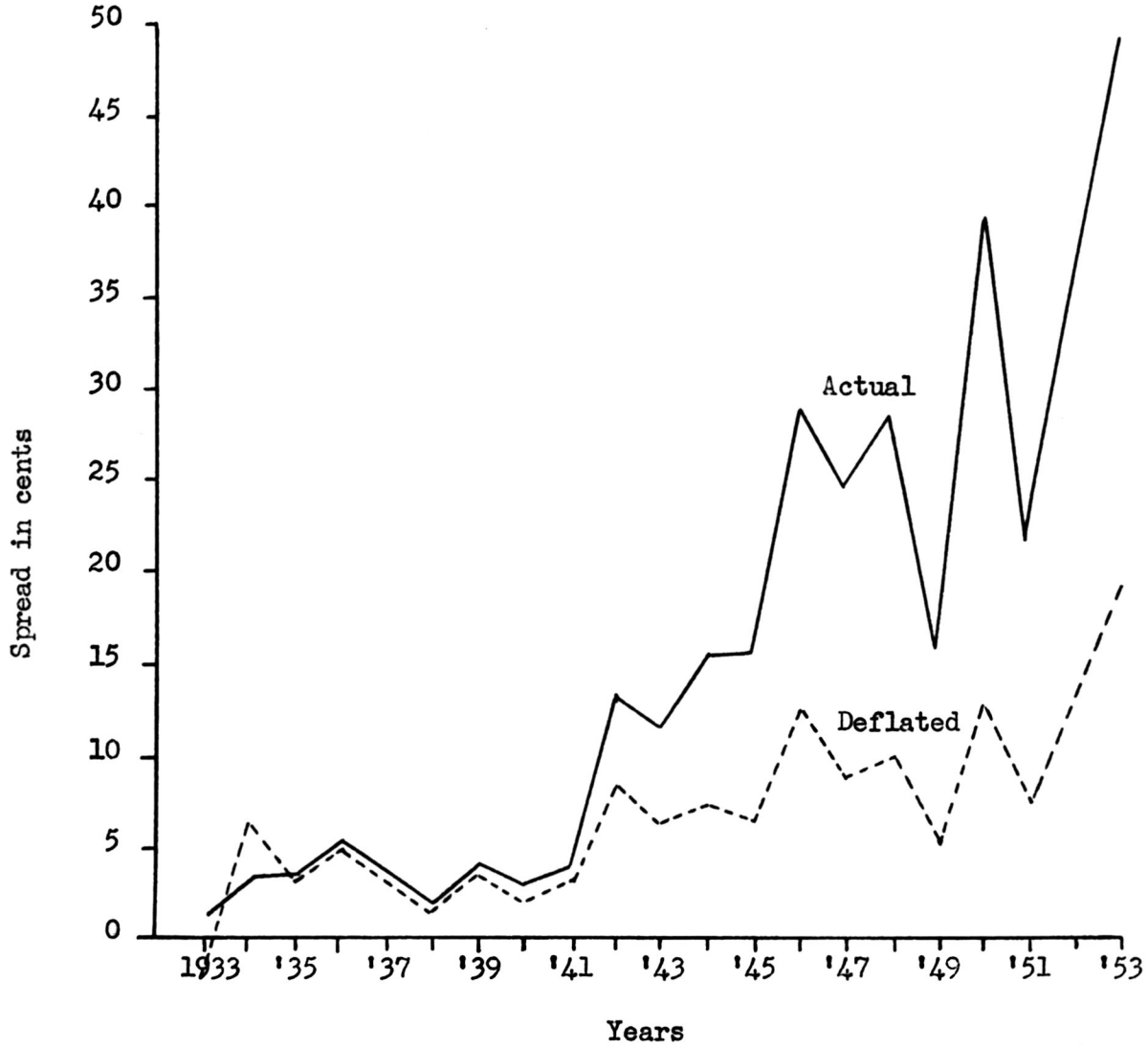

Fig. 10. Trends of spreads (in cents) between white and yellow corn, yellow as base, Kansas City, for 21 years, 1933-1953.

