THE INFLUENCE THAT CHANGES IN THE BUTTERFAT PRICE-FEED COST RATIO HAVE UPON THE PRODUCTION AND PRICE OF KANSAS BUTTER

by

DICK ALBERT DODGE

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INTRODUCTION

The purpose of this study is to determine the influence that changes in the butterfat price-feed cost ratio have upon the production and price of Kansas butter.

As an illustration of possible relation, in September and October 1931 the price of butter was high in relation to feed costs, being 28 and 38 per cent respectively, above the average for those months. Butter production showed a decided increase over normal about two months later or in November and December, being 18 per cent above normal in November and 40 per cent above normal in December.

This study is an attempt to establish a relationship between the increased production and the high butterfat-feed cost ratio as in the example cited above and other similar cases during the past decade.

To general farmers and dairymen, the results of this study should be of practical value in formulating present and future plans. Local conditions will affect their ultimate decisions but knowing in general the reaction of producers to a certain feed cost ratio should aid in deciding their own procedure. The average butterfat price-feed cost ratio discussed later should also afford a basis from which the producer can plan his feeding or concen-

trates.

The value of such a study has been indicated by the reports of the Division of Crop and Livestock Estimates, Bureau of Agricultural Economics, United States Department of Agriculture, in the publication, Milk Production Trends.

In this report feed prices are discussed from the standpoints of possible production, prices and quality of butterfat. In the past, comparisons were made and production forecasted from studies of pasture conditions. More and more consideration is being given to the effect of available grains and grain prices on present production and farmers intention in regard to cows on hand and numbers of heifers being kept for future production.

The September 1931 issue of Milk Production Trends states, "The number of milk cows on September 1 appears to be fully 3.6 per cent above the number on hand last year. The heavier culling reported as intended this fall has not yet materialized, and the recent changes in the price of butter and price of feed have probably caused some farmers to change their plans in regard to reducing their herds[1]".

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1. Milk Production Trends.
Division of Crop and Livestock Estimates,
Bureau of Agricultural Economics, U.S.D.A.
September 22, 1931, page 1.

Another quotation indicating the belief that farmers are using the relative position of feed price and butterfat prices as important factors in their production plans appeared in the October 1931 issue of Milk Production Trends.

"The plans of farmers in regard to increasing their herds appear to have been materially changed by the drop in feed prices and the increase in the price of butter. October reports from dairy correspondents show a nearly universal tendency to keep more milk cows[2]".

These statements are supported by figures to substantiate them. Other indications of the value of establishing the relationship between butterfat price and feed costs have presented themselves in other phases of the forecasting work of the Division of Crop and Livestock Estimates.

Realizing that there are a great number of factors which cause fluctuations in price and production of butter it would be beyond the scope of this thesis to consider them. This study, therefore, does not attempt to explain all factors influencing production and price of Kansas butter, but is an attempt to determine the effect of the but-

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2. Milk Production Trends.
Division of Crop and Livestock Estimates,
Bureau of Agricultural Economics, U.S.D.A.
October 24, 1931, page 1.

terfat price-feed cost ratio on the production and price of Kansas butter.

The relationship shown or the degree of regularity with which the butterfat price-feed cost ratio follows the cycles of production and of price should be indicative of its relation to them. An attempt has been made to determine the point, in the butterfat price-feed cost ratio, at which production will begin to decline or increase, due presumably to the trend of the existing ratio. A study of the trends of production and price of Kansas butter as compared to the trends of the butterfat price-feed cost ratio should find application in proving or disproving the influence of the ratio upon the production and price of Kansas butter.

As Kansas is not primarily a dairy state it is to be expected that her production will be influenced more in periods of low feed costs than would be true of strictly dairy sections. When feed costs go up Kansas farmers tend to decrease their milk production, except in the intensive fluid milk districts, and sell grains for cash or feed them to other classes of livestock. In periods of low cash income from grain sales the reverse seems to be true, that is, they increase their milk production.

ACKNOWLEDGMENT

The writer wishes to acknowledge his indebtedness to, and to express thanks particularly to his major instructor, Professor George Montgomery of the Department of Agricultural Economics of the Kansas State College of Agriculture and Applied Science, under whose direction this study was made. Also, thanks are due Doctor W. E. Grimes, Head of the Department of Agricultural Economics, for criticism of the work.

MATERIAL AND METHODS

Sources of Materials for the Study

The butterfat price-feed cost ratio used in this study was computed by the Bureau of Agricultural Economics, Division of Crop and Livestock Estimates, and published in Statistical Supplement to Milk Production Trends, issued November 1931.

The choice of commodities used in preparation of this ratio was necessarily limited to those for which the prices actually paid by farmers were known or could be calculated with a fair degree of accuracy. The butterfat price used was calculated by months from the wholesale prices of various grades of creamery butter and the prices

received by farmers for farm butter as reported by special dairy correspondents. It was assumed that a typical ration would include about four parts by weight of corn, two of oats, two of bran, one of cottonseed meal and one of whatever grain (corn, wheat, oats, barley, or bran) was cheapest per pound at the time. This ration was based largely on data available as to the quantities of the major feed stuffs which are annually fed to dairy cattle. Figures from several thousand farms reporting the amounts of different feeds being fed to milk cows on October 1, 1931 were also considered. All prices of feed grains and mill feeds were converted to comparable prices per pound. The prices used for feed grains were the United States averages of prices reported as being paid to producers on the fifteenth of each month. For bran and cottonseed meal the monthly reports on prices paid by farmers were used where available. Where only quarterly prices were collected monthly prices were interpolated, with allowance for changes in wholesale prices.

None of these prices strictly represent the value of grain being fed by butterfat producers but the average for September, October and November, 1931 appear to reasonably be close to the value of feed on October 1 as reported by special dairy correspondents in states marketing butterfat. The average prices in sections selling butterfat are not

known but combining the average values of feed reported from the principal butterfat producing states gives a weighted October 1 average for these states of 83 cents per 100 pounds which was thirteen cents below the average of all reports from dairymen in the United States.

Butter production figures were secured from the United States Department of Agriculture Yearbooks[3], and from the Monthly Reports of Butter Production[4]. Figures on the milk production per cow were taken from the Wisconsin Dairying Publication No. 120, State Board of Agriculture, Wisconsin[5]. The number of cows and heifers kept for milk production for various years were secured from United States Yearbooks of Agriculture[6]. Prices of butterfat at Kansas cream stations were taken from the Dairy Drovers Telegram of Kansas

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3. U.S.D.A. Yearbook, 1930.

