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Milk Bases in Utah and Their Effect on Total Supply of Market Milk

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MILK BASES IN UTAH AND THEIR EFFECT ON TOTAL SUPPLY OF MARKET MILK

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INTRODUCTION

Development

Some of the most striking changes in the production and marketing of dairy products have occurred since World War II. Dairy farming, for instance, has become more specialized and more commercial. Modern techniques of refrigeration, bulk handling, and transportation have made it possible for market milk to be shipped many miles without appreciable loss of quality.

The results of increased specialization can be seen in the declining number of farms with milk cows. Each year milk cows are kept on four or five percent fewer farms in the United States. At the same time, however, the total number of milk cows on farms has declined by approximately one percent a year. Despite this decrease, production per cow has risen enough so that total production has increased and dairy farmers continue their record breaking pace of production. This constant increase in supply of market milk in the United States has created an excess of market milk in many of the major milk sheds.

The problem of market milk surpluses is further increased by seasonal variation in production. Production normally is high

during the spring months and low during the spring months and low during the fall months of the year. Demand for fluid milk tends to be more uniform throughout the year. This results in high seasonal surpluses in the spring for which manufacturing facilities must be maintained and which must be operated at less than optimum capacity during the fall.

To encourage a more even production of market milk, several seasonal pricing plans have been developed encouraging producers to establish an even trend of production. One of these is the base-excess plan which milk cooperatives in Utah have used in paying producers for a number of years.

Although cooperatives in Utah use the same general type of seasonal pricing plan, variations exist between specific rules and provisions of their base-excess programs. An example of this is the method of calculating base and the circumstances under which base may be transferred. These differences raise problems in the operation of the various base-excess plans would provide a basis for study to alleviate some of the conflicts that exist.

The production of market milk in Utah has been increasing at a faster rate than consumer demand. In 1948 shipments of market milk in Utah totaled 195 million pounds and increased to 401 million pounds in 1957. This represents an annual increase of about eight percent. Consumption of fluid milk and cream during the same period increased

only five percent per year. The proportion of market milk used for fluid milk and cream consumption decreased from about 85 percent in 1948 to 64 percent in 1957. The lower the percent used for fluid the lower the average or blend price paid producers (2).

In addition to trying to control seasonality of production, milk cooperatives have also attempted to use the base-excess plan to control total production of market milk.

Purpose of Study

With the rapid increase in the production of market milk, producers and milk cooperatives have requested further study of the effects of the base-excess program on the production of market milk. Previous studies have been primarily concerned with the supply of market milk, its use and seasonal variations. Little has been done to determine the effect pricing programs have on total production of market milk.

The specific objectives of this study are:

1. To study the base-excess programs of milk cooperatives in Utah, describe their operations, and determine changes that have been made in base rules and provisions.
2. To determine the effect changes in base rules and provisions have on seasonal and total supply of market milk.

Source of Data and Methods of Procedure

The objectives were accomplished by obtaining producer shipments of market milk, producer prices, number of producers and base rules and provisions from three milk cooperatives in Utah, Federated Milk Producer's Association, Hi-Land Dairy and Weber Central Dairy Association. The information was acquired by personal contact with the milk dealers. Changes in base rules and provisions from year to year were examined and compared with changes in shipments of milk. Shipments were adjusted for secular trend and reduced to average shipments per producer. Since milk prices and production costs were fairly stable during the study period, changes in shipments of milk after the above adjustments were assumed to be due to changes in base rules and provisions.

Total monthly shipments of market milk include only those shipments from Utah producers. The data obtained are from the fall of 1954 through December 1961.

Tabular, descriptive and correlation analysis were used as the primary methods of presenting the results and showing the relationships that were found to exist. These methods of analysis were chosen in preference to multiple correlation analysis or analysis of variance because of the nature of the data. The number of yearly observations was limited thus decreasing the value of an intensive statistical analysis of the data obtained. The study was further complicated by

differences in administration of the base-excess programs of the three cooperatives. Because of differences in base programs and their administration producer response was studied on an individual milk cooperative basis.