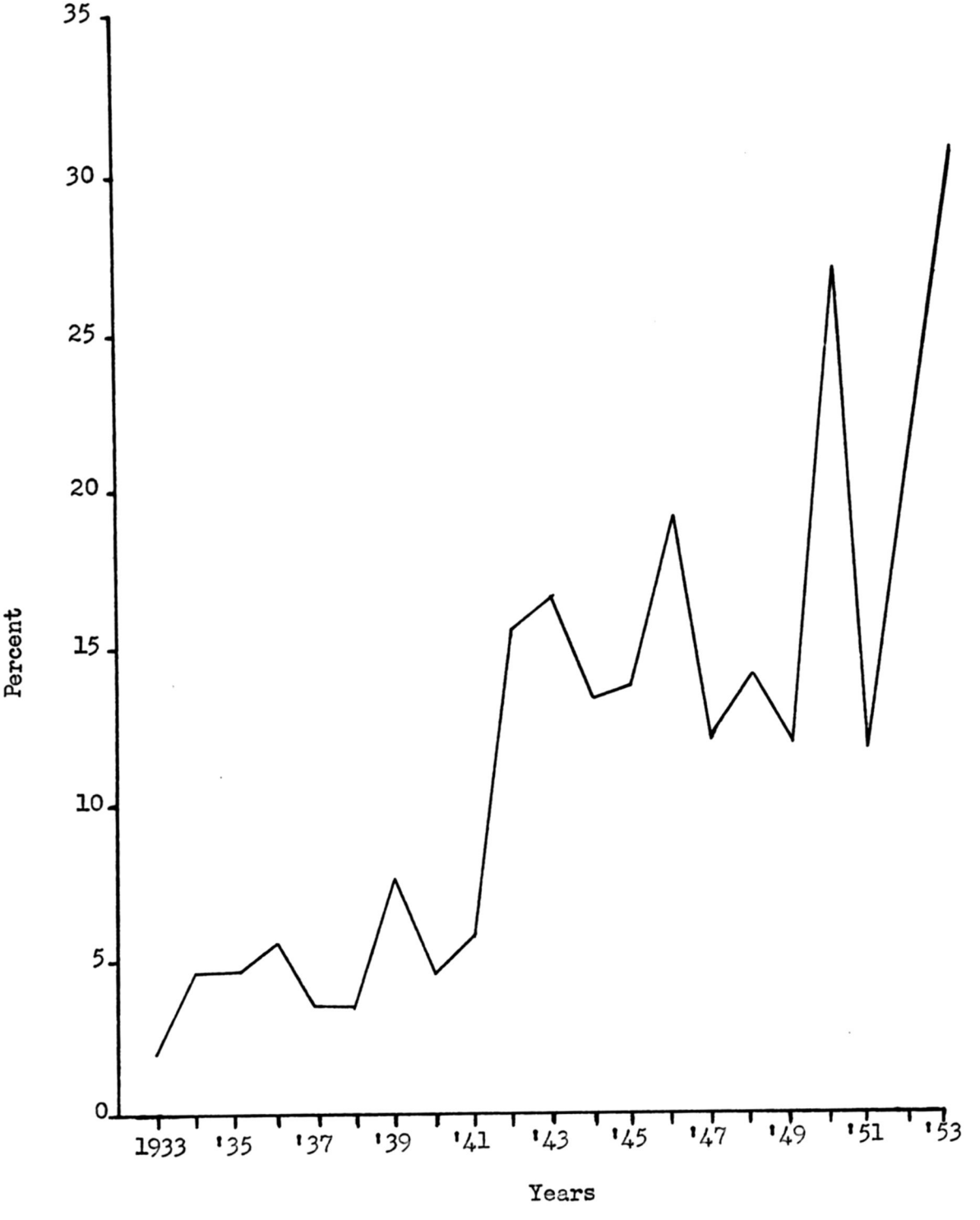

Fig. 11. Trend of spread (as percent) between white and yellow corn, yellow as base, Kansas City, for 21 years, 1933-1953.

The deflated trend of price spread is superimposed in Fig. 10. It was found that the trend of both actual and deflated prices was almost parallel, as would be expected.

Trend of White and Yellow Corn Prices. The general trend of prices for white and yellow corn at Kansas City followed closely the general level of economic activity as shown by Fig. 12 which was constructed using the deflated prices. In the early 1920's these prices had an upward tendency due to the after effect of World War I with a decline in 1926. There also was a price decline from 1930 to 1932. The prices started rising in 1933 reaching highest peak in 1937. There was a decline in 1938. From 1938 to 1945, the prices fluctuated within a range of about 10 cents. There was a rise again reaching a high in 1947 and then a decline reaching a 1929 level in 1953.

Relationship Between White and Yellow Corn Prices

Since for many purposes white and yellow corn may be used interchangeably, the average annual prices for them were graphically correlated for the years 1921 to 1953. Fig. 13 indicated that the prices at Kansas City for white and yellow corn bore a close relationship at all times. The relationship between the two price series appeared to be linear with a positive coefficient of correlation. In order to test this assumption the coefficient of correlation was calculated between annual average prices from 1921 to 1953. The coefficient of correlation was $+.99$. With 31 degrees of freedom, this coefficient was significant. This indicated that changes in the price of white corn were associated with changes in the price of yellow corn in a consistent relationship. With a coefficient of correlation of $+.99$, it may be stated that about 98 per cent of the white corn price variations were related to the yellow corn price variation.

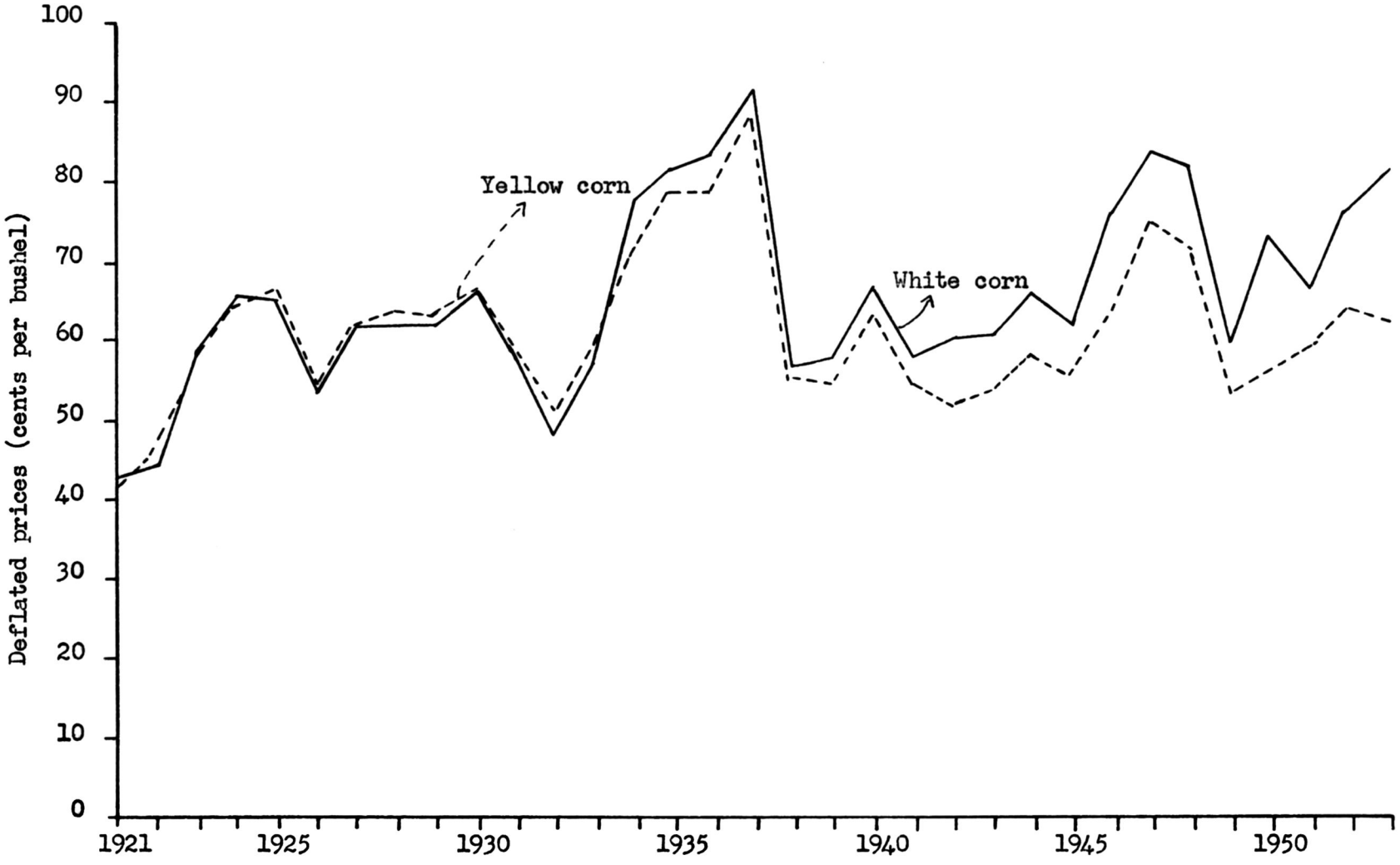

Fig. 12. Average annual deflated corn prices, Kansas City, 1921-1953.