4. Monthly Estimate of Creamery Butter Production. Bureau of Agricultural Economics, U.S.D.A. Market News Service, Washington, D. C.

5. Wisconsin Dairying Bulletin No. 120. by Walter H. Ebling, Agricultural Statistician, Samuel J. Gilbert, Assistant Statistician, Gilbert T. Gustafson, Junior Statistician, Wisconsin Crop and Livestock Reporting Service.

6. U.S.D.A. Yearbook, 1930.

City[7]. Prices of butter at Chicago were taken from the Drovers Journal, Yearbook of Figures, Chicago[8].

Other information from Milk Production Trends, United States Department of Agriculture, Bureau of Agricultural Economics, Division of Crop and Livestock Estimates[9].

METHOD OF PROCEDURE

The butterfat price-feed cost ratio was used as the basis for all comparisons made. The objectives of this study were, using this ratio as a base, to determine its influence on Kansas butter production, and on the price received by producers.

Some of the comparisons made were: ratio with Kansas butter production; ratio with milk production per cow; using actual pounds; using actual in per cent of average for the period and actual in per cent of normal. The comparisons were made currently, that is, the ratio for each month with the production for the same month, also compar-

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7. Kansas City Daily Drovers Telegram.
Published by the Drovers Telegram Company.

8. Drovers Journal, Yearbook of Figures, 1930.
Published by the Chicago Daily Drovers Journal.

9. Milk Production Trends.
United States Department of Agriculture,
Bureau of Agricultural Economics
Division of Crop and Livestock Estimates.

ing the ratio for each month with production one month and two months later. The ratio was compared with prices of butterfat as reported from local cream stations in Kansas.

Mathematical correlations were calculated between the ratio and butter production and also between the ratio and milk produced per cow.

Other relations were envolved by noting number of times ratio and price moved together from month to month, and times they moved in opposition to each other, and at what period or periods of the year the greatest correlation occurs. These have given some possible reasons or explanations for such variations.

REVIEW OF LITERATURE

Literature related to this study is limited. Dairy forecasting is comparatively new and especially forecasts based on such factors as are used in this study. Publications such as Milk Production Trends, published by the division of Crop and Livestock Estimates, Washington, D. C., have in the past, largely limited their work to reports of current happenings.

Intensive studies have been made of the affect of the corn-hog ratio on the production of swine for a number of years. The basis of this ratio is quite similar to the

butterfat price-feed cost ratio studied in this work.

Another interesting study similar to this was reported in the February 1932 issue of Farm Economics published by Cornell University[10].

It was an attempt to establish a relationship between egg price-feed cost ratio and number of hens and pullets on hand. This study was based on numbers reported on October 1 of each year since 1924. The number of poultry was lagged one year behind the ratio. An almost perfect relation was found, indicating the importance of the position of the ratio on farmers plans for the next years poultry production.

The basis of these studies were the product price and the feed costs, using whatever feed was most important, in the production of the product.

The relationships established in these studies have proved to be of economic value to producers.

It is probable that the relationships established from a study of butterfat price-feed costs to the price and pro-

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10. Farm Economics,
Department of Agricultural Economics and Farm Management,
New York State College of Agriculture
Cornell University, Ithaca, New York, No. 74
February 1932, page 1658.

duction of butter should be of similar value to dairy farmers.

These studies are not related to this study but are similar in nature and therefore interesting in comparison.

COMPARISON OF BUTTER PRODUCTION IN KANSAS TO BUTTER-FAT PRICE-FEED COST RATIO

Table I shows the ratio of butterfat price to pounds of typical dairy ration since 1910 by months. The total and the average for each month for the twenty-two years, 1910 to 1931, and a grand average of 24 pounds of ration for one pound of butterfat for the 264 months.

This average of 24 pounds of ration for one pound of butterfat cannot be said to be the point at which a dairyman can profitably feed grain to his dairy cows but some where around this figure will be the point at which it will become one of the more important factors influencing his profits or losses.

A study of this table shows the seasonal influence of price and production on the ratio or pounds of feed a pound of butterfat will buy. Being quite high 1 to 26.1 in January and falling off quite rapidly to a low of 1 to 20.4 in June, followed by a slow, steady increase during the fall months, reaching a high in December of 1 to 27.8.

Table I. Ratio of Butterfat Price to Pounds of Typical Dairy Rations

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1910	23.1	21.0	21.9	21.4	19.6	19.2	19.4	20.0	21.7	23.9	26.2	26.3
1911	24.6	22.6	21.8	19.3	18.2	17.5	17.6	18.1	19.0	20.2	22.6	23.9
1912	25.3	21.6	20.0	19.4	16.9	15.9	16.4	17.2	20.1	22.5	26.6	29.7
1913	28.4	28.6	28.5	27.2	22.6	21.1	19.8	19.1	20.2	21.2	22.3	23.5
1914	22.5	20.6	19.5	17.7	17.7	17.7	18.3	18.7	19.2	20.5	22.9	23.4
1915	22.2	19.8	18.3	18.6	17.7	17.7	17.3	17.1	18.6	21.1	23.0	24.1
1916	22.7	21.8	23.5	23.4	20.8	19.5	19.2	19.6	20.3	21.1	21.4	21.7
1917	21.2	20.7	19.0	17.7	15.1	14.6	13.8	14.0	16.1	17.3	18.9	19.5
1918	20.2	18.7	16.3	15.7	16.2	16.1	16.7	17.0	19.7	22.6	24.5	26.3
1919	22.5	19.8	22.2	22.3	19.8	17.9	17.4	17.6	19.2	23.0	25.0	25.1
1920	23.1	21.6	21.2	21.6	17.2	16.2	17.0	18.6	22.2	27.0	33.2	32.1
1921	33.2	30.6	32.5	32.4	23.6	21.9	25.9	30.9	31.8	32.7	40.2	38.0
1922	30.4	28.6	26.7	25.3	24.7	25.3	26.4	25.6	26.6	30.4	32.3	35.2
1923	32.0	29.9	29.0	28.9	24.6	22.8	23.4	25.3	27.4	28.1	31.0	32.6
1924	33.3	31.1	29.7	26.2	24.3	23.9	22.1	19.9	20.3	20.2	21.3	22.6
1925	21.1	19.5	22.3	25.3	22.6	21.7	23.0	23.7	25.7	31.2	33.0	33.1
1926	30.7	30.1	30.4	28.9	28.1	27.9	27.4	26.4	28.5	29.9	32.9	35.7
1927	34.0	32.5	34.0	33.2	28.9	24.0	23.7	22.9	24.3	26.6	29.0	29.9
1928	29.6	26.9	26.0	24.0	21.8	21.4	22.3	24.9	28.0	29.2	30.1	30.8
1929	29.2	27.8	28.1	27.8	28.0	27.1	26.5	25.6	25.8	26.7	27.0	26.5
1930	25.7	23.1	23.4	24.5	24.0	20.9	22.6	23.2	24.3	25.9	28.0	24.7
1931	22.6	22.3	24.8	23.2	18.9	19.9	21.3	26.0	32.4	39.9	34.4	
Total	5756	5392	5391	5220	4713	4502	4575	4714	5134	5663	6058	5847
Aver.	26.1	24.5	24.5	23.7	21.4	20.4	20.7	21.4	23.3	25.7	27.5	27.8

