Some Pricing and Regulatory Effects of the Federal Order On The Tulsa Milkshed

By
Leo V. Blakley and Durward Brewer
Department of Agricultural Economics

LLETIN NO. B-451 MARCH, 195

Agricultural Experiment Station
DIVISION OF AGRICULTURE
Oklahoma A. & M. College, Stillwater

CONTENTS

What a Federal Milk Order Means...

A Federal Order on milk marketing is instituted only when requested by an organized group of producers and approved by the Secretary of Agriculture. Such an Order may vary in detail from one milkshed to another; however, the objectives are the same for all, including the Tulsa milkshed.

The three objectives of a Federal Milk Order are:

1. Provide stable and dependable markets for producers who sell milk in city markets;
2. Assure consumers that they will get an adequate supply of pure and wholesome milk; and
3. Provide an efficient mechanism which will operate in the public interest for establishing minimum prices to farmers for fluid milk.

To accomplish these aims, an Order provides for the establishment of: (a) a minimum price to producers which reflects the demand for and the supply of milk in the market; (b) a fair and equitable method of distributing the money to all producers who sell milk in the market; and (c) a procedure for obtaining accurate weights and tests of milk.

Cost of milk to the handlers is equalized in the market so that one handler does not have to pay more than another for the same grade of milk which is used for the same purpose. All milk is classified according to its use.

Prices are related to supply and demand by the use of price formulas. Class I milk price formulas for the Tulsa milkshed start with the value of milk which is manufactured into dairy products (condensed milk, butter, milk powder, etc.), then a certain amount is added to cover the extra cost of producing Grade A milk for consumption in fluid form.

Class II milk prices for the Tulsa milkshed are the same as prices paid for manufacturing milk by selected plants in the area.

Butterfat differentials for tests above and below 4 percent are related to Chicago 92 score butter prices.

Some Pricing and Regulatory Effects of the Federal Order on the Tulsa Milkshed

By Leo V. Blakley and Durward Brewer
Agricultural Economics Department

Governmental regulation of milk marketing under Federal Order is relatively new in Oklahoma. In May 1950, Federal Milk Marketing Orders became effective in the Tulsa and Oklahoma City milksheds. Since that date, Federal Orders have been initiated in additional milksheds serving Oklahoma dairy farmers.

Four years of governmental participation appear sufficient to appraise some of the pricing and regulatory effects of a Federal Order upon the dairy farmers of Oklahoma. For this reason, the Experiment Station undertook a study in the Tulsa milkshed to determine the size and type of farm adjustments which were either directly or indirectly connected with the Federal Order.

The basic information for this study was obtained by personal interviews with 45 Grade A dairy producers in the Tulsa milkshed. The producers were selected at random from the group of 340 Grade A producers who had been in dairy production from at least 1949 through 1952. This is a sample of 1 out of 8 of the relatively "long time" Grade A producers in the Tulsa milkshed.

The farms of the producers in the sample were of the family type and ranged in size from 80 to 320 acres with Grade A buildings and facilities. In general, additional feed for the dairy enterprise was purchased while most of the labor was furnished by the operator and his family. Dairy production was the most important enterprise on about 82 percent of the farms in the sample. Most of the remaining farms were combination beef and dairy farms, and on some of these beef contributed more to the farm income than did the dairy enterprise.

The producers interviewed had been in Grade A dairy production at least 4 years. About 35 percent had been in Grade A dairy production from 4 to 5 years, 35 percent from 5 to 9 years, and 30 percent had been in Grade A dairy production for more than 9 years. On the basis

of these characteristics, the analysis applies directly to the adjustments of relatively "long time" dairy producers and may not be valid for the adjustments of "new" producers.

Effects

HERD SIZE

Only small changes were made in the distribution of herds from one size group to the next and in the average size of herds (Table 1). In general, there were fewer herds with 11 to 20 cows and more herds with 10 cows or less in 1953 than in 1949.

The average herd size of the producers in the sample increased from 22.5 head in 1949 to 23.5 head in 1951. After this peak, a net decrease of about one cow per herd occurred from 1951 to 1952 and a further decrease of one cow per herd occurred from 1952 to 1953. The most common herd size, 11 to 20 cows, also decreased each year after 1951.

There is evidence that the number of pounds of milk sold per farm did not decrease significantly as average herd size decreased. A detailed study of individual farm milk sales revealed that 1952 milk production per farm was down only 0.3 percent from 1951 while the average herd size was down almost 5.0 percent. For practical purposes this represents the same total milk production, but from fewer cows.

Table 1.—Dairy Herd Size of 43 Producers in the Tulsa Milkshed, 1949-1953.

Herd size	Number of producers in:				
	1949	1950	1951	1952	1953
10 or less	1	2	2	2	5
11-20	23	23	23	20	17
21-30	7	6	5	9	8
31-40	2	3	3	4	1
41 or more	4	5	5	3	4
Unknown	6	4	5	5	8
Total	43	43	43	43	43
Avg. herd size	22.5	23.0	23.5	22.4	21.5

SOURCE: Data acquired from interviews with producers in the Tulsa, Okla., milkshed.