REVIEW OF LITERATURE

Various studies have been conducted on milk control programs and their effectiveness in leveling out seasonal production. The continually growing surplus of market milk is of primary concern. A thorough review and appraisal of the milk control programs of the Northeastern States was made by Leland Spencer and S. Kent Christensen.(5). They described in detail the milk control programs, price formulas, price fixing, and listed the comparative advantages and effect on the market. Spencer and Christensen maintained,

> It is generally believed that fall-premium plans and the changing of class 1 prices seasonally have relative little effect upon overall production. ...Many believe that the base surplus plan is the only plan yet devised which penalizes individual farmers for producing beyond the needs of the market. Others (including the authors of the report) believe that under this plan, as normally used, producers strive to establish high base and having done so, try to maintain production at that level throughout the year. (5, p. 76)

This encourages producers to produce more each year than they normally would under other price plans. This study also indicated that state and federal milk control programs, in general, affected an increase in price received by producers.

A comprehensive report presented by Stanley F. Krause gives a complete review of the various milk control programs (3). He

discusses in detail the base-excess pricing plans, the fall premium pricing plans, the seasonal variation of class prices and different variations of these plans. An evaluation is made of each giving the advantages and problems that exist in each plan.

John M. Cassel's book, A Study of Fluid Milk Prices provides a concise economic foundation for studying milk prices (1). He also focused his attention on factors that are directly related to milk prices including producers' ability and willingness to increase or decrease production.

> Just because a given increase in price called forth a given increase in supply, it does not follow that a decrease in price of the same amount would restore the output to its former level. ...When production is once established on a particular level there are forces of economic intertia which tend to maintain it there at least for a time. (1, p. 11-12)

The reaction of the producer to price changes and other supply factors must be considered in light of the time lag for adjustment of supply.

Other factors that affect prices and supply are pricing plans and other bargaining methods. Mr. Cassel describes the fundamental ideas behind the classified-price plan and the base-excess price plan. He stated that the base-excess plans are not only concerned with problems of bargaining and distribution but also with the control of total annual production.

> Base-rating plans are bound by the very nature of their most elementary provisions to have a moderate influence on the seasonal fluctuations in production, and although in certain forms they have had a tendency to stimulate production in general, they can by the introduction of appropriate modifications be made to exercise a restraining influence upon the farmers' programs for expansion of output. (1, p. 63-64)

The stimulus to increase production comes from several factors of which three factors may be attributed to the base rating plan. The first is the possible price advantage to be gained in a bargaining position. The second is the change encouraged from spring to fall freshening giving a stimulus in production at the time of freshening in the fall and later in the spring when cows are placed on green pasture. During spring freshening there is but one period where a stimulus to increase production is present. A third is the tendency of farmers to buy additional cows, and later, failing to reduce their herds to the previous herd size.

A study was made by Rondo A. Christensen describing the shipment and use of market milk in Utah (2). Receipts of market milk in Utah increased approximately eight percent per annum from 1948 to 1957. The total pounds of market milk shipped during this same period increased from 195 million pounds to 401 million pounds. There was a favorable balance between supply and consumption of market milk in 1948. By 1957 the rapid increase in production of market milk had caused an unfavorable balance.

An analysis was also made of the seasonal variation in shipments of market milk in Utah. There was a trend toward a more even level of production between 1948 and 1957. The variation of shipments from low to high production months in 1948 was about 27 percent. In 1957 the variation was only 13 percent.

GENERAL HYPOTHESIS

The supply of market milk in any given area will be affected in some way by all factors of production. As the relationship among these variable factors affecting supply becomes more favorable toward producers, supply will tend to increase.