Statistical Supplement to Milk Production Trends. No. 5, U.S.D.A. Bureau of Agri. Econ. Division of Crop and Livestock Estimates, November 1931, page 2, Tables 1 to 7, inclusive.

An index of butter production was computed for the period of 1921 to 1931 (Table II). Using the normal of this period as a base or 100 per cent, the actual production was expressed in per cent of the normal production. This butter production index and the butterfat price-feed cost ratio were compared by three month periods. The general relationship shown over this eleven year period is close. The trend of one factor comparing quite closely to the trend of the other. The cycles in the production index and butterfat price-feed cost ratio seem to be rather short, being mainly about nine months in duration. This cycle appears quite regular with the months averaged in quarterly periods.

During the post war period 1921 to 1923 butter production fluctuated markedly with no very great changes in the total amounts produced and also during these three years there was a quite favorable butterfat price-feed cost ratio. That is, the price of feeds were much lower in relation to the price of butterfat than for the average of the eleven year period.

The relationship existing from 1925 through 1930 is very marked, although being combined into quarterly periods the breaks do not coincide as well as might be expected. There are periods when the production declined even though the ratio was becoming more favorable. (Fig-

Table II. Butterfat Price-Feed Cost Index

Monthly variations expressed in per cent of average for that month

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1921	116	110	116	119	97	94	109	125	121	129	143	120
1922	106	103	95	93	101	109	111	105	109	106	104	111
1923	112	107	104	106	101	98	97	104	104	98	100	103
1924	116	111	106	96	100	103	93	82	77	70	69	72
1925	74	70	79	86	93	94	97	97	98	109	107	105
1926	107	108	109	106	113	120	115	108	108	104	106	113
1927	119	116	121	122	117	104	100	94	93	93	94	95
1928	104	96	93	88	89	92	94	102	107	102	97	97
1929	102	100	100	102	115	117	111	105	98	93	87	84
1930	83	83	86	90	97	90	95	95	92	90	90	78
1931	83	80	89	85	78	86	90	107	123	138	111	

Statistical Supplement to Milk Production Trends. No. 5, U.S.D.A. Bureau of Agri. Econ., Division of Crops and Livestock Estimates. November 1931, page 2, Tables 1 to 7 inclusive.

ure I). These inconsistencies may be attributed to other factors of major importance such as the percipitation for a given period.

For example, by the middle of 1924 the butterfat price-feed cost ratio was becoming more favorable, yet the production continued to decline throughout the remainder of the year and was still low in the early part of 1925.

Pasture conditions are always an important factor in milk production and rainfall certainly is a factor which determines pasture conditions to a large extent. The percipitation for the year 1924 was 2.78 inches below normal and a large part of this decrease came in the months when pasture was most in need of rain. May was 1.91 inches below normal and June 2.73 below. July and August were about average but the fall months, September, October, and November, were each about one inch below normal. These were the conditions in the middle division of the state. Similar conditions existed in the eastern division with May and June especially dry. This affected the late fall and early winter production because when a cow's production has fallen down it is difficult to bring back, even with the best of feeding, until the next lactation period. The same data were charted, that is, butter production in per cent actual of normal and butter price-feed cost ratio by months. Again the period 1921 to middle of 1924 did not show the

Table III. Monthly Index of Butterfat Price-Feed Cost Ratio Averaged by Three Month Periods.

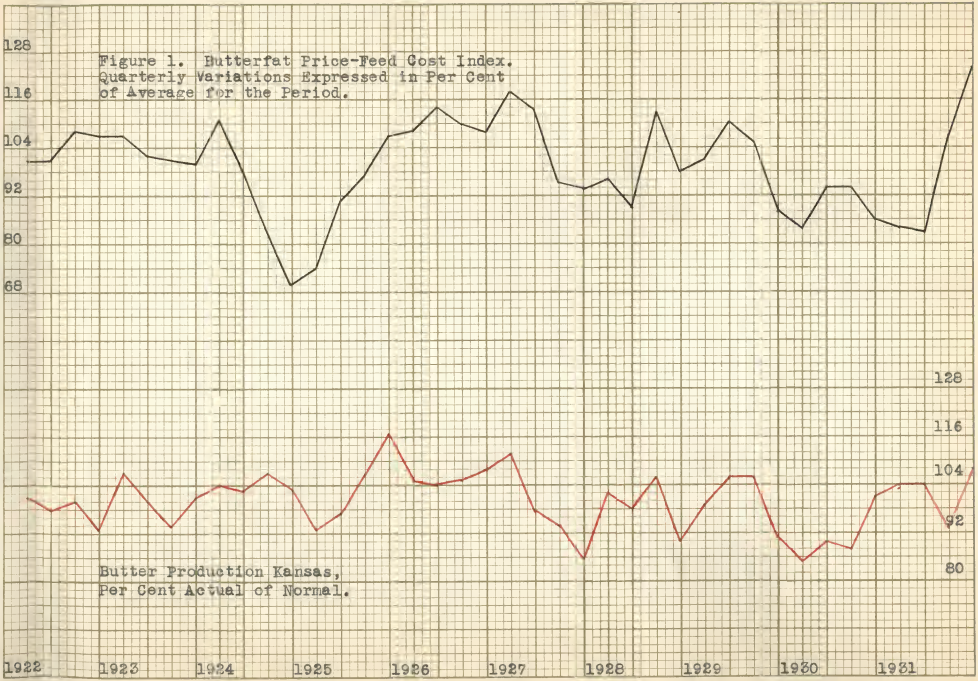
	Jan. Mar.	April June	July Sept.	Oct. Dec.
1921	114	103	115	130
1922	101	101	108	107
1923	107	102	101	100
1924	111	99	84	70
1925	74	91	97	107
1926	108	114	110	108
1927	118	114	95	94
1928	97	89	101	98
1929	101	111	105	88
1930	84	92	94	86
1931	84	83	106	124

Source:

Calculated from Table II.

expected correlation. There is the same trend throughout the period but the minor fluctuations are so numerous that the relationship could not be definitely established. Beginning in 1924 conditions became more stable and both production and the ratio moved in longer cycles of from three to nine months. Some, however, are for even longer than nine months, continuing in one case, for as long as eighteen months but the change was gradual with no great increase occurring.