MILK TESTS

Both milk tests and butterfat price differentials have declined since the Federal Order became effective. In 1949 the butterfat price differential averaged about 10 cents. That is, for each point (0.1 percent) which an individual farmer's milk tested below 4 percent, a deduction of 10 cents per 100 pounds was made in the price of milk. For milk testing above 4 percent an addition of 10 cents per 100 pounds was made for each point. From January through May 1950, the butterfat price differential was 7 cents for each point over the 4 percent test level and the butterfat price differential was 10 cents for each point under the 4 percent test level.

Under the Federal Market Order, the butterfat price differential was set by a formula based directly upon Chicago 92 score butter prices. The immediate effect of pricing by formula was to equalize the butterfat price differentials for points above or below the 4 percent test level. This meant that the butterfat price differential for milk of less than 4 percent was reduced from 10 cents to 7.5 cents. This decrease provided the stimulus for producers to lower the average test of milk on the Tulsa Market. For producers selling milk which tested above 4 percent the price per 100 pounds was lower than in 1949 (the premium for high-fat milk was less) and slightly higher than in the first five months of 1950. For producers selling milk which tested below 4 percent the price per 100 pounds was higher than in 1949 and in the first five months of 1950 (the discount for low test milk was less). Consequently producers began mixing herds and using lower test breeds. By 1951, producers had reduced their average tests from 4.16 percent to 4.03 percent—a decline of 1.3 points (0.13 percent) in the butterfat tests.

In terms of relationships, the change in the butterfat price differential one year was always followed by a change in test in the same direction the following year (Fig. 1). As an average for the 3 years 1949-1952, a 4.4 percent change in the butterfat price differential was followed by a change of one percent from the milk test level during the next year. For example, a decrease in the butterfat differential from 8.00 to 7.65 cents would be followed the next year by a reduction in average tests from 4.00 percent to 3.96 percent with other price relationships remaining about the same.

These changes indicate that butterfat pricing under the Federal Order was sufficiently flexible to permit some adjustment of milk tests to market demands. Under the Order, lower butterfat price differentials

encouraged the use of lower test breeds and resulted in an increased number of pounds of milk produced per cow.

This analysis applies to a period in which dairy prices were relatively stable. However, since 1952 drastically lower prices of beef and the restricted production of some crops have made the extra income from dairying quite attractive. During such periods milk tests might go up even though the butterfat price differentials were going down. Thus, it is the butterfat differential relative to price (or income alternatives) that is important for anticipating changes in average tests. In other words, the low beef prices and restricted crop production during some periods might be more important than changes in the butterfat price differential in determining milk tests.

PRODUCTION STABILITY

In the Tulsa milkshed, two factors appeared to be most important in causing variations in milk production. These factors were (1) changing weather conditions, and (2) changing relative milk prices.

Weather

The type of instability of milk production which is caused by changing weather conditions is largely unplanned and outside the farmer's control. The results of weather conditions are reflected in the amounts and prices of feed and pasture crops which, in turn, partially determine milk production. Favorable weather usually indicates that feed prices will be low and milk production large. On the other hand unfavorable weather usually indicates that feed prices will be high and milk production small.

Most of the dairy farmers interviewed were particularly responsive to changing weather conditions since they did not produce all the feed needed for their dairy enterprises. About 60 percent of the dairy men purchased three-fifths or more of their total feed requirements and about 31 percent purchased from one-fifth to three-fifths of their feed requirements. Only about 9 percent purchased less than one-fifth of their feed requirements.

Since a considerable proportion of the feed for the dairy enterprise was purchased, high feed prices represented large out-of-pocket costs for any given amount. In order to reduce these costs, some of the farmers would use lower feeding rates or lower quality feeds and some would decrease the size of their dairy enterprises and expand the size of other enterprises. Both types of adjustment would result in a de-

cline in milk production. In a similar manner, milk production would increase when feed prices were low. These actions, though, depend upon the other price or income possibilities facing each individual farmer. The Federal Order, of course, could not affect that part of the production instability which was caused by weather.