The base-excess pricing plan with a large incentive will tend to encourage producers to increase production during the base building period. In the long run situation an increase in price for milk will also tend to encourage producers to increase production. But less favorable conditions such as a decrease in price in the immediate future or a smaller incentive in the base-excess plan will not cause the dairy farmer to decrease production by a proportionate amount. "When production is once established on a particular level there are forces of economic inertia which tend to maintain it there, at least, for a time." (1, p. 12)

Some of the primary factors affecting dairy production are price received by the farmer for his milk, the cost of production and the incentive present in pricing programs that may or may not exist in the milk shed.

To accomplish the objectives set forth, a comparison of milk shipments from year to year is necessary. The immediate effect of

the base-excess plans can be observed in the short number of years available. The cost of production that may be expressed in the form of a milk-feed price ratio, and prices in a competing enterprise such as beef that may be expressed as a milk-beef price ratio, have a definite effect on the production of milk. Their impact would be greater in the long run, however, than during the short period of time studied.

DESCRIPTION OF BASE-EXCESS PLANS AND PROVISIONS

General Principle of Base-excess Plan

The base-excess pricing plan is designed to encourage more uniform milk production by giving the uniform milk producer a greater return per hundredweight during the specific base-excess paying period than the highly seasonal producer. This is accomplished by establishing a producer's base calculated from average shipments in the fall when shipments of milk tend to be at a low point.

The producer receives a higher price for milk that is considered base and a lower price for milk that is in excess of the established base. The prices of base and excess milk are determined by the utilization of the milk. Milk sold for fluid use is allocated to base milk. It thus receives a higher price than milk used for manufacturing purposes. The excess milk receives the lower manufacturing price. The uniform producer is able to establish a larger base than the seasonal producer with low shipments in the fall, and thus establishes a greater claim to fluid milk sales of succeeding months.

A secondary objective of the base-excess plan is an attempt to control the annual shipments of market milk. This is sometimes attempted by limiting the building of new base through closed or simi-closed base.

The base building period consists generally of three to six consecutive months when milk shipments are normally low, and usually includes September, October, and November. The method used in computing base varies but often is the average daily shipments during the present base building period. Variations in base calculation may include the average daily shipments of previous year's base building periods and/or established base of previous years.

Another characteristic of the base-excess plan is the base-excess paying period. It can begin immediately after base has been established and continue for a twelve-month period or may be effective only during the months of largest shipments. During this period a base price is paid for the pounds of base milk and a lower price is paid for milk delivered in excess of the earned base. If we assume two producers have shipments of equal size and same butter fat content but have dissimilar bases, the producer with the larger base will receive a higher blend price per hundredweight of milk and thus larger total receipts. The blend price producers receive per hundredweight of market milk is determined as follows:

Assume producer A has an earned base of 300 pounds daily or 90 hundredweight for a 30 day period, and delivered 140 hundredweight during the month. Further assume producer B has an earned base of 150 pounds daily or 45 hundredweight for a 30 day period, and also delivered 140 hundredweight during the month. If the base price was

$4.50 and the excess price was $3.00 the blend price of the milk for producers A and B would be:

Producer A

90 hundredweight @ base price $4.50	= $405.00
50 hundredweight @ excess price $3.00	= $150.00
Total value of milk	$555.00

Total value of milk ($555.00 ÷ total deliveries of milk, 140 hundredweight) = blend price $3.964 per hundredweight.

Producer B

45 hundredweight @ base price $4.50	= $202.50
95 hundredweight @ excess price $3.00	= $285.00
Total value of milk	$487.50

Total value of milk ($487.50 ÷ total deliveries of milk, 140 hundredweight) = blend price $3.482 per hundredweight.

Characteristics of Cooperative Base-excess Plans

The three cooperatives have been using the base-excess plan to pay producers since approximately 1950. Hi-Land has maintained a semi-open base building program during the entire period. Federated has had periods of semi-open and close base while Weber Central has had periods of open, semi-open and a closed base. All cooperatives have initiated changes in their base-excess programs from time to time.

Base building period

The milk cooperatives have established their base building period generally in the fall as was discussed previously. Federated and Weber Central maintain a building period in late summer and fall of the same calendar year. Hi-Land, however, had a building period consisting of two time intervals in the same calendar year, January through February and September through November. This system existed until 1960, table 1.