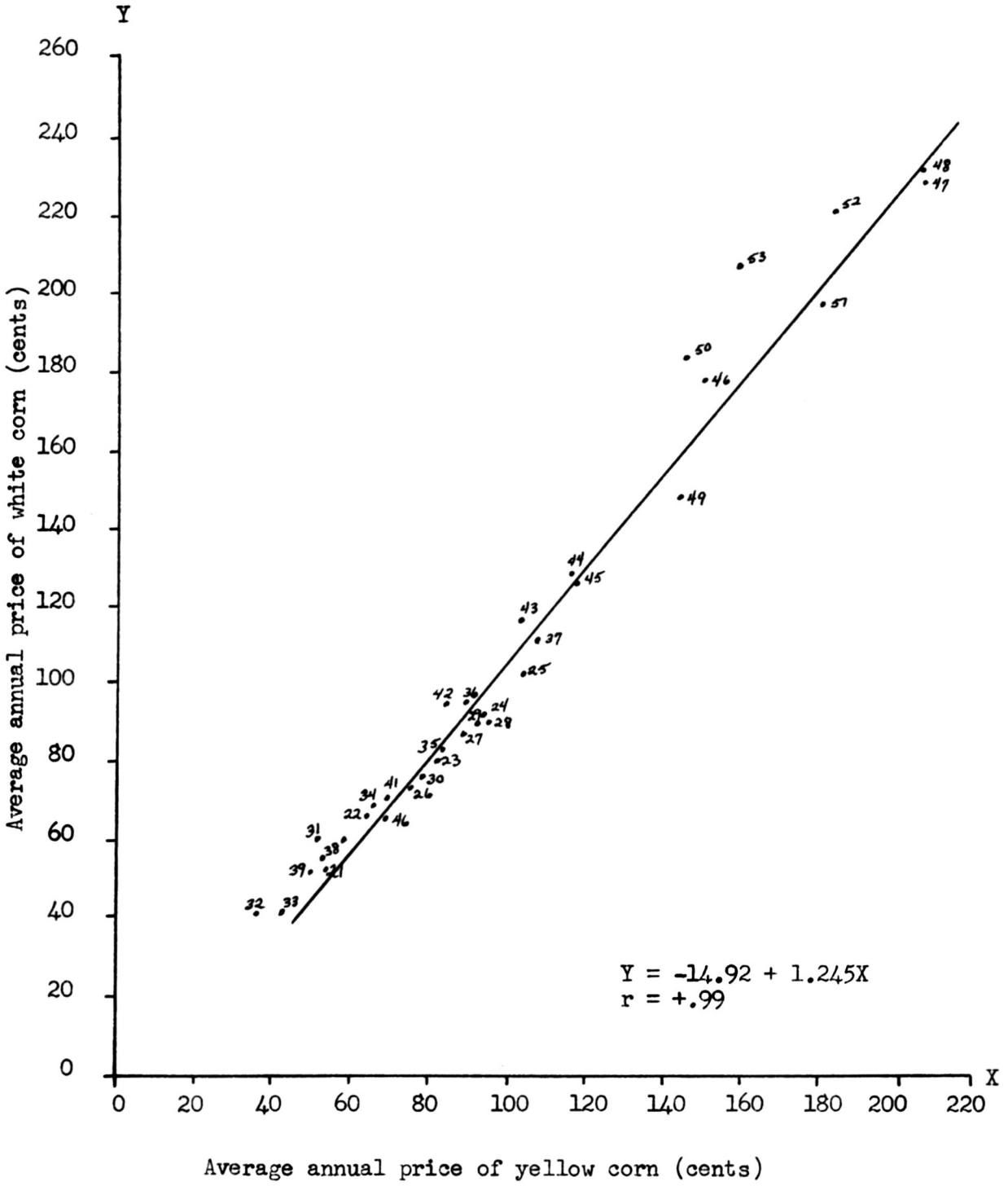

Fig. 13. Relationship between the average annual white and yellow corn prices, Kansas City, 1921-1953.

RELATIONSHIP BETWEEN THE ACRE VALUES OF WHITE AND YELLOW CORN

The study of acre yield of white and yellow corn hybrids indicated that white corn hybrids out yielded yellow corn hybrids, but the differences were not great enough to be statistically significant. Thus, it was concluded that the yields of the two types of corn were almost comparable.

The study of prices of white and yellow corn revealed that since 1934, white corn has been almost continuously selling higher than yellow corn by an average of as low as $0.006 in January 1939 to as high as $0.91 per bushel in August 1952. One individual day (August 27, 1952) the premium was $1.10.

A study was made of the acre values in dollars for the years 1942 to 1953 (with the exception of those cases in which yield data were not available). It was found that acre values for white corn were higher by an average of $19.40, $29.35, and $31.64, respectively, for Districts 1, 3, and 5 (Table 21). In order to find out if these differences were statistically significant, a "t" test was made. The values of "t" were 0.86, 2.86, and 1.28 respectively for Districts 1, 3, and 5, which were non significant except in District 3. In other words, the differences in Districts 1 and 5 were no greater than that which could have occurred through experimental error. It may be well to point out that since yield data is limited, no safe conclusion can be made.

The acre values for the years 1942 to 1953 were graphically correlated for each of the three districts. Figures 14, 15, and 16 indicated that acre values for white and yellow corn bore a close relationship in the years studied. The relationship between the two acre value series appeared to be linear. The coefficient of correlation was calculated between the acre values under consideration, which was found to be $+.99$, $+.97$, and $+.99$ respectively

Table 21. Total acre values of white and yellow corn, 1942-1953.