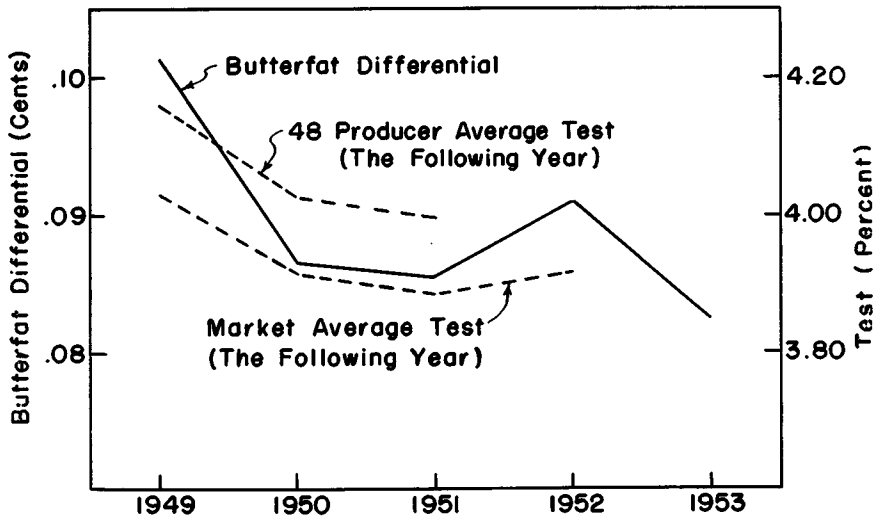
Relative Milk Price

The type of instability of milk production which is caused by changing relative milk prices is under the farmer's control and is a result of planned action. This type of instability is greatest when an alternative enterprise yielding approximately the same income can be included in the farm organization. The beef enterprise is such an alternative enterprise for many of the dairy farms in the Tulsa milkshed. Therefore, the price of milk relative to the price of beef was important in determining the production of the two products.

An analysis of changes in relative milk prices as indicated by the milk-beef price ratios* and milk production for the Tulsa milkshed

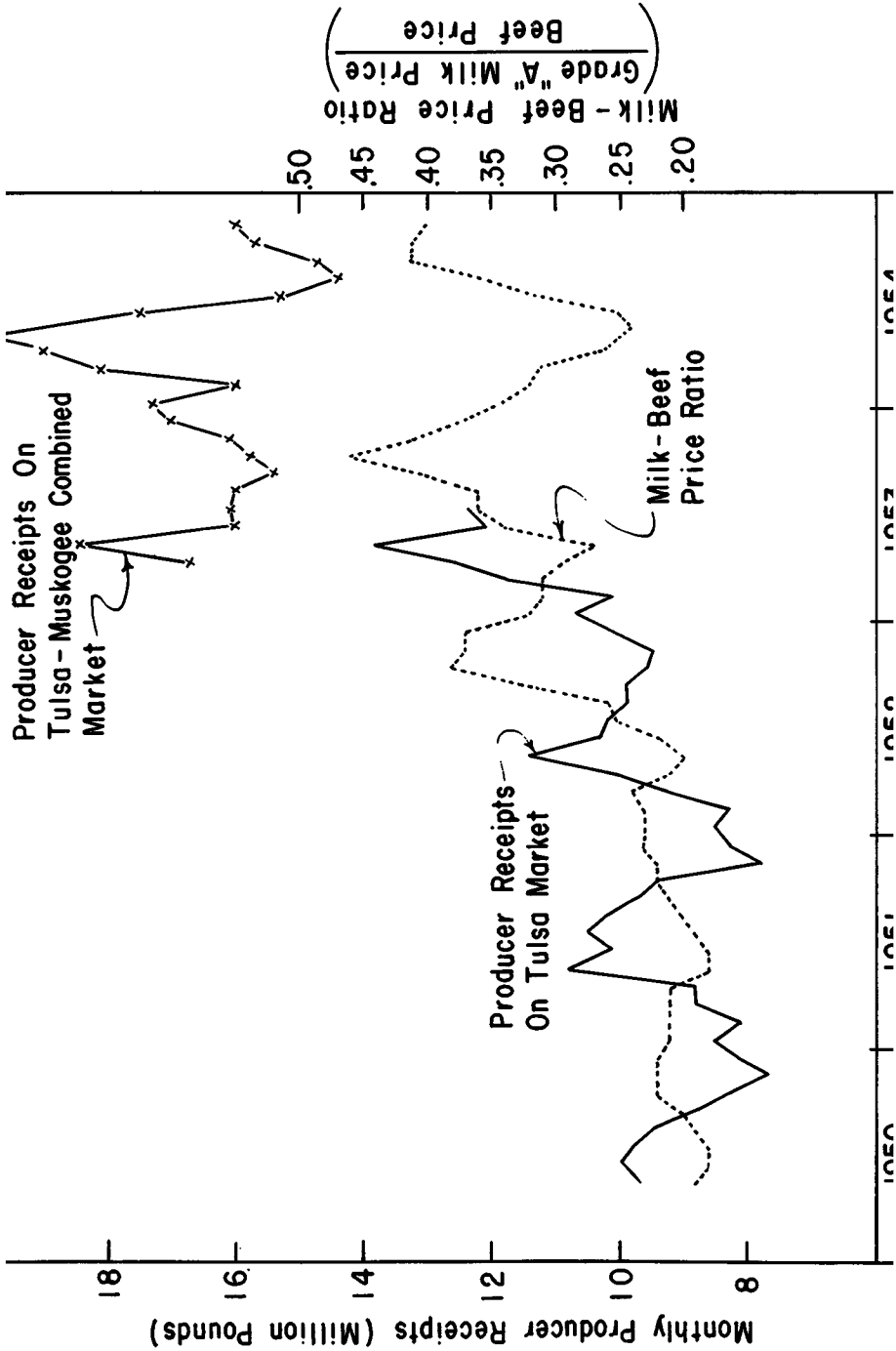
* The milk-beef price ratio is computed in the following manner: The Tulsa uniform blend milk price per 100 pounds is divided by the price received by Oklahoma farmers for cattle per 100 pounds for the same month.