Table 1. Base building periods for Federated, Hi-Land, and Weber Central, 1954-1961

Year	Federated	Hi-Land	Weber Central
1954	None	Jan.-Feb. Sept.-Nov.	Aug.-Dec.
1955	Aug.-Nov.	Jan.-Feb. Sept.-Nov.	Aug.-Dec.
1956	July-Nov.	Jan.-Feb. Sept.-Nov.	None
1957	July-Nov.	Jan.-Feb. Sept.-Nov.	Aug.-Dec.
1958	July-Nov.	Jan.-Feb. Sept.-Nov.	Aug.-Dec.
1959	July-Nov.	Jan. Sept.-Dec.	None
1960	None	Aug.-Dec.	None
1961	July-Dec.	Aug.-Dec.	None

Base building rules

The method of calculating base for each cooperative has changed from time to time. Federated and Hi-Land used past shipment records as well as the shipment record of the immediate base building period involved. Federated changed their method of calculating base almost every year. Hi-Land maintained the same method of calculation until 1959; since then they have changed each year. Weber Central used shipment records of previous years only in 1959. In 1954, 1955, and 1957, they maintained a completely open base, calculating base from the immediate base building period involved. During 1956 and 1959 base was closed. In some instances bases were adjusted upward for producers who had small bases in relation to their production, table 2.

The year indicated in Table 2 makes reference to the year in which the base was earned. The earned base became effective the following calendar year.

Base building incentive

When studying the producer response to existing base building programs, a measure indicating the incentive or degree of restrictiveness toward producer base building is required. The base building incentive is represented by the amount base could be increased during any one base building period by increasing shipments one pound per day. The base building incentive of Hi-Land for 1954 is 0.33, indicating an allowable increase of base for the coming year of 0.33 pounds

Table 2. Base building rules for Federated, Hi-Land, and Weber Central, 1954-1961

Year	Federated	Hi-Land	Weber Central
1954	Closed	Average daily shipments during base building period of 1952, 1953, and 1954 ÷ 3.	Average daily shipments during base building period of 1954.
1955	Average daily shipments during base building period of 1955 ÷ 1955 daily base ÷ 2. (Limit of 20 lbs. or 4 percent increase which ever was larger.)	Average daily shipments during base building period of 1953, 1954, and 1955 ÷ 3.	Average daily shipments during base building period of 1955.
1956	Average daily shipments during base building period of 1956 ÷ 2 (1956 daily base) ÷ 3.	Average daily shipments during base building period of 1954, 1955, and 1956 ÷ 3.	Closed (Adjustments were made in individual base)
1957	Average daily shipments during base building periods of 1956 and 1957 ÷ 1956 daily base ÷ 3.	Average daily shipments during base building period of 1955, 1956 and 1957 ÷ 3.	Average daily shipments during base building period of 1957.
1958	All of average daily shipments during base building periods of 1956, 1957 and ½ of 1958, ÷ 1956 daily base ÷ ½ 1958 daily base ÷ 4.	Average daily shipments during base building period of 1956, 1957, and 1958 ÷ 3.	Average daily shipments during base building period of 1958 ÷ 3 (1958 daily base) ÷ 4.

Table 2. continued.

Year	Federated	Hi-Land	Weber Central
1959	All of average daily shipments during base building periods of 1956, 1957, and 1959 and ½ of 1958, ÷ ½ 1958 daily base ÷ 4.	Average daily shipments during base building period of 1956, 1957, 1958, and 1959 ÷ 4.	Closed (Adjustments were made in individual base)
1960	Closed (all base decreased 10 percent June 1, 1960.)	Five percent increase of individual daily base if producer attained 80 percent of existing Hi-Land base during the base building period of 1960.	Closed
1961	Average daily shipments during base building period of 1961 ÷ daily base of 1961 ÷ 2.	Maximum of two percent increase of base. Increase derived from average daily shipments in base building period of 1961.	Closed

for every pound of market milk shipped during the base building period of 1954, table 3. There were, however, years when a base incentive was not directly indicated in the base building provisions such as Federated's program in 1955, Hi-Land's program in 1960 and 1961, and Weber Central's program in 1956 and 1959.