	Yellow Corn			White Corn			
	Price per bu.	Yield per acre (bu.)	Total Acre Value	Price per bu.	Yield per acre (bu.)	Total Acre Value	Spread
District 1:							
1942	82.4¢	67.3	$ 55.46	95.6¢	77.0	$ 73.61	$ +18.15
1943	102.5	66.2	68.52	116.2	68.3	79.36	+10.84
1944	114.6	53.9	61.77	128.7	55.3	71.17	+ 9.65
1945	114.7	58.6	67.21	127.4	52.0	66.25	- 0.96
1946	149.5	67.4	100.76	178.5	71.9	128.34	+27.58
1947	205.3	62.0	127.29	229.5	62.6	143.68	+16.39
1948	204.1	103.8	211.86	232.9	110.8	258.05	+46.19
1949	133.4	103.2	137.67	149.1	110.1	164.16	+26.49
1950	144.6	108.6	157.04	184.0	98.6	181.42	+24.38
1951	178.3	71.9	128.20	199.7	71.7	143.18	+14.98
1952	183.2	52.8	98.73	221.6	51.7	114.57	+15.84
1953	—	—	—	—	—	—	—
Average	135.6	70.56	109.90	172.66	75.45	129.40	$ +19.40
District 3:							
1942	82.4	42.7	35.18	95.6	51.6	49.33	+14.15
1943	—	—	—	—	—	—	—
1944	114.6	73.0	84.68	128.7	79.9	102.83	+18.15
1945	—	—	—	—	—	—	—
1946	149.5	45.0	67.28	178.5	44.5	79.43	+12.15
1947	205.3	75.1	154.18	229.5	71.7	164.55	+10.37
1948	204.1	79.6	186.56	232.9	83.4	194.24	+ 7.68
1949	133.4	91.8	122.46	149.1	93.6	139.56	+17.10
1950	144.6	86.0	124.36	184.0	90.1	165.78	+41.42
1951	—	—	—	—	—	—	—
1952	183.2	49.2	90.13	221.6	51.8	114.79	+24.66
1953	159.3	68.0	108.32	208.7	65.7	137.12	+28.80
Average	135.60	67.82	108.13	172.61	70.26	127.52	$ +29.35
District 5:							
1942	—	—	—	—	—	—	—
1943	102.5	23.9	24.50	116.2	26.9	31.26	+ 6.52
1944	114.6	50.1	57.41	128.7	47.4	61.00	+ 3.59
1945	114.7	70.2	80.52	127.4	71.5	91.09	+ 8.46
1946	149.5	34.2	51.13	178.5	36.7	65.51	+14.38
1947	—	—	—	—	—	—	—
1948	204.1	41.8	85.31	232.9	54.6	127.16	+41.85
1949	133.4	74.2	98.98	149.1	86.2	128.52	+ 29.54
1950	—	—	—	—	—	—	—

Table 21. (Cont')

	Yellow Corn			White Corn			
	Price per bu.	Yield per acre (bu.)	Total Acre Value	Price per bu.	Yield per acre (bu.)	Total Acre Value	Spread
1951	178.3	62.6	111.62	184.0	74.7	137.44	¢25.82
1952	—	—	—	—	—	—	—
1953	159.3	63.0	100.36	208.7	80.9	168.84	¢68.48
Average	144.5	52.0	76.23	172.66	59.86	101.35	$ ¢31.64

Source: Adapted from original data in Tables 4, 5, 6, and 7.

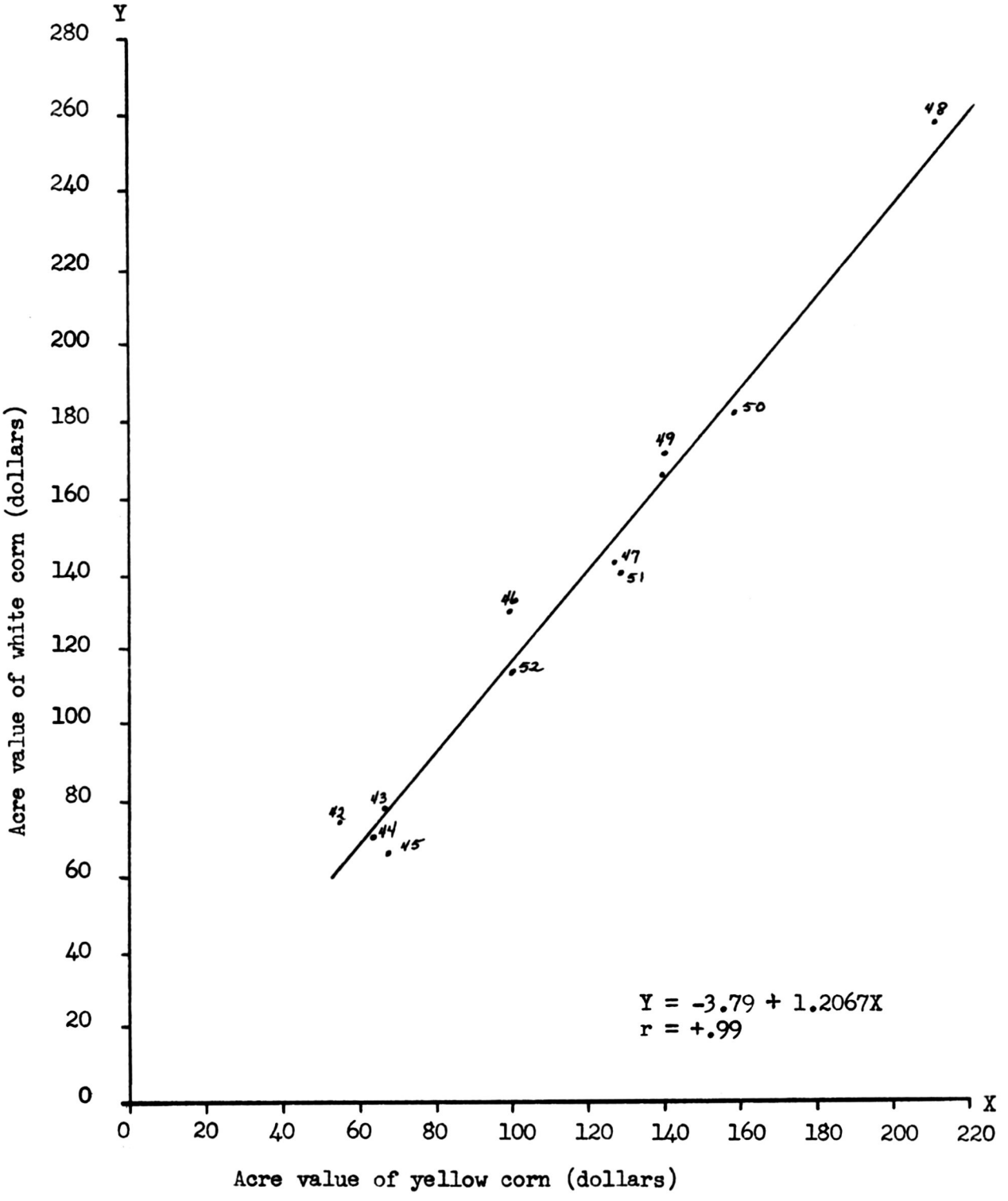

Fig. 14. Relationship between the dollar acre value of white and yellow corn in District 1, Northeastern Kansas, 1942-1952.