Fig. 1.—Butterfat differential, market average test the following year, and 48 producer average test the following year. Tulsa, Okla., milkshed; 1949-1953.



SOURCE: 1949 butterfat differential compiled from monthly Fluid Milk and Cream Report, BAE, USDA. Remaining data obtained from various reports of the Market Administrator for Tulsa, Okla., milkshed, AMS, USDA, and from records of the Pure Milk Producers Association of Eastern Oklahoma.

Fig. 2.—Milk-beef price ratios, producer receipts on Tulsa market and producer receipts on the Tulsa-Muskogee combined market. 1950-1954.



reveals two types of changes (See Figure 2 and Table 2). The first type is a seasonal or month-to-month change in the relationship of the milk-beef price ratio and milk production. The second type is an annual or year-to-year change in the same relationship.

Seasonal Changes.—Seasonally, the milk-beef price ratio was lowest during April, May, and June. This was to be expected since Grade A milk prices usually are lowest during this period of flush production, while Oklahoma cattle prices (particularly stockers and feeders) usually are highest. Consequently, the milk-beef price ratio was lowest when milk production was highest. During the fall the opposite condition occurred with the milk-beef price ratio at a peak and production at its lowest point.

Annual Changes.—From the standpoint of annual changes, changes in relative milk prices have been followed by changes in milk production in the same direction (Figure 2). From May 1950, until the middle of 1952, the milk-beef price ratio increased slightly; production also increased by a moderate amount. Beginning with the drop in cattle prices in June 1952, the milk-beef price ratio increased rapidly, though irregularly, until the peak was reached in October 1953. Milk production also began to increase rapidly, and a new record was established each month. However, in 1954 the upward climb was halted. Lower support prices for dairy products decreased the actual prices of dairy products and beef prices began to strengthen. As a result, the milk-beef price ratio declined more than usual during April, May and June. The lower relative milk prices together with the unfavorable weather during the summer of 1954 were responsible for the large decreases in milk production beginning in June. However, even this large decline in relative milk prices left the milk-beef price ratio substantially above 1950 and 1951 levels. This relationship of relative milk prices and milk production can be better observed if the seasonal changes are removed* (Figure 3). In general, milk production begins to increase within 3 to 6 months after there has been an increase in the milk-beef price ratio. In the other direction, milk production begins to decrease within 3 to 6 months after the beginning of a decrease in the milk-beef price ratio. These changes were not directly proportional but they were always in the same direction.

Fluctuating Production Under Milk-Beef Price Ratios.—An attempt was made to determine the number of dairy producers who would change production of beef and dairy under different prices. With

* The seasonal changes were removed by the use of a 12 month moving average.

Table 2.—Monthly Uniform Blend Milk Prices, Cattle Prices Received by Oklahoma Farmers, and Milk-Beef Price Ratios*, for the Tulsa Milkshed, 1950-1954.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1950												
Milk Price	----	----	----	----	4.14	4.08	4.04	4.14	4.70	4.94	5.03	5.09
Beef Price	----	----	----	----	21.50	22.30	23.00	23.00	23.40	22.90	23.30	23.50
Ratio	----	----	----	----	.19	.18	.18	.19	.20	.22	.22	.22
1951												
Milk Price	5.41	5.64	5.71	5.76	5.04	4.99	5.17	5.35	5.58	5.79	5.87	5.96
Beef Price	25.20	27.20	27.50	28.00	28.00	27.60	27.00	27.00	27.00	26.50	26.60	25.80
Ratio	.21	.21	.21	.21	.18	.18	.19	.20	.21	.22	.22	.23
1952												
Milk Price	6.11	6.19	6.30	5.55	5.29	5.27	5.67	5.76	6.39	6.66	6.60	6.51
Beef Price	26.40	26.50	26.50	26.50	27.00	24.50	23.00	22.00	20.00	17.50	18.00	17.60
Ratio	.23	.23	.24	.21	.20	.22	.25	.26	.32	.38	.37	.37
1953												
Milk Price	5.76	5.52	5.30	4.76	4.40	4.46	5.01	4.90	5.08	5.23	5.07	4.86
Beef Price	17.80	17.70	17.00	16.40	16.20	13.10	14.00	13.50	12.60	11.30	12.30	13.10
Ratio	.32	.31	.31	.29	.27	.34	.36	.36	.40	.46	.41	.37
1954												
Milk Price	4.65	4.59	4.53	4.01	3.71	3.75	4.28	4.83	5.46	5.37	5.04	----
Beef Price	13.80	14.40	14.80	15.20	15.70	15.00	13.70	13.20	13.30	13.00	12.50	----
Ratio	.34	.32	.31	.26	.24	.25	.31	.36	.41	.41	.40	----