Table 3. Base building incentive ratio for Federated, Hi-Land, and Weber Central, 1954-1961

Year	Federated	Hi-Land	Weber Central
1954	0.0	0.33	1.0
1955	0.125	0.33	1.0
1956	0.33	0.33	1.0
1957	0.33	0.33	1.0
1958	0.125	0.33	0.25
1959	0.25	0.25	1.0
1960	0.0	0.166	0.0
1961	0.50	0.10	0.0

The base incentive for Federated in 1955 was estimated by observing the actual base increases and base building programs of other years included in the study and comparing them to the allowable base increase in 1955. The opinion of Federated personnel of the degree of base incentive present in 1955 was also considered in estimating the base

building incentive. The incentive was estimated to be approximately 0.125. The same method was used in estimating the base building incentive for Hi-Land in 1960 and 1961.

In 1956 and again in 1959 Weber Central closed base building but adjusted the base of individual producers according to their past production and present base. Base was increased to correspond more closely to individual producer shipments. For this period the base building incentive was determined by comparing the total adjusted base for Weber Central with total shipments of Weber Central during the normal base building period. Base increase and base building programs of other years included in the study were also used in estimating the base building incentive for these years.

Base-excess paying period

The effectiveness of the base-excess plan as a means of controlling production would seem to be increased with the number of months during the year it is used. When base and excess prices are used for a full year in computing returns to farmers, shipments above alloted base are discouraged.

Federated and Hi-Land have generally paid producers on base and excess prices for twelve months. Weber Central did not begin using base and excess prices for the full twelve months until 1958, table 4.

Table 4. Months base and excess prices used in paying producers for Federated, Hi-Land, and Weber Central, 1955-1961

Year	Federated	Hi-Land	Weber Central
1955	Jan.-Dec.	Jan.-Dec.	Apr.-June
1956	Jan.-May	Jan.-Dec.	Apr.-June
1957	Jan.-Dec.	Jan.-Dec.	Apr.-Dec.
1958	Jan.-Dec.	Jan.-Dec.	Jan.-Dec.
1959	Jan.-Dec.	Jan.-Dec.	Jan.-Dec.
1960	Jan.-Dec.	Jan.-Dec.	Jan.-Dec.
1961	Jan.-Dec.	Jan.-Dec.	Jan.-Dec.

Transfer of base

It is usually possible for producers to increase base in two ways. One way is building base as has been discussed and the second is by purchasing additional base. When base building provisions are restrictive, base building is slow. Providing base can be transferred, producers can purchase base, thereby increasing base immediately. All three milk cooperatives have allowed the transfer of base under certain conditions, table 5.

In all cases a transfer of base requires the approval of the respective cooperative board of directors, and in the case of base sold to two or more individuals it is necessary to divide the base in the same proportion as the sale of the cows. When production of previous

Table 5. Rules for transferring base for Federated, Hi-Land, and Weber Central, 1954-1961

Cooperative	Year	Characteristics			
		Base trans. with farm & herd	Base trans. with only the herd	Base trans. without the farm or herd	Number of buyers allowed
Federated	1954 thru 1957	100	75	0	2 (in case of partnership sale)
	1958 thru June 1960	100	66/2/3	0	2
	June 1960 thru 1961	100	80	0	2
Hi-Land	1954 thru 1959	100	100	0	2
	1960 thru 1961	100	100	0	(No limit)
Weber Central	1954 thru 1956	100	100	0	(No limit)
	1957 thru 1960	100	66/2/3	0	(No limit)
	1961	100	50	0	(No limit)

years is required for calculation of future base, the cooperatives have also considered the transfer of base to include the transfer of production records. A further restriction imposed on base transfers requires the seller of the base to dispose of the entire base, and shipments of the purchaser must be delivered to the same distributer where base was earned.