When the ratio becomes more favorable, in the majority of cases, it is approximately two months before butter pro-


128
116
104
92
80
68
Figure 1. Butterfat Price-Feed Cost Index.
Quarterly Variations Expressed in Per Cent
of Average for the Period.
128
116
104
92
80
Butter Production Kansas,
Per Cent Actual of Normal.
1922
1923
1924
1925
1926
1927
1928
1929
1930
1931

duction begins to increase. This is especially true during the pasture season as the feeding of concentrates is not of as great importance during the grazing season.

The increases in butter production shows up more nearly currently in the winter months, when the amounts and kinds of concentrates fed are of more importance in the ration of the cows, thus being more of a factor in the amount of butter produced.

The mathematical correlation between the index of Kansas butter production and butterfat price-feed cost ratio, monthly variations expressed in per cent of average for that month, gave a correlation of +.207. Considering that the entire period 1921 to 1931 inclusive was used, and that during parts of this period other factors were of major importance, this was considered to be a relatively high correlation.

Professor George Montgomery, Agricultural Economics Department, Kansas State College correlated United States butter production and the butterfat price-feed cost ratio from 1922 to 1931 and found a correlation of +.317 when the butterfat price-feed cost ratio was correlated with the butter production of a period two months later.

The changes in the amount of butter produced are more abrupt than changes in the butterfat price-feed cost ratio, that is, the greatest amount of the increase or decrease

Table V. Kansas Butter Production Index

Actual Production in Per cent of Normal.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1921	75	80	95	110	101	97	99	99	97	102	105	88
1922	105	102	97	91	98	107	114	95	91	95	90	94
1923	108	109	104	99	99	102	100	87	96	88	109	108
1924	108	108	98	101	102	108	111	103	109	105	104	100
1925	96	93	90	95	100	94	98	110	111	123	113	116
1926	105	108	102	103	105	105	105	106	105	104	104	116
1927	112	111	115	105	100	89	93	101	89	89	80	90
1928	107	99	100	95	94	105	107	109	104	89	87	94
1929	97	98	102	103	109	106	107	107	104	97	90	91
1930	85	83	89	89	93	88	83	84	97	103	101	99
1931	102	106	106	108	101	104	86	98	97	102	118	104

Source:

Monthly Estimates of Creamery Butter Production, U.S.D.A. Bureau of Agri. Econ. Market News Service, Washington, D. C.

for any period usually occurs in the first one or two months of the period (Figure 2). Indicating that when dairymen realize the comparative advantage of feeding concentrates they get almost immediate results and the biggest per cent of the possible increase within a short time. The later increases may be attributed in part to other factors such as milking of more cows, cows which would not otherwise be milked, and the bringing into production of more heifers than the normal increase.

The dairy industry in Kansas seems to be one on which farmers tend to fall back in times of depression. It affords a fairly steady cash income with little in the way of cash expenditures when carried on in a small way. The only period since 1924 when the relationship between butter production and the butterfat price-feed cost ratio does not rather consistently appear is the period beginning around June 1930 and continuing until May 1931. During this period butter production was increasing almost steadily while the ratio was becoming less favorable or holding about uniform. The assumption is that this was due to the increased number of farmers who either began milking a few cows they had, or who purchased heifers that otherwise would have gone to market, and began selling small lots of butterfat. No one farmer would produce any considerable quantity but with many farmers doing this to supply them-

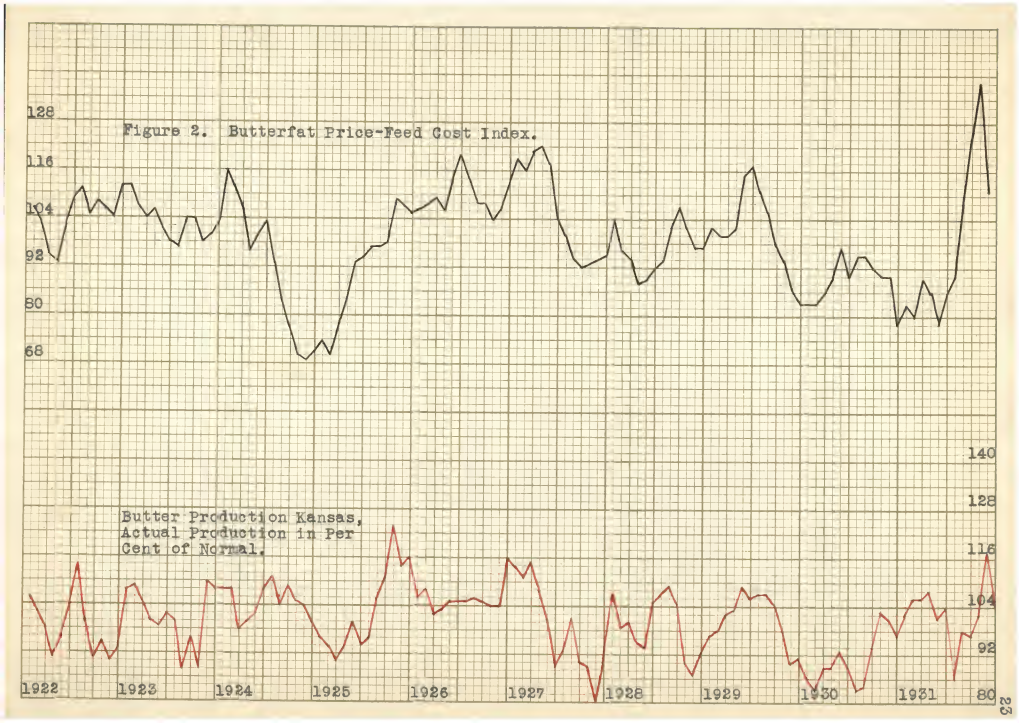


Figure 2. Butterfat Price-Feed Cost Index.
128
116
104
92
80
68
Butter Production Kansas, Actual Production in Per Cent of Normal.
140
128
116
104
92
80
1922
1923
1924
1925
1926
1927
1928
1929
1930
1931

Table IV. Kansas Butter Production Index. Index of Production Based on Normal Production for 1921-31

	Jan. Mar.	Apr. June	July Sept.	Oct. Dec.
1921	83	102	98	98
1922	101	98	100	93
1923	107	100	94	101
1924	104	103	107	103
1925	93	96	106	117
1926	105	104	105	108
1927	112	98	94	86
1928	102	98	106	90
1929	99	106	106	92
1930	85	90	88	101
1931	104	104	93	108

Source:

Calculated from Table V.

selves with a small steady cash income it could easily be enough of a factor to show up in the total quantity of butter produced.