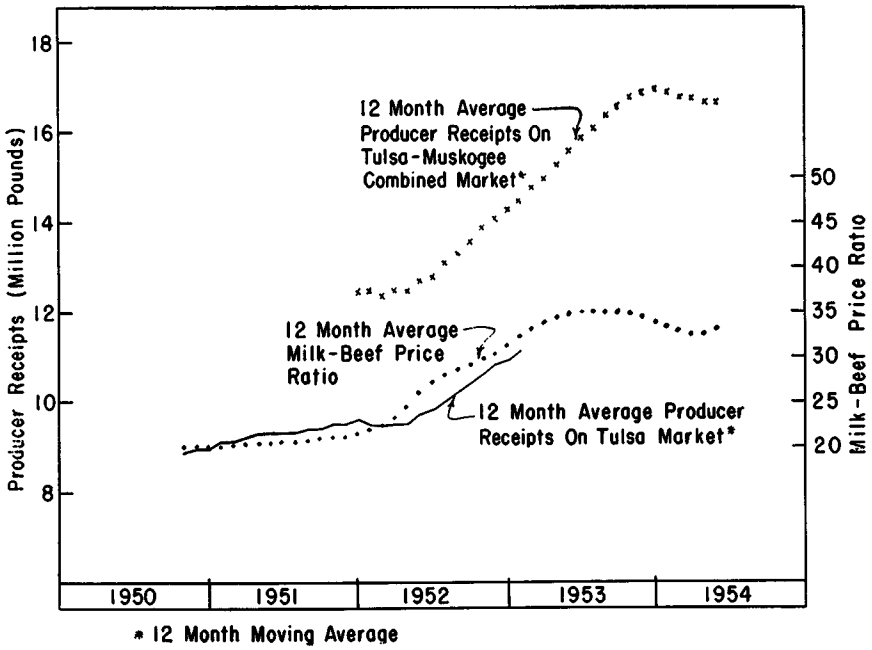
* The uniform blend milk price per 100 pounds is divided by the price received by Oklahoma farmers for cattle per 100 pounds during that same month.

prices of $16.50 per 100 pounds for beef and $5.00 per 100 pounds for Grade A milk, roughly 75 percent of the producers were engaged exclusively in Grade A production at the time of the survey. Using these prices as a base, producers were asked to indicate their production plans under different prices of milk or of beef or of both milk and beef.* In all cases the prices of labor, machinery, feed, and other crops were specifically assumed to remain the same.

An increase in the price of milk to $6.00 (from $5.00) per 100 pounds with no change in beef prices would stimulate milk production (Table 2). Approximately 91 percent of the Grade A producers would be engaged exclusively in milk production under these prices as compared with 75 percent under the prices of $5.00 milk and $16.50 beef. Thus, about 16 percent of the dairy producers would drop beef production from their farm organizations under the higher price of milk.

* Answers to this series of questions were obtained from 32 producers in the sample.

Fig. 3.—Twelve-month moving averages of milk-fed price ratios, producer receipts on the Tulsa market, and producer receipts on the Tulsa-Muskogee combined market. 1950-1954.



SOURCE: Computed from Table 2 and from data in various reports of the Market Administration for the Tulsa-Muskogee, Okla., milk marketing area, AMS, USDA.

Table 3.—Percentage of 32 Grade A Milk Producers With No Beef Production at Given Prices of Milk and Beef, Tulsa Milkshed.

When BEEF PRICE was: (dollars/100 lbs.)	And MILK PRICE was: (dollars/100 lbs.)	The percentage of producers with no beef production was:
14.00	4.00	71.88
	5.00	75.00
	6.00	90.62
16.50	4.00	56.25
	5.00	75.00
	6.00	90.62
20.00	4.00	43.75
	5.00	65.62
	6.00	84.38
25.00	4.00	40.62
	5.00	56.25
	6.00	62.50

On the other hand a decrease in the price of milk to $4.00 (from $5.00) per 100 pounds with no change in beef prices would cut milk production (Table 3). Under these prices, only about 56 percent of the Grade A producers would be engaged exclusively in milk production and about 19 percent would add beef production to their farm organizations.

At a very low relative milk price ($4.00 milk and $25.00 beef), approximately 41 percent of the Grade A producers would remain exclusively in milk production. The other producers would add beef production to their farm organizations. Almost 44 percent of the farmers in the sample would completely abandon the Grade A enterprise so long as this low relative milk price existed.