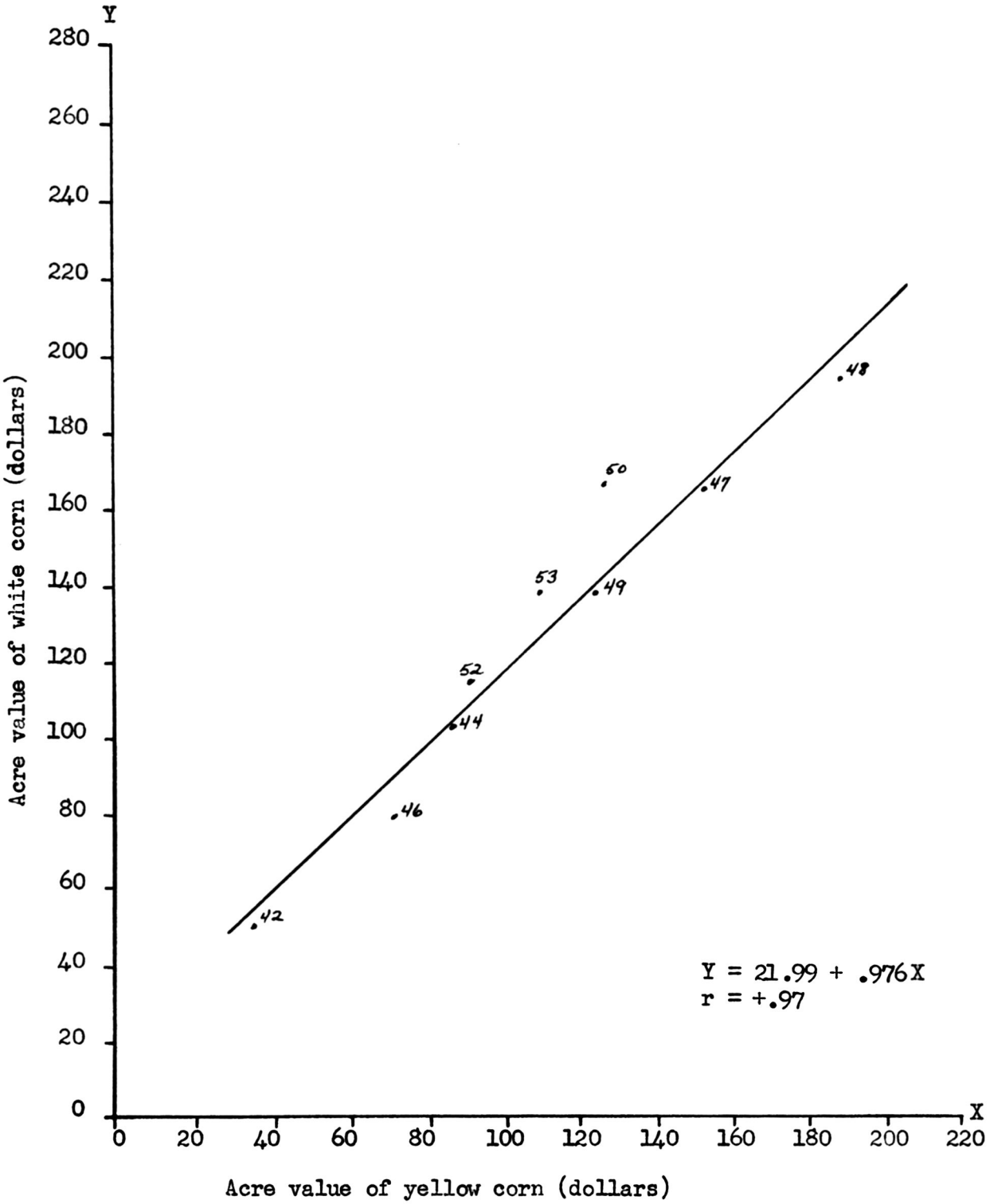

Fig. 15. Relationship between the dollar acre value of white and yellow corn in District 3, Southeastern Kansas, 1942-1953.