COMPARISON OF MILK PRODUCTION PER COW IN KANSAS TO BUTTERFAT PRICE-FEED COST RATIO

Increases in production often are quite large in comparatively short periods of time. To determine whether increases were due to higher production per cow or due to the milking of more cows the following comparisons were made. Data for studying increase in number of cows were not a-

vailable so an attempt was made to establish the relationship between the ratio and milk production per cow.

Figures were available of the production per cow on the first day of each month since 1925. These averages taken from a large number of farms should show a relation to the ratio if the farmers as a group give any attention to the relative position of milk prices and feed costs.

It was difficult to establish any relationship using actual production figures because the normal trend of production has shown such a rapid increase ever since these production figures have been secured. Charting each month with the same month a year later the production lines in nearly all cases showed an increase. This fact can be attributed to a number of influences but are outside of the scope of this thesis.

Because the normal increase seemed to overshadow the minor fluctuations the normal trend of production per cow was determined for the period 1925 to 1931, then the actual milk production per cow for each month was expressed in per cent of the expected or normal production. This gave a figure more nearly representative of changes due to seasonal factors. These milk production figures showed more seasonal variations than did the butter production figures. That is, they seemed to be affected more by factors, such as pasture conditions. At any rate, even with the normal

trend accounted for, most years showed the highest seasonal production during the pasture months.

The tendency of the milk production per cow to follow the ratio curve exists but not to the degree that is true of butter production.

The farmers reporting these production figures are probably the better dairymen and a large per cent of them are engaged in selling whole milk. Because of this fact, their monthly production does not vary as much as is true of those farmers selling butterfat.

The average milk production per cow, expressed in per cent of the normal trend of production was correlated with the monthly index of the butterfat price-feed cost ratio. When the ratio figures were correlated with the production one month later, a relatively high correlation was obtained. The correlation was found to be +.406.

These figures on milk production per cow per day were compared with the ratio in three different forms. The actual production figures were compared with the ratio. The production per cow in per cent of the average of the seven year period (Figure 3), and production per cow in per cent of normal (Figure 4). The actual in per cent of the normal showed much the highest correlation. Having the normal increase accounted for it remains that variations are due to other factors. The production figures are much

Table VI. Kansas Milk Production.

Pounds of Milk Produced Per Milk Cow Per Day.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1925	10.6	10.3	10.9	12.2	13.8	14.9	13.9	12.4	11.7	10.2	9.5	10.3
1926	11.3	12.3	12.8	13.6	14.8	17.4	14.5	12.7	11.7	10.4	11.5	11.7
1927	12.4	12.3	12.6	14.4	16.1	16.6	15.8	14.1	12.9	10.7	11.3	11.4
1928	11.4	13.0	12.8	14.4	15.0	17.3	16.5	14.7	13.0	11.6	11.2	10.8
1929	11.8	12.8	13.4	15.1	16.1	17.3	17.3	15.1	13.0	11.2	11.1	11.2
1930	11.9	13.0	14.3	15.2	15.6	17.7	15.9	13.1	12.6	11.9	10.8	12.3
1931	12.5	13.4	14.4	15.2	16.2	18.0	15.6	13.3	12.8	11.7	12.0	11.9
Total	81.9	73.7	91.2	100.1	107.6	119.2	109.5	95.4	87.7	77.7	77.4	79.6
	11.7	12.2	13.0	14.3	15.3	17.0	15.6	13.6	12.5	11.1	11.0	11.3

Source:

Wisconsin Dairying Bulletin No. 120. Page 100. Wisconsin Crop and Livestock Reporting Service.

Table VII. Pounds of Milk Produced Per Cow Per Day in Per Cent of Average For Seven Year Period.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1925	90.5	84.4	83.8	85.3	90.2	87.6	89.1	91.2	93.6	91.9	86.4	91.1
1926	96.6	100.8	98.5	95.1	96.7	102.3	92.9	93.4	93.6	93.7	104.4	103.5
1927	106.0	100.8	96.9	100.6	105.2	97.6	101.3	103.7	103.2	96.4	102.7	100.9
1928	97.4	106.5	98.5	100.6	98.0	101.8	105.8	108.0	104.0	104.5	101.8	95.6
1929	100.8	104.9	103.0	105.6	103.2	101.8	110.9	111.0	104.0	100.9	100.9	99.1
1930	101.7	106.5	110.0	106.3	102.0	104.1	101.9	96.3	100.8	107.2	98.2	108.8
1931	106.8	109.0	110.7	106.3	105.9	105.9	100.0	97.8	102.4	105.4	109.0	105.3

Source:

Wisconsin Dairying Bulletin No. 120. Page 100. Wisconsin Crop and Livestock Reporting Service.