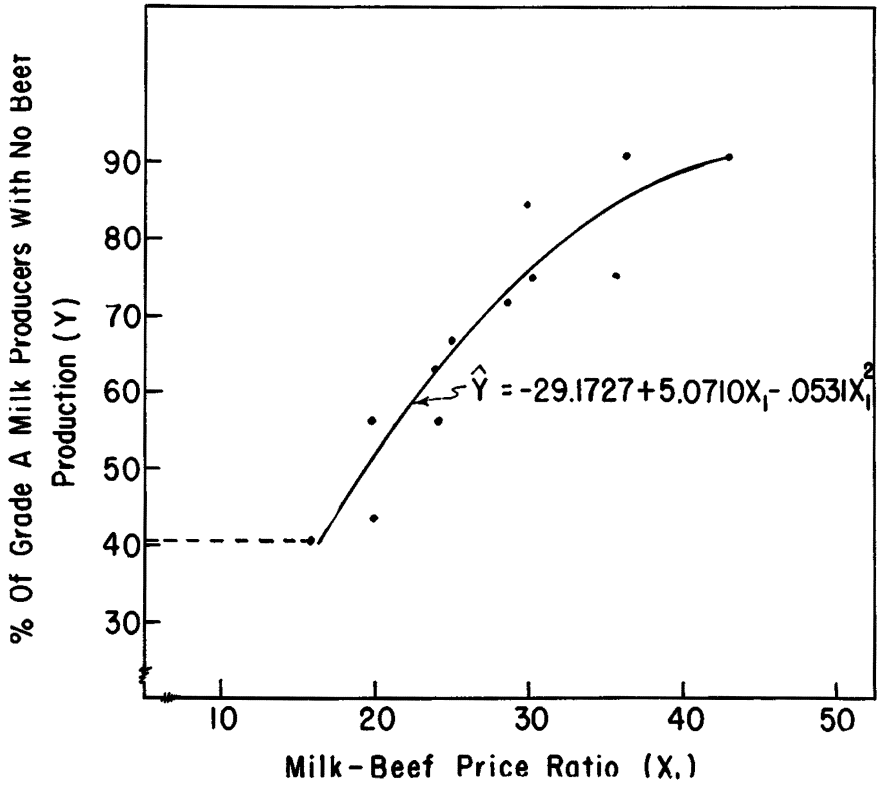
The positive relationship between the relative price of milk and the importance of milk production on the farms in the sample was very high.* With a milk price at 20 percent of the beef price, about 51 percent of the Grade A producers would have no beef production (Figure 4). However, if the milk price was as much as 40 percent of the beef price, about 89 percent of the Grade A producers would have no beef production. Thus, as the relative price of milk increased, a larger percentage of the producers would have no beef production. Moreover, the number of producers adjusting production to relative price

* See "Notes on Methodology," page 21.

was high. Over 40 percent of these long time Grade A producers indicated that they would change from milk production exclusively to beef production exclusively, or vice versa, depending upon the relative prices of milk and beef.

This information could serve as a guide in anticipating changes in milk production when there is a change in the relative price of milk. However, it reflects only the direction of change in milk or beef production. For example, it indicates that milk production will decrease if relative milk prices go down. It does not indicate that milk production will decrease by any given percentage or number of pounds.

Fig. 4.—Relationship of milk-beef price ratio and the percentage of Grade A milk producers with no beef production, Tulsa milkshed.



SOURCE: See table in Notes on Methodology, page 21.

Class I Milk Price Changes.—Under the Federal Order, actual Class I milk prices are set by a formula subject to a supply and demand adjustment. If the Class I price is relatively high, the analysis indicates that more production will come on the market which, through the supply-demand provision, will eventually decrease the Class I price as well as the blend price. If on the other hand, the Class I price is relatively low, less production will come on the market which will eventually result in a higher Class I price and blend price. Therefore, since there have been no restrictions under the Federal Order which would keep new producers off the market (except base-surplus restrictions*), milk prices were free to move up or down through time depending upon milk production. In addition, beef prices have been free to move up or down through time. To this extent, the Federal Order has not inhibited the movement of relative milk prices.

If milk prices before the Federal Order did not change with different amounts of milk placed on the market, then the stability of milk production would depend on the type of restrictions used to control milk supply. In this case milk production might have been either more stable or less stable depending upon these restrictions.

SEASONALITY

Under the Federal Order, an attempt was made to get more even milk production throughout the year by paying a lower price for Class I milk during that season of the year when production was largest. Since April, May, and June usually were the months of largest production, the lower prices applied only to these months. The Class I milk price during these months was 40 cents per 100 pounds lower than the Class I price during the remaining months. For example, the basic formula price plus $1.45 is the Class I price (before the supply-demand adjustment) for April, May and June, and the basic formula price plus $1.85 is the Class I price (before the supply-demand adjustment) for July through March.

Of the producers interviewed, only about two-thirds would attempt to have about the same production during the fall and winter months as they had during the spring and summer months with this difference of 40 cents. Consequently, a considerable surplus of Grade A milk would result during April, May, and June from the remaining one-third of these producers and from the new producers unless additional con-

* This means that only a predetermined amount of milk of each producer is eligible for sale at Class I prices (under normal conditions) during April, May, and June. Base-surplus restrictions are set up to encourage more even milk production throughout the year.

trols were imposed. These additional controls became effective with the adoption of the base-surplus plan in April 1951. Under this plan, the daily average deliveries of Grade A milk for the individual producer during April, May, and June was equal to his average daily deliveries of Grade A milk during the four month period September through December.*

The process of adjusting dairy enterprises in order to have about the same milk production from one month to the next involved a considerable length of time. Generally it required a change in the breeding program to include more cows freshening in the fall and fewer cows freshening in the spring. Also on some farms a fall pasture program had to be integrated into the crop rotation plan and the farm organization.