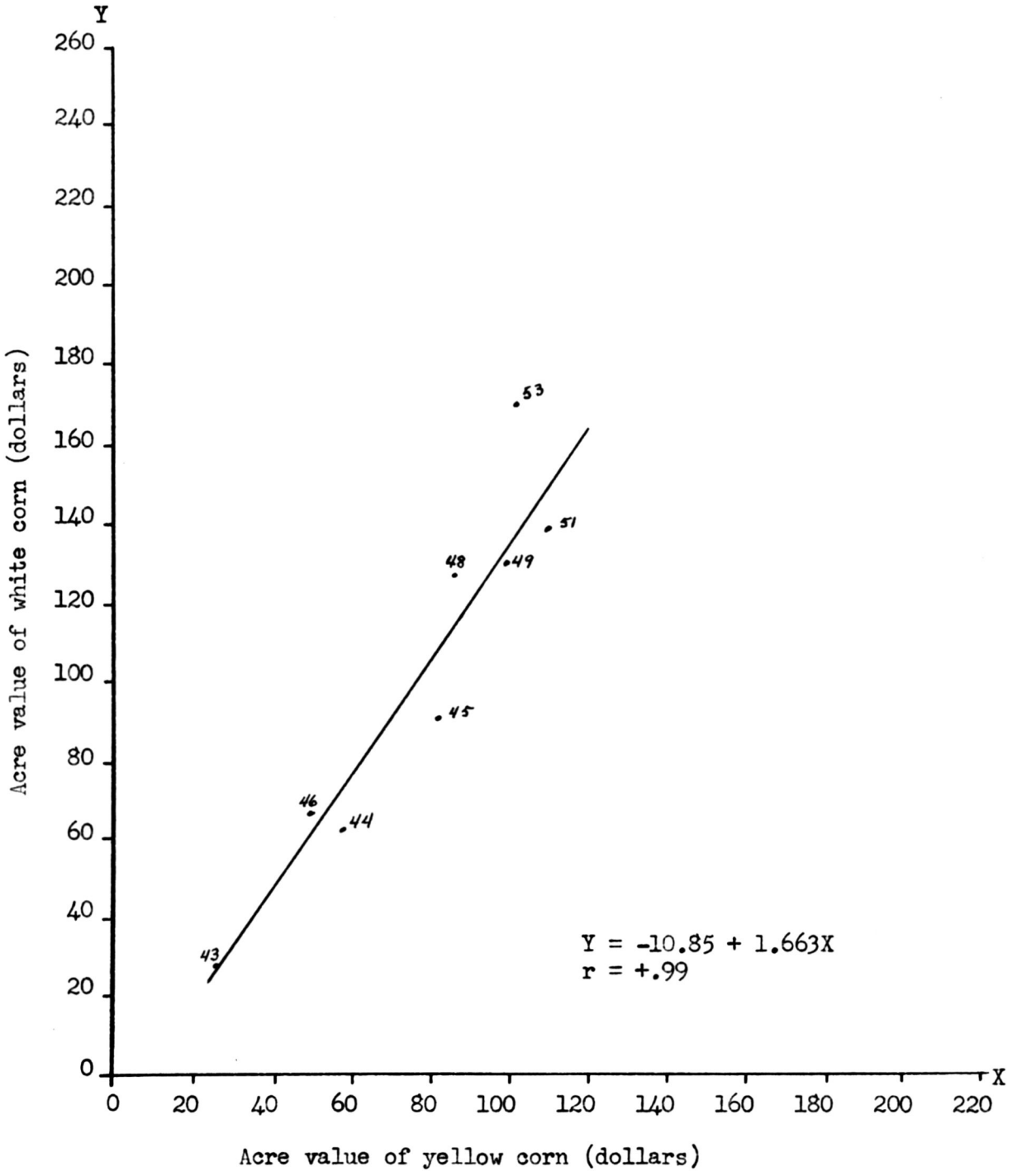

Fig. 16. Relationship between the dollar acre value of white and yellow corn, District 5, South Central Kansas, 1942-1953.

for Districts 1, 3, and 5. This indicated that changes in acre values of white corn were associated with changes in the acre values of yellow corn in a consistent relationship. In other words, 98 per cent ($.99^2$) of the variation in acre values of white corn in District 1, 94 per cent ($.97^2$) in District 3 and 98 per cent ($.99^2$) in District 5, were associated with the corresponding variations in acre value of yellow corn.

Thus, it may be concluded that since in District 3, there was a significant difference in acre values and no significant difference in yield, the difference in price alone was responsible for making differences in acre values. In Districts 1 and 5 no significant differences were found either in yields or in acre values.

MARKETING OF WHITE AND YELLOW CORN

General

Table 22 gives one an idea of how corn is used.

Table 22. Corn: Supply and distribution, United States, year beginning October, average 1947-51, and annual 1949-54.

Item	Average 1947-51	1949	1950	1951	1952	1953	1954
				Million bushels			
Supply							
Production	3,031.1	3,238.6	3,057.8	2,899.2	3,279.4	3,176.6	2,950.0
Carryover	560.8	813.0	845.0	739.2	486.5	768.8	900.0
Imports	.7	.8	.7	.9	.9	1.0	1.0
Total supply	3,592.6	4,052.4	3,903.5	3,639.3	3,766.8	3,946.4	3,851.0
Distribution							
Wet-process products	122.3	127.7	133.2	123.7	130.0	125.0	125.0
Dry-process products							
Breakfast foods	10.5	10.0	11.0	11.0	11.0	11.0	11.0
Farm household use	15.5	15.3	15.2	14.2	13.2	13.0	13.0
Corn meal, grits, etc.	67.2	65.0	70.0	70.0	71.0	71.0	71.0
Alcohol and distilled spirits	34.1	36.1	45.2	27.4	17.3	24.0	25.0

Continued

Table 22. (Cont')

Item	Average 1947-51	1949	1950	1951	1952	1953	1954
				Million bushels			
Seed	11.4	11.1	11.1	11.1	10.9	11.0	11.0
Exports	81.4	106.5	107.2	75.5	139.6	95.0	115.0
Total non-feed uses	342.4	371.7	392.9	332.9	393.0	350.0	371.0
Livestock feeds	2,648.8	2,835.7	2,771.4	2,819.9	2,605.0	2,696.0	2,755.0
Total utilization	2,991.2	3,207.4	3,164.3	3,152.8	2,998.0	3,046.0	3,126.0
Carryover at end of year, all positions	601.4	845.0	739.2	486.5	768.8	900.0	725.0

Source: U. S. Dept. Agr., Feed Situation.

Breaking Table 22 down a little further, it is possible to see the importance of the dry-process products used for direct human consumption. This information is given in Table 23.

Table 23. Per cent dry-process products of total distribution of corn, United States, year beginning October, average 1947-51 and annual 1951-54.

Item	Average 1947-51	Per cent 1951	1952	1953	1954
Breakfast foods	0.35	0.35	0.37	0.36	0.35
Farm household use	.52	.45	.44	.43	.42
Corn meal, grits, etc.	2.25	2.22	2.37	2.33	2.27
Total	3.12	3.02	3.18	3.12	3.04

Source: Computed from Table 22.

From the data on the utilization of corn, it is seen that the dry-process products constitute a minor portion of the entire utilization. Subdividing the dry-process products for the year 1954, it can be seen that the uses may be listed in the order of importance are feeds, exports, corn meal, grits, etc., alcohol and distilled spirits, farm household use, seed, and

breakfast food. The Corn Industries Research Foundation (3) listed the mixed feed manufacturers, dry-millers, wet-millers, and distilling and fermentation industries in order of importance as industrial users of corn.

Dry-Process Products

Of the various uses of corn that are listed, this study is concerned with the dry-process products, and more specifically breakfast foods, farm household use, and corn meals, grits, etc. The dry corn miller may be described as the individual using dry corn as a raw material without altering the moisture condition more than a minimum in order to produce the desired dry product. The dry corn millers may be divided into two groups; namely, the commercial miller and the cross-roads miller. The cross-roads miller maintains a rather localized trade while commercial millers have a broader distribution of their products. The quantity of corn used by the two has been estimated to be about the same (3).

The products commonly made by the standard corn mill are listed by Keenan (10) as follows: hominy, table grits, brewers grits, standard corn meal, corn meal, granulated meal, cones, corn flour, hominy feed, germ meal, and corn oil. Specialities listed include breakfast cereals, flakes, adhesives, fillers, and binders. In addition to the above uses, The American Corn Millers Federation (4) lists explosives, baby foods, and certain powdered soaps as important uses of white corn products.

The most important product, particularly of the cross-roads and the smaller commercial mills, is corn meal (3). It may be ground by the "old process" or the "new process". Old process meal is made by grinding whole corn between closely rotating stones. The germ of the corn is not removed

because its presence in the meal improves the flavor and nutritional properties of the final product. Its keeping quality is limited, however. New process meal is made from degermed hulled corn kernels by the use of steel rollers and cylinders and other modern equipment. Most of the corn meal of interstate commerce is made by the new process.

A by-product of the new process method of corn meal is corn flour. This flour may be made from corn meal by additional grinding and bolting until the granules are as fine as those of wheat flour.

Wallace and Bressman (18) have discussed the types of corn desirable for wet and dry process milling. In the dry process milling, the products are chiefly made out of the horny starch of the kernel. Thus, the dry corn miller desires a flinty corn rich in protein. The wet process miller, interested mainly in extracting the starch, desires a rather soft corn low in protein.