The milk cooperatives have assisted their members in various ways in selling base. Presently they all have standard forms and field men to assist members in making the transaction. They also provide assistance by advertising base for sale. However, they have indicated that they do not suggest a price for base. Federated and Weber Central have provided a standard form for base transfer since about 1950, while Hi-Land has provided a standard form since 1959.

Entrance of new producers

The method used by new producers to acquire base has been done primarily by purchasing base. However, there have been times when new producers were able to enter the market and obtain a base without buying it. Federated granted base to a few producers in 1955 and 1956 on a percent of their existing shipments. This was done to obtain sufficient milk from farms meeting specific building and other requirements for Nevada sales.

Weber Central has granted base to new producers at various times. It was granted on a percentage of the producers present shipments. It

has also been indicated that Hi-Land has granted base to new producers on the same bases. Both have purchased private dairies and have established base for producers supplying the dairies. The base granted for this reason was established in proportion to fluid milk sales existing for the specific dairy.

Administration of the base-excess plan

Administration of base-excess plan by the three cooperatives has not been the same. Federated has maintained a strict program not deviating from its plan once established. They publish a producer news letter once a month in which they explain the operation of the base-excess plan and changes that take place. They also have a meeting of all producers in February of each year in which they explain the base building program for the coming fall and discuss the base-excess plan and its operations.

Hi-Land, while maintaining a fairly strict base-excess plan, has not made its members as well informed concerning the program. They publish a regular monthly news letter but have not used it to better acquaint their producers with their base-excess program. They have an annual meeting of producers in July in which they explain the base building program of the coming year and discuss the base-excess plan.

Weber Central has deviated often from its stated program as they did in 1956 and again in 1959. During these particular years they announced that base building would be closed and then adjusted

individual bases as was previously explained. They do not have a regular news letter and seem to provide their producers with little information concerning the operation of the base-excess plan. They do, however, have an annual meeting of producers in February or March at which time they inform members present of the new base building provisions for the coming fall.

All three cooperatives have allowed for adjustment of individual base when circumstances arose such as disease in the herd that would unjustly penalize the producer because of low shipments during the base building period. If unusual circumstances were not present and shipments for an individual producer were lower than established base during the base building period, the Federated producer would be penalized in the same proportion as he could have increased base. Weber Central and Hi-Land do not penalize producers when they ship less than their established base during the base building period. Base was also maintained for producers who were called on a church mission or into the armed services. Action on these matters required approval by the board of directors of the respective cooperative.

PRODUCER RESPONSE TO BASE-EXCESS PROGRAMS

The profit motive encourages the farmer to allocate his resources to the best of his ability to obtain the highest possible returns for his efforts. The dairy farmer producing in a market where the base-excess plan is in operation can establish a breeding program, improve his feeding program and control the buying and selling of his milk cows to gain a greater return from his enterprise. Assuming the profit motive in farming exists as it does in most business enterprises, the dairy farmer should react to base building programs and changes that take place from time to time. This could be done by increasing or decreasing total shipments during specific periods of time. When base building is liberal it is advantageous for the individual producer to establish a larger base and thereby gain a better blend price for his milk. If base building is closed for the year an increase in production will not increase base and the farmer would receive a reduced blend price with no possibility of increasing the amount of his base milk.

Producers may also react to the base-excess plan by leveling out shipments during the year, or shifting their peak production months from the spring to the fall, thus establishing a larger base

and increasing the percent of annual shipments for which the base price is received.

Total Market Milk Shipments

All producers

Shipments of market milk to Federated, Hi-Land, and Weber Central have increased approximately 45 percent in the last seven years. Shipments increased from 239 million pounds in 1955 to 346 million pounds in 1961, table 6.