By 1952, most of the producers in the sample were in the process of adjusting toward more fall production and less spring production. Within this sample group, actual production records were available for only 19 dairy farms. Of these 19, the majority had less milk production in March, April, May, July, and August of 1952 as compared with the same months of 1951 (Figure 5). For the remaining months, the majority had more milk production in 1952. However, the mild weather during the fall and early winter of 1952 favored large fall production and this was responsible for some of the adjustment. With the exception of May, the pattern of total milk deliveries for these 19 producers was toward less seasonal variation in 1952 than in 1951 (Figure 6). In general, production was smaller from June through August and larger from October through December. Thus, with the aid of the weather, the base surplus plan and the 40-cent price differential were sufficient incentives to cause producers to try to get more even production from month to month. Moreover, producers favored the continued use of both the price differential and the base-surplus plan. Approximately 80 percent of the producers said that they considered the base-surplus plan to be the most "fair" method of dealing with the seasonal surplus problem, especially since it tended to keep the summer producer off the market.

Apparently one major advantage of the Federal Order is the fact that all producers in the market are assured like treatment under a particular seasonal control program, which is acceptable to the majority of producers. Before the Federal Order, the base-surplus plan for one plant was entirely different from the plan for another plant since the

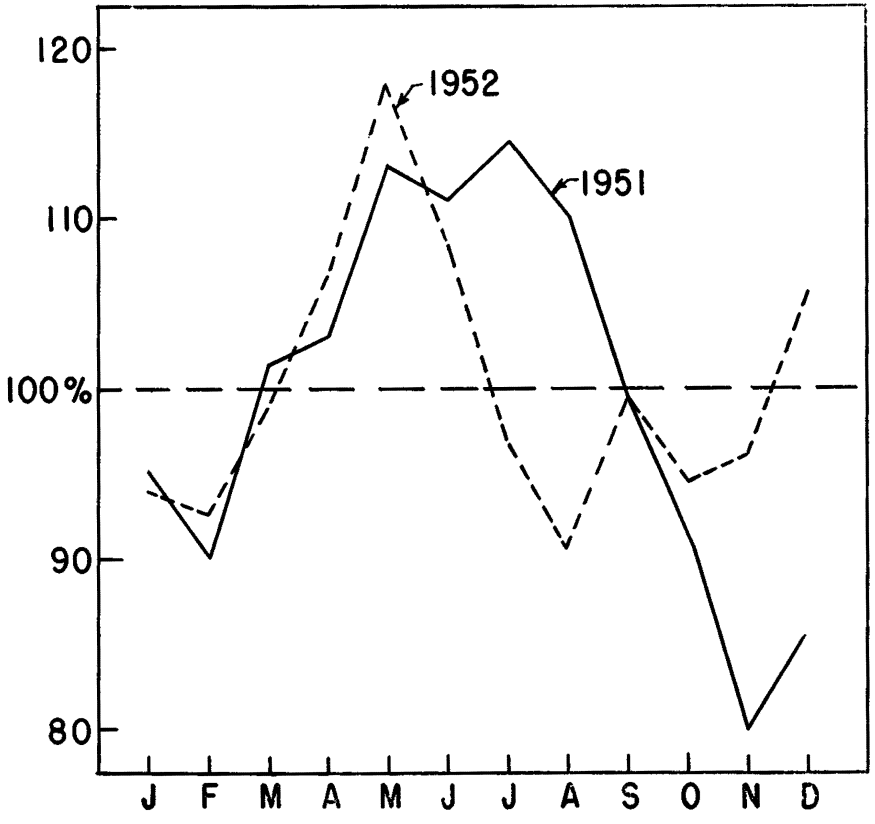
* Later revised (September 1952) to the five month period September through January.

Class I utilization of milk was not the same in each of the plants. The result was that one farmer might be selling to a plant with one base setting period and procedure while a neighboring farmer might be selling to a different plant with another base setting plan or period. By making the base-surplus plan cover the whole market, a more equitable treatment among farmers was assured.

Summary

This study was concerned with the size and type of adjustments in milk production associated with the pricing and regulatory effects of the Federal Order in the Tulsa, Okla., milkshed. The study was based on a personal-interview survey of producers who had Grade A milk

Fig. 5.—Seasonal variation of milk production, 19 Grade A milk producers in the Tulsa milkshed, 1951 and 1952.