Hominy, or grits, the coarsely ground endosperm, may be prepared by the new process or by special milling technique which requires softening of the grain by soaking before grinding (3). The grits are flavored with malts, sugar, and other ingredients previous to rolling. After rolling, they are dried to about 16 per cent moisture as packed. Corn is sometimes flaked whole instead of in grit form. Brewers use, among other things, meal, grits, and flakes as malts adjuncts in the brewing of beer.

About two bushels of corn each weighing 56 pounds are required to make 100 pounds of old process meal, whereas 3 bushels are required to make the same quantity of new process meal (3). For each bushel, the dry miller will usually obtain about 29 pounds of grits or meal and four pounds of corn flour. The oil recovery is only 0.6 to 0.7 pounds per bushel according to

Neeman (10). The by-products of the dry corn mill include oil, hominy feed, germ cake, and germ meal. Roughly 85 to 90 per cent of the dry milled corn product is used for food, the remainder by other industries.

Winton, et. al. (19) arranged the products of white corn in the following order in regard to acidity, fat, and ash, beginning with the lowest percentage: grits, meal, flour, feed and germ. They may be arranged in the following order in regard to protein: flour, meal, grits, feed and germ. The percentage of nitrogen free extract is not strikingly different in the grits and meal but is lower in the feed and lowest in the germ.

Dry-Process Mill

Sievers (13) gave a brief outline sketch of the dry process mill. Fig. 17 gives this information in brief. It is a sketch of the "new process" type mill which has been explained.

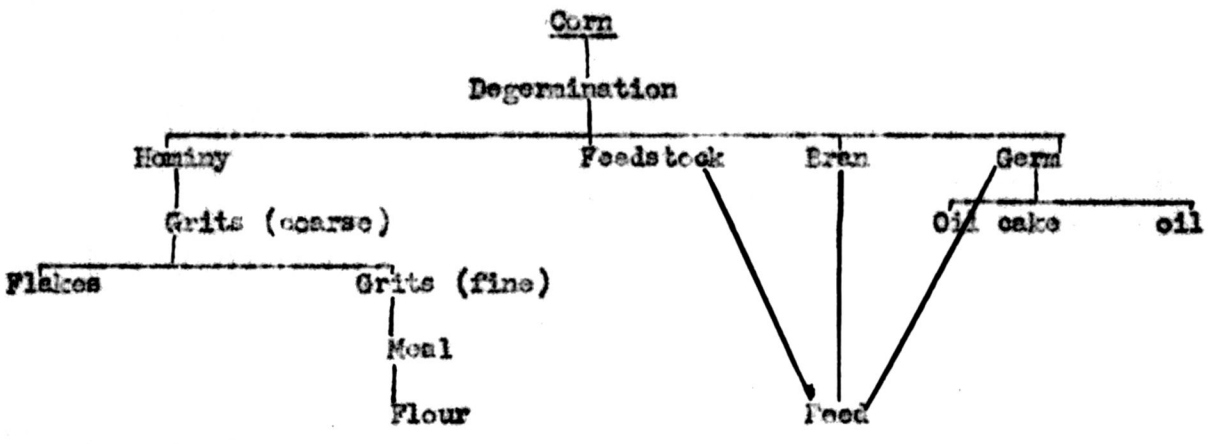

Fig. 17. Siever's diagram of the dry process mill and its products.

Stanly (16) has pointed out that moisture, acidity and fat content are the major factors in keeping quality of corn and corn products. Of these

three variables, degree of acidity is the most important criterion in judging quality. With uniform moisture, the increase in acidity varies more or less directly with uniform fat; the acidity increases more rapidly as the percentage of moisture increases. Acidity in corn is highest in the germ and nearly all the increase in it is due to the presence of moisture. The two most important factors in the manufacture of corn products with good keeping quality are the removal of fat and excessive moisture. Corn with 14 per cent or less moisture, corn meal or flour with 14 per cent or less, and hominy feed with 10.5 per cent or less are considered secure from undue deterioration if kept in a dry ventilated place.

Degerminated corn has proved to be the most desirable form of corn for use in the commercial dry milled products. Scot (11) emphasized the need for removal of the germ before desirable products with keeping quality may be obtained. The germs contain enzymes which function to break down the starch of the endosperm at germination so the young embryo and seedling may grow. When water is present in sufficient quantity this enzymatic activity begins. Removal of the germ therefore, enables one to control the fermentation of starch or the enzymatic activity.

Winton et al (19) stated that rancidity results when fermentation is induced in corn products. Thus, they recommended that "Whole kernel meal, like cream, should be produced locally and consumed soon after grinding." By the use of new process, products may be produced which are relatively stable and will keep well in storage.

Oil and oil cake are among the chief by-products of the dry corn mill. Sievers (13) mentioned that in the wet milling process, the oil content of the germ is about 45 per cent. The cake produced contains about 9 per cent

oil and the germ material from a bushel of corn is about 3.47 pounds, whereas in the dry milling process the oil content of the germ is about 18 per cent. Six per cent of the oil remains in the cake and about 4.17 pounds of germs are obtained from a bushel of corn.

According to Smith (14) the corn refiner returns 26 per cent of the original grain to the farmer to provide a supplementary feed for his livestock. Of the endosperm, starch, gluten, and certain solubles are returned. Of the hull, chiefly cellulose and of the germ, oil and fibrous material are returned.

Smith states, "Starch is the mother lode of the grain. It gave rise to the refining industry and still remains the principal product in the sense that it is the base component of most corn products."

SUMMARY AND CONCLUSIONS

An investigation was undertaken to study and analyze trends in prices and production of white corn. Because for many purposes white corn and yellow corn can be interchangeably used, relevant data on yellow corn was used as basis for comparison. Price data were taken from the Kansas City Board of Trade Grain Market Review, 1921-1953. For corn testing purposes, the state of Kansas has been divided into districts. Because white corn is grown mostly in the eastern part of the state, yield study was made for three eastern districts, i.e., 1, 3, 5.

The results of the study insofar as past experience is concerned may be summarized as follows:

From the comparison of the prices of white and yellow corn from 1921 to 1953, it was found that from 1921 to 1932 yellow corn was priced higher than

white corn which may be attributed to livestock feeders' preference for yellow corn because of its carotene content. The price relationship changed in 1933 when white corn became priced higher than yellow corn, probably because of its (white corn) decreased production but more or less constant utilization. Since 1934 white corn has been consistently priced higher than yellow corn by an average of as low as $0.006 in January 1939 to as high as $0.91 per bushel in August 1952. One individual day (August 27, 1952) the premium was $1.10 per bushel.