Table 6. Annual shipments of market milk from Utah producers to Federated, Hi-Land, and Weber Central, 1955-1961

Year	Total Shipments	Federated	Hi-Land	Weber Central
			million pounds	
1955	239	144	55	41
1956	274	164	63	48
1957	295	172	69	54
1958	302	169	73	60
1959	325	175	80	71
1960	332	179	82	72
1961	346	184	88	75

Federated producers increased their shipments 40 million pounds, or 28 percent during the last seven years. Although the absolute increase in shipments was not as great for Hi-Land and Weber Central, their percentage increases from 1955 to 1961 were much greater. Hi-Land had an absolute increase of 32 million pounds or a 60 percent increase and Weber Central producers increased their shipments 34 million pounds or 83 percent.

Since 1955 the number of grade A or market milk producers for the three cooperatives has decreased from 1,868 to 1,296 indicating a 31 percent reduction. The decrease in producers was largest for Federated with a decrease of 35 percent. Hi-Land and Weber Central had a decrease in membership of 21 and 27 percent respectively, table 7.

Table 7. Average number of grade A producers for Federated, Hi-Land, and Weber Central, 1955-1961

Year	Federated	Hi-Land	Weber Central
1955	1125	397	346
1956	1021	378	330
1957	970	375	315
1958	876	345	300
1959	821	316	285
1960	783	314	270
1961	729	313	254

The decrease in number of producers and the increase in milk shipments indicate an even greater increase in shipments per producer. From 1955 to 1961 Federated producers increased their individual shipments an average of 97 percent. Hi-Land producers increased their individual shipments an average of 103 percent while Weber Central producers increased an average of 147 percent, table 8.

Table 8. Annual shipments of market milk per producer for Federated, Hi-Land, and Weber Central, 1955-1961

Year	Federated	Hi-Land	Weber Central
		thousand pounds	
1955	138	139	119
1956	161	166	144
1957	177	184	170
1958	193	212	200
1959	213	252	248
1960	229	261	266
1961	252	282	294
		Percent increase from 1955-1961	
	97	103	147

In analyzing the response of producers to the base building incentive, shipments were divided into two periods, the base building period that has been previously described, and the production year.

The production year includes shipments from the beginning of a base building period to the beginning of the next base building period.

The average daily shipments per producer during these two periods were adjusted for upward secular trend. If the hypothesis is true that producers do respond to changes in base rules and provisions, the base-excess plan becomes one of the more important factors affecting the production trend of market milk. This is due to the strong pricing mechanism of the base-excess plan and the control of producer entry by the cooperatives. If the upward trend were not removed from the data an absolute change in production would reflect a greater relative change at the beginning of the study than toward the end, thus tending to distort the picture of producer response to base building incentive. The adjustment for secular trend also allows the reader to more easily observe production response to changes in the base program from year to year. The actual shipments and adjusted shipments of the base building period are presented in Table 9.

The percent change of actual and adjusted shipments from one year to the next for the base building period are indicated in Table 10.

The average daily shipments per producer for the production year and the percent change in relation to the previous year's production are presented in Tables 11, and 12.

Table 9. Average daily shipments of market milk per producer during base building period for Federated, Hi-Land, and Weber Central, 1954-1961

Year	Federated		Hi-Land		Weber Central	
	Actual shipments	Adjusted shipments	Actual shipments	Adjusted shipments	Actual shipments	Adjusted shipments
	pounds					
1954	358	358	329	329	269	269
1955	388	335	366	300	312	231
1956	494	388	446	313	401	239
1957	562	403	492	292	456	214
1958	575	363	590	323	582	258
1959	642	378	684	351	702	298
1960	670	352	701	302	722	237
1961	725	354	770	304	780	214

Table 10. Percent change in shipments from the previous year during the base building period for Federated, Hi-Land, and Weber Central, 1955-1961