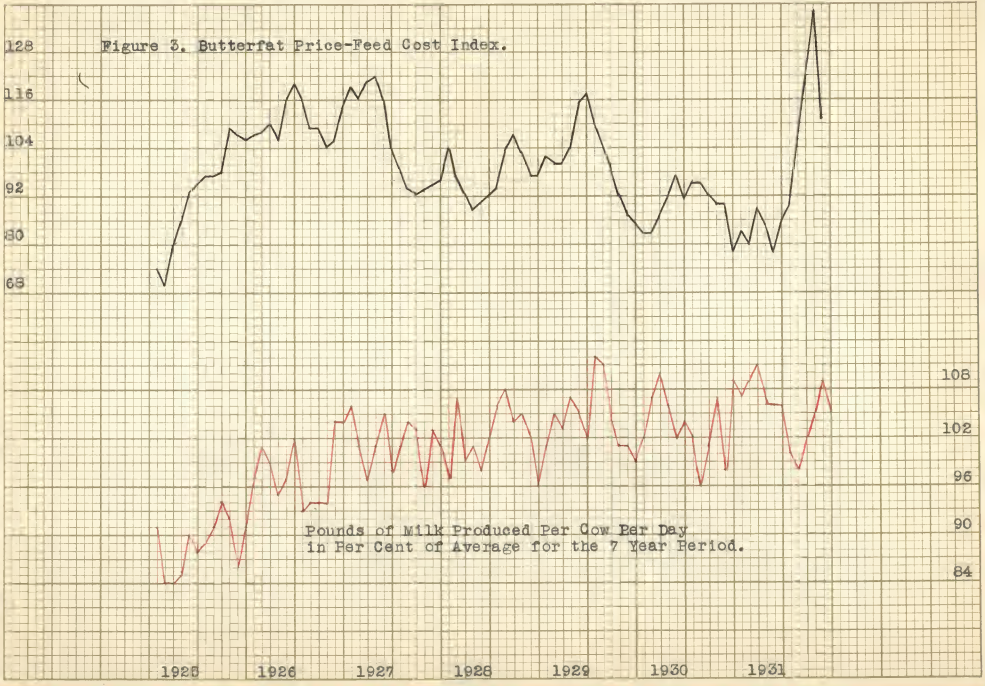

128
116
104
92
80
68
Figure 3. Butterfat Price-Feed Cost Index.
108
102
96
90
84
Pounds of Milk Produced Per Cow Per Day
in Per Cent of Average for the 7 Year Period.
1925
1926
1927
1928
1929
1930
1931


Figure 4. Butterfat Price-Feed Cost Index.
128
116
104
92
80
68
110
104
98
92
86
Production Per Cow Per Day
Average Actual in Per Cent of Normal.
1925
1926
1927
1928
1929
1930
1931

Table VIII. Production Per Cow Per Day.

Average Actual in Per Cent of Normal

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1925	95.4	92.0	94.8	93.1	95.2	92.5	94.5	95.4	96.3	100.0	91.3	96.3
1926	100.0	106.0	106.7	100.7	100.0	106.0	96.7	96.2	96.7	99.0	108.5	107.3
1927	107.8	102.5	100.8	103.5	106.6	99.4	103.2	105.2	104.9	99.0	104.6	102.7
1928	97.4	104.8	98.5	100.6	98.0	101.7	105.8	108.1	104.0	104.5	101.8	95.5
1929	99.2	100.0	99.2	102.7	103.2	100.0	108.8	109.4	102.4	98.2	99.1	97.3
1930	98.3	98.5	102.1	100.6	98.1	100.6	98.2	93.5	97.7	101.7	94.7	105.1
1931	101.6	97.1	99.3	98.0	100.0	100.5	94.3	93.7	97.7	97.3	103.4	100.0

Source:

Wisconsin Dairying Bulletin No. 120. Page 100. Wisconsin Crop and Livestock Reporting Service.

more variable than the ratio figures but the major trends are the same. The greatest relationship appeared when the ratio was compared with the production a month to a month and a half later (Figure 5). There are, of course, the seasonal high points of production but even these do not spoil the relationship shown to the ratio curve.

It was suggested that there might be a lag of six months or there abouts in the production as compared to the ratio. This correlation was attempted, but although there seems to be some relationship, apparent in the longer trends it does not show nearly the marked relationship found with the ratio compared to the production one month later.

Comparing the ratio with the production per cow one month later a table was made noting the number of times the production and the ratio moved up together, the number of times they moved down together, the number of times ratio went up and production down, and the number of times ratio moved down and production per cow was up. The results of this study were as follows:

Up together	Down together	Index up Production down	Index down Production up
33	21	16	14

In a total of 84 months, 54 times a positive relationship was shown or 64.2 per cent of the time the production followed the trend of the ratio.

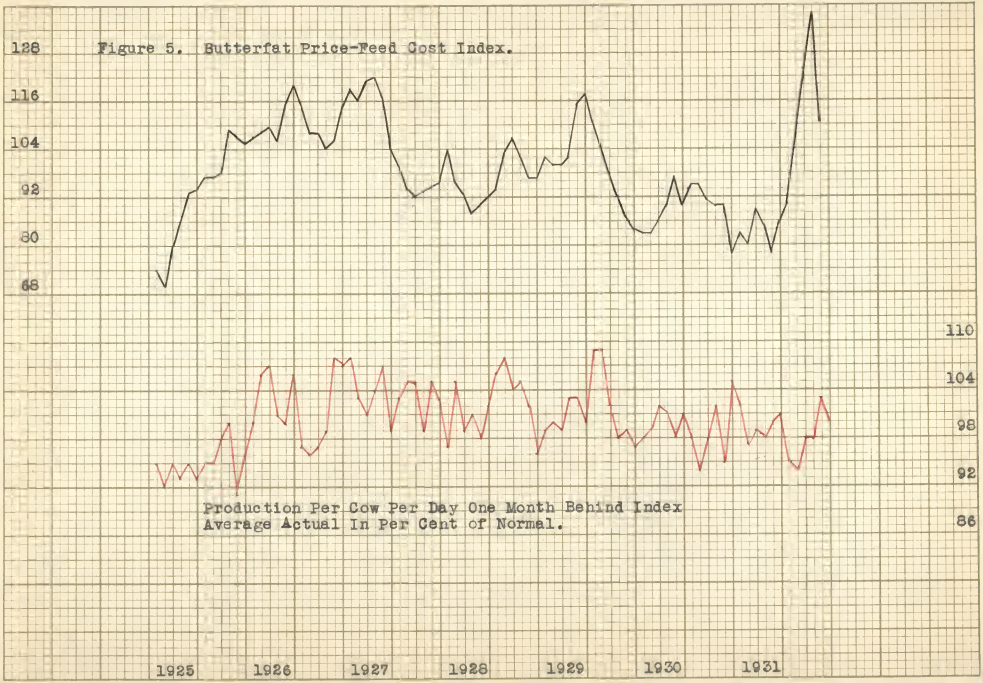


Figure 5. Butterfat Price-Feed Cost Index.

Production Per Cow Per Day One Month Behind Index
Average Actual In Per Cent of Normal.

COMPARISON OF BUTTERFAT PRICE TO THE BUTTERFAT PRICE-FEED COST RATIO

In comparing the butterfat price-feed cost ratio with Kansas butterfat prices it is recognized that the ratio is being compared with a factor which is itself a part of the ratio. However, since the ratio was computed from butterfat prices for the entire United States, and since a time element was introduced the comparison may be justified.