The index of seasonal movement of spread for the period 1934-1953 shows a low of 67.06 in April and a high of 146.63 in July. The range of the index of the movement of spread was 79.6 while the index of irregularity was 36.6. This violent seasonal fluctuation was probably due to dry-millers' demand for white corn in June, July, and August when the supply on the market was limited.

The index of the seasonal movement of average prices of white corn from 1921 to 1953 reached a low of 92.3 in December and then rose regularly to its high of 110.0 in July. The range of the index of seasonal price variation was 17.8 while the index of irregularity was found to be 7.3. Yellow corn price movement was almost parallel to white corn. The reasons for this rather significant seasonal price variation nearly every year probably are that a major part of corn crop is marketed by the farmers immediately after harvest, thus creating heavy seasonal demand, and limited market facilities.

The trend of both actual and deflated prices of white corn was found to be generally rising. This was consistent with general economic activity.

Because farmers have to make estimates about the future prices on which to base their decisions about the most profitable season of the year to

market their white corn, a study was made of the past price behavior. Tables are presented which indicate the percentage of times prices of white corn have been higher, lower, or have remained the same after a given month for a period of 20 years, i.e., 1935 to 1954. For completeness, similar information is presented on yellow corn and the spread between the two.

A study of the relationship between the prices of white and yellow corn revealed a linear relationship with a significant +.99 coefficient of correlation. This may be interpreted to mean that about 98 per cent of white corn price variations were related to the yellow corn price variations.

The study of acre yields of white and yellow corn hybrids indicated that white corn outyielded yellow corn hybrids, but the differences were not great enough to be statistically significant. Thus, it was concluded that yields of two types of corn were almost comparable.

The study made of acre values in dollars for white and yellow corn for the years 1942 to 1953, revealed that the acres values for white corn were higher by an average of $19.40, $29.55, and $31.64, respectively, for Districts 1, 3, and 5. The "t" test made showed that differences in acre values were significant in District 3. Thus, it may be concluded that in District 3, since there was a significant difference in acre values and no significant difference in yield, the difference in price alone was responsible for making differences in acre values.

In Districts 1 and 5, although there was an indicated premium of $19.40 and $31.64, respectively, these differences were no greater than could have occurred through experimental error.

In view of data limitation for yields, probably no safer conclusion can be made other than that in the years 1942-1953 white corn would have yielded

a premium of $19.40, $29.35, and $31.64, per acre, respectively, for Districts 1, 3, and 5 if the yields obtained on the experimental plots could have been obtained by farmers, if the premiums would not have been reduced by special handing costs required for white corn, and if premiums paid in the terminal market were reflected in their entirety to farmers.

In respect to most agronomic characteristics such as drying, lodging, dropped ears, disease resistance, etc., white corn is considered equal to yellow corn. Endosperm color being a genetic factor, all desirable agronomic characteristics of yellow corn can be retained while breeding for white corn.

The two types of corns are of equal feeding value with the exception of beta-carotene contained in yellow corn. Because of its beta-carotene content, yellow corn is superior to white corn in feeding value. However, if pasture or hay can be fed with white corn, yellow corn has no advantage over white corn.

ACKNOWLEDGMENTS

The author is indebted to Professor L. W. Schruben, his major instructor, for suggesting the problem, his guidance, and the encouragement given during the course of study.

Sincere acknowledgment is made to Mrs. Ruth Clifton for her many suggestions, constructive criticism, and consultations.

Special acknowledgment is made to Mr. Lowell C. Johnson, P. O. Box 146, North Bend, Nebraska, for sending his personal file on white corn, which was very valuable for this study.

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APPENDIX

APPENDIX I

The hybrids and the districts considered are as follows:

DISTRICT 1: Northeastern Kansas.

Yellow Hybrids	White Hybrids
1. U. S. 13	1. Kansas 2234
2. Kansas 1585	2. Kansas
3. Kansas 1646	3. U. S. 523W (K. 2299)
4. Kansas 1639	

DISTRICT 3: Southeastern Kansas.

Yellow Hybrids	White Hybrids
1. U. S. 13	1. Kansas 2234
2. Kansas 1585	2. Kansas 2275
3. Kansas 1639	3. U. S. 523W (K. 2299)
4. Kansas 1646	
5. Funk G. 711	
6. Keystone 222	

DISTRICT 5: Southcentral Kansas.

Yellow Hybrids	White Hybrids
1. U. S. 13	1. Kansas 2234
2. Kansas 1585	2. Kansas 2275
3. Kansas 1639	3. U. S. 523W (K. 2299)
4. Kansas 1646	
5. Funk G. 711	

APPENDIX II

The following was the source of data for Tables 4, 5, and 6: Kansas Agricultural Experiment Station Bulletins, Kansas Corn Tests 1938 to 1953. (Published Annually)

Year	Bulletin Number	Dist. 1	Dist. 3	Dist. 5
			(Page)	
1942	311	16	26	--
1943	323	17	--	33
1944	325	17	25	31
1945	329	14	24	34
1946	333	15	32	45
1947	336	14	28	--
1948	340	18	31	39
1949	342	15	27	35
1950	347	20	31	--
1951	352	21	--	38
1952	358	22	31	--
1953	364	20	29-30	36

Data used were from tables giving one year's results of the corn performance tests in the various districts. When the corn performance tests were conducted in two counties in a district, the average of the two was used.

WHITE CORN IN KANSAS

by

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AN ABSTRACT OF A THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Economics and Sociology

KANSAS STATE COLLEGE
OF AGRICULTURE AND APPLIED SCIENCE

1955

The purpose of this study was to analyze trends in prices and production of white corn. In planning their business, farmers have to make many estimates. They have to consider the yielding ability of the variety to be planted as well as whether it commands a price premium in the market. Another important decision is to determine the most profitable season of the year to market corn. It was assumed that the results of this investigation would help farmers answer such questions, and would serve as a guide if it would be more profitable for Kansas farmers to grow white corn instead of yellow corn.

Because for many purposes white corn and yellow corn can be interchangeably used, relevant data on yellow corn was used as a basis for comparison. Price data were taken from Kansas City Board of Trade Grain Market Review, 1921-1953. For corn testing purposes, the state of Kansas has been divided into districts. Because white corn is grown mostly in the eastern part of the state, yield study was made for three eastern districts, i.e., 1, 3, and 5. The yield data were obtained from Kansas Corn Tests, as reported by Kansas Agricultural Experiment Station.

High cash price for No. 2 white corn and No. 2 yellow corn on each Wednesday of the month from January 1921 to December 1953 were used to obtain the monthly average prices, which were used to study price trends, spreads, seasonal variations, etc. The seasonal price variation was determined by the 13-month moving average method. To study the price trends, the prices of white and yellow corn were deflated using the U.S.D.A. index numbers for prices received by farmers.

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