Year	Federated		Hi-Land		Weber Central	
	Actual shipment	Adjusted shipment	Actual shipment	Adjusted shipment	Actual shipment	Adjusted shipment
	percent change					
1955	8.4	-6.4	11.2	-8.8	16.0	-14.1
1956	27.3	15.8	21.8	4.3	28.5	3.6
1957	13.8	3.9	10.3	-6.7	13.7	-10.5
1958	2.3	-9.9	19.9	10.6	27.6	20.6
1959	11.2	4.1	15.9	8.7	20.6	15.5
1960	4.4	-6.9	2.5	-14.0	2.8	-20.5
1961	8.2	.6	9.8	.7	8.0	-9.7

Table 11. Average daily shipments of market milk per producer during the production years for Federated, Hi-Land, and Weber Central, 1954-55 and 1960-61

Year	Federated		Hi-Land		Weber Central	
	Actual shipments	Adjusted shipments	Actual shipments	Adjusted shipments	Actual shipments	Adjusted shipments
	pounds					
1954-55	371	344	357	323	297	256
1955-56	416	337	412	312	349	228
1956-57	503	371	481	315	438	236
1957-58	558	373	530	297	494	211
1958-59	575	336	642	342	631	267
1959-60	660	368	705	338	723	278
1960-61	648	340	745	312	780	354

Table 12. Percent change in shipments per producer from the previous year during the production years for Federated, Hi-Land, and Weber Central, 1954-55 through 1960-61

Year	Federated		Hi-Land		Weber Central	
	Actual shipments	Adjusted shipments	Actual shipments	Adjusted shipments	Actual shipments	Adjusted shipments
	percent change					
1955-56	12.1	-2.0	15.4	-3.4	17.5	-21.0
1956-57	20.9	10.1	16.7	1.0	25.5	3.5
1957-58	10.9	.5	10.2	-5.7	12.8	-10.6
1958-59	3.0	-10.0	21.1	15.2	27.7	26.5
1959-60	14.8	9.5	9.8	-1.2	14.6	4.1
1960-61	-1.8	-7.6	5.7	-7.7	7.9	-8.6

The relationship between base building incentives and percent changes in production of the three cooperatives can be seen in Table 13. The relationship is more apparent with Federated than with the other cooperatives.

Table 13. Base building incentive and production response for Federated, Hi-Land, and Weber Central, 1955-1961

Dairy	Year	Base building incentive	Percent change over previous year: Base building period	Percent change over previous year: Production year
Federated Milk Producers Assoc.	1955-56	0.125	-6.4	-2.0
	1956-57	0.33	15.8	10.1
	1957-58	0.33	3.9	.5
	1958-59	0.125	-9.9	-10.0
	1959-60	0.25	4.1	9.5
	1960-61	0.00	-6.9	-7.6
	1961	0.50	.6	----
Hi-Land Dairy	1955-56	0.33	-8.8	-3.4
	1956-57	0.33	4.3	1.0
	1957-58	0.33	-6.7	-5.7
	1958-59	0.33	10.6	15.2
	1959-60	0.25	18.7	-1.2
	1960-61	0.166	-14.0	-7.7
	1961	0.10	.7	----
Weber Central Dairy Assoc.	1955-56	1.0	-14.1	-21.0
	1956-57	1.00	3.6	3.5
	1957-58	1.00	-10.5	-10.6
	1958-59	0.25	20.6	26.5
	1959-60	1.00	15.5	4.1
	1960-61	0.00	-20.5	-8.6
	1961	0.00	-9.7	----

The calculation of correlation coefficient "r" and test of significance of "r" allow a closer look at the degree of association between base building incentive and production response. The base building incentive is considered the independent variable and production response from year to year is considered the dependent variable, table 14.

Table 14. Correlation coefficients of base building incentives and production responses for Federated, Hi-Land, and Weber Central, 1955-1961

Processor	"r"*	Test of significance of "r"**
	Base building period	
Federated	.62	.10
Hi-Land	.21	.35
Weber Central	.19	.35
	Production year	
Federated	.77	.05
Hi-Land	.46	.20
Weber Central	-.35	----

* The formula used to obtain "r" (correlation coefficient) is:

$$r = \frac{(n)\ (\Sigma XY) - (\Sigma X)\ (\Sigma Y