These figures were graphed using scales that would make them as nearly comparable as possible. The relation in this case as might be expected is an inverse one. The supposition being that a more favorable feed ratio would increase production and bring about a resultant lower price. The period 1920 to 1932 was used in this comparison and a very satisfactory relationship appears. There are short periods when these factors appear to be working in opposition to each other, but if time permitted, the overshadowing factor or factors could probably be determined.

Beginning in the spring of 1920 butterfat price began a downward movement from a high of 69 cents a pound in March to a low of 25 cents a pound in May 1921. The trend of the ratio during this period was upward or becoming more favorable.

In the fall of 1922 price advanced sharply from 28

cents in August to 53 cents in December. This advance in price was not preceded by any appreciable change in the ratio. Production fell off very markedly in the summer and fall of 1922 which probably accounts in part for this increase in price.

From 1923 the inverse relationship existing between these two factors is very marked with the changes in the price coming about two to two and a half months after the ratio changes. The last half of the years 1929 and 1930 are rather out of line but prices in general were declining very rapidly during this period, and butterfat prices seemed to keep ahead of feed prices by a large margin.

The period during which the country was most nearly on a stable or normal basis, 1924 to 1929, has throughout this study shown the highest relationship indicating that in times of readjustment as in the post war period, 1919 to 1923, or in times of changing business conditions as this country and others have experienced since the middle of 1929, the factors which normally have the greatest effect on the farmers plans or methods of procedure are replaced by a more artificial factor, or factors outside of the farmer's immediate control.

There seems to be no long time cycle in the production of dairy products as have been determined in the case of hogs, cattle and other livestock. In the case of butterfat

Table IX. Butterfat Price Paid At Kansas Local Stations.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly Ave.
1917	39.0	40.2	41.0	44.0	39.1	39.5	38.9	42.1	46.6	47.3	46.2	49.7	42.8
1918	52.3	54.0	46.6	42.0	43.3	44.0	46.3	48.2	58.0	62.2	64.8	70.6	52.8
1919	64.7	46.0	59.1	63.1	61.1	52.6	53.3	57.0	61.4	69.5	74.8	74.0	61.4
1920	62.2	62.1	69.7	64.5	58.6	53.9	55.6	54.2	57.6	54.4	55.8	42.2	57.6
1921	44.8	41.3	41.3	38.9	25.5	25.8	34.0	35.3	35.6	41.3	39.5	36.4	36.6
1922	28.2	30.6	32.4	31.2	30.6	32.8	31.9	28.5	33.7	38.0	45.0	52.6	34.6
1923	49.8	46.5	46.4	45.1	38.5	35.0	34.5	40.0	44.4	43.5	49.9	52.5	43.8
1924	51.6	48.1	45.9	35.4	34.0	35.5	34.0	30.5	31.8	31.8	36.6	39.9	37.9
1925	37.0	37.0	42.3	39.0	37.8	37.8	37.5	39.0	43.0	46.6	45.6	42.8	39.6
1926	37.6	37.5	37.7	35.0	34.0	34.4	33.0	33.7	38.5	43.5	42.5	44.6	38.1
1927	42.1	45.1	46.0	45.8	38.0	37.3	35.8	35.7	38.8	41.8	43.3	47.5	41.4
1928	46.2	43.6	47.8	42.9	42.0	41.2	40.0	41.8	45.3	44.4	46.4	46.9	44.0
1929	44.0	45.8	47.1	46.1	43.5	41.4	39.8	40.3	41.7	41.9	34.9	31.6	41.5
1930	27.6	28.8	30.8	32.4	27.9	23.4	26.8	33.9	34.2	29.3	24.9	20.4	28.4
1931	19.0	19.3	22.1	17.4	14.8	15.3	16.8	20.3	22.8	26.1	22.4	20.8	19.7
Ave. 1921-1931	40.9	40.4	41.8	39.2	35.2	34.5	34.7	35.8	38.7	40.2	40.8	41.5	

Source:
Prices taken from Kansas City Daily Drovers Telegram and averaged by months.

price, there is a distinct seasonal trend but this corresponds to the trend of the ratio (Figure 6). Changes in the butterfat price-feed cost ratio are followed by changes in butterfat price about two to two and a half months later. At times, there appears to be a lag of as much as three months, but these were few during the twelve year period studied.

In this connection, an attempt was made to determine if the relationship would appear to a greater degree if the butterfat price was compared directly with the number of pounds of feed a pound of butterfat would buy rather than the relative position of the ratio based on an average of the period being used. This was worked out for only a few years and as the relationship was not as good as when the index figures were used, it was not developed further.

The price of standard or 90 score butter at Chicago was charted with the ratio (Figure 7). Here again, the major trends were the same but these butter prices did not show the correlation to the ratio which was found in the Kansas butterfat price. In the case of Chicago butter price, the lag was found to be somewhat longer than was true of the butterfat price. These butter prices show a distinct lag of from three to four months, whereas the Kansas butterfat prices showed only a two to two and one-half month lag behind the ratio.