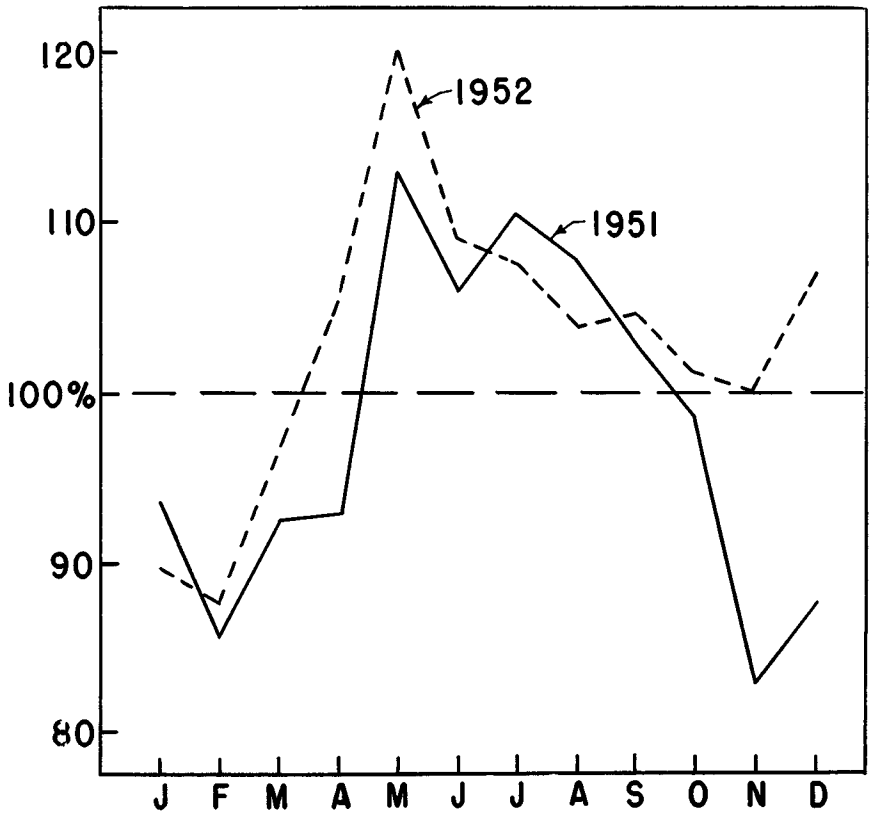
SOURCE: Computed from data furnished by the Pure Milk Producers Association of Eastern Okla.

enterprises on their farms in each of the four years prior to 1953. Thus, all producers sold Grade A milk both before and after the initiation of the Federal Order.

The adjustments to the pricing and regulatory effects of the Federal Order are summarized as follows:

(1) The formula pricing of butterfat in Grade A milk under the Federal Order tied the butterfat price differential directly to the butter market. Before the order, the discount on milk testing below 4 percent was 10 cents for each point; under the Order this discount was reduced to 7.5 cents. As a result, dairy farmers began using lower test breeds. Since these pro-

Fig. 6.—Seasonal variation of milk production, all producers in the Tulsa milkshed, 1951 and 1952.



SOURCE: Obtained from various reports of the Market Administrator for the Tulsa-Muskogee milk marketing area, AMS, USDA.

ducers did not change total Grade A milk production, the pricing of butterfat under the Federal Order decreased the emphasis on fat production and resulted in larger milk production per cow. Consequently the pricing procedure was sufficiently flexible to permit adjustment of milk tests to market demands. For the period 1949-1952, the adjustment was a change of 1 percent in the milk test level for each 4.4 percent change in the butterfat price differential.

(2) Changes in milk prices relative to beef prices and changes in weather conditions appeared to be the most important factors influencing milk production in the Tulsa milkshed. Of these, the Federal Order could have influenced only the milk price. Since there were no Federal Order restrictions to keep new producers off the market (except base-surplus restrictions), milk production increased whenever relative milk prices went up and decreased whenever relative milk prices declined. For example, only about 50 percent of the long time dairy producers said that they would have no beef production with a milk price at 20 percent of the beef price. In the other direction, about 89 percent of these producers said that they would have no beef production with a milk price at 40 percent of the beef price.

(3) There is evidence that the combination of the base-surplus plan and the lower Class I prices during April, May, and June was sufficient incentive to stimulate a more even milk production from one month to the next for the long time dairy producers. However, even these producers had not adjusted their production programs to get fall production equal to spring production. Therefore the surplus problem during the spring and summer still exists.

Notes on Methodology

Regression Statistics for Grade A Milk Producers With No Beef Production, Tulsa Milkshed.

Correlations

Variate	Zero Order Correlations		
	X_1^2	Y*	Sy^2 = 3,053.5
X_1*	.9902	.9225	R^2 = 0.8929
X_1^2*	----	.8848	R = 0.9449

Test of Significance

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares
Deviations from linear regression	10	454.9715	----
Deviations from curved regression	9	327.0298	36.3367
Curvilinearity of regression	1	127.9417	127.9417

$$F = \frac{127.9417}{36.3367} = 3.52 \text{ (not significant for this sample size)}$$

*Where Y = Percentage of producers with no beef production.
X_1 = Milk-beef price ratio.
X_1^2 = The square of the milk-beef price ratio.

The correlation coefficient was 0.94 for the least squares curvilinear regression line (parabola) of the formula: $Y=29.1727 + 5.071X_1 - 0.0531X_1^2$. This regression line was a better fit to the data but was not statistically different at the 5 percent level from a straight line regression line for which the correlation coefficient was 0.92. The parabola was used because of the known production characteristics involved in getting 100 percent milk production and no beef production. No extrapolation could be made for milk prices lower than 16 percent of beef prices because about 41 percent of the producers indicated that they would not cut milk production in response to further decreases in relative milk prices.