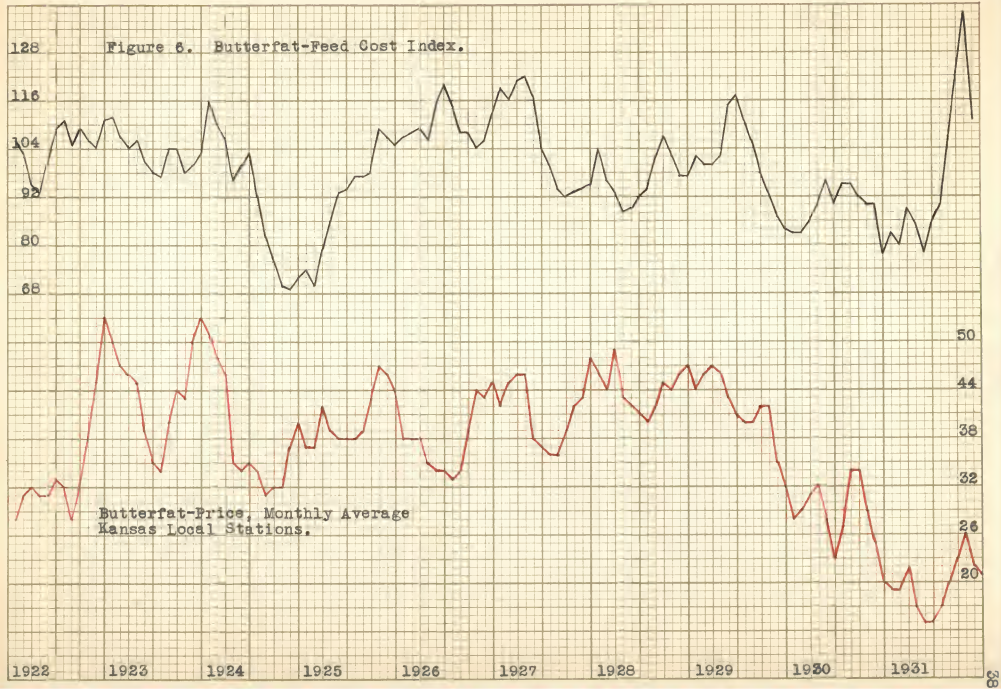


Figure 6. Butterfat-Feed Cost Index.
128
116
104
92
80
68
50
44
38
32
26
20
Butterfat-Price, Monthly Average
Kansas Local Stations.
1922
1923
1924
1925
1926
1927
1928
1929
1930
1931

Table X. Chicago Butter Prices 90 Score

Simple Monthly Average.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1921	46.6	46.2	43.7	43.3	28.9	31.7	38.0	37.7	37.3	39.6	38.1	37.4
1922	32.0	34.6	36.8	36.2	34.1	35.8	34.2	33.4	36.7	40.2	45.8	50.0
1923	48.6	48.4	48.5	44.7	40.7	38.9	38.1	42.4	44.5	45.5	49.0	49.6
1924	51.1	49.4	45.4	36.2	35.6	37.8	35.3	34.9	35.0	38.8	39.0	41.0
1925	37.4	38.4	45.4	41.5	39.3	40.2	40.2	40.6	44.6	47.0	46.3	45.2
1926	41.9	41.9	40.7	37.4	38.4	37.6	37.4	38.8	41.2	43.0	45.4	48.8
1927	46.7	49.0	48.4	47.0	40.1	39.1	38.2	39.2	42.6	43.7	45.0	47.1
1928	45.0	44.3	46.9	43.1	42.5	41.4	42.6	44.5	45.6	45.0	46.6	47.7
1929	45.5	47.8	46.7	43.4	41.0	40.9	40.0	41.0	42.8	41.8	39.4	37.2
1930	33.8	34.1	36.2	36.2	32.1	30.0	32.5	36.5	36.7	35.7	31.6	29.0
1931	26.0	26.0	27.6	23.8	21.4	21.1	22.6	25.5	27.9	29.8	28.0	26.8

Source:

Drovers Journal Yearbook of Figures, 1930. Published by Chicago Daily Drovers Journal.

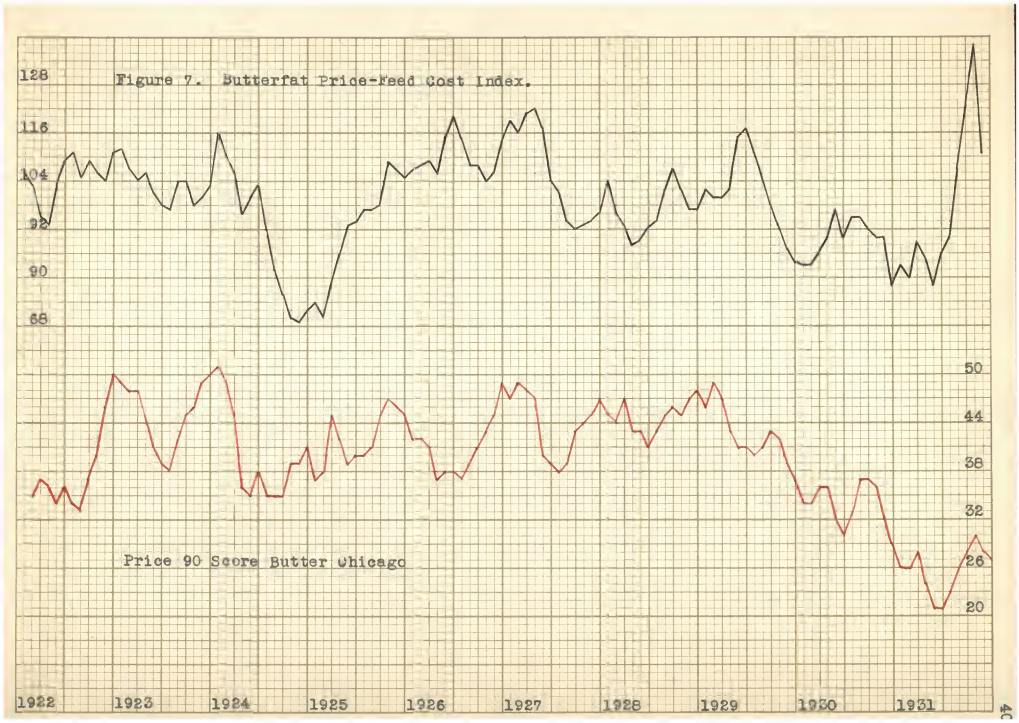


Figure 7. Butterfat Price-Feed Cost Index.
128
116
104
92
90
68
50
44
38
32
26
20
Price 90 Score Butter Chicago
1922
1923
1924
1925
1926
1927
1928
1929
1930
1931

Comparing the ratio with the Kansas butterfat price two months later, the following results were obtained:

Up together	Down together	Ratio up price down	Ratio down price up
24	30	51	37

Out of the total of 142 months an inverse relationship was shown 62 per cent of the time.

This is not a complete indication of the correlation existing because often the trend is broken one month by some other factor which gives a direct correlation rather than an inverse one.

SUMMARY

It has been evident throughout this study that producers do give considerable attention to the relationship existing between butterfat price and the price of concentrates.

The most consistent relationship appeared in the butter production study indicating that the producers of butterfat in Kansas vary their production according to the relative margin of profit.

Those producers with a whole milk trade apparently pay less attention to the relative price of feed, presumably because of the need of a more nearly stable production to supply their trade.

It takes about one and one-half to two months before changes in the butterfat price feed cost ratio show up in the production of butter.

In the case of milk produced per cow, the influence is shown in about one month to six weeks.

Price changes are even more tardy in responding to changes in the ratio, usually occurring about two to two and a half months later with occasionally as much as three months lag.

The correlation between production and the ratio is much higher during the months when pasture is not available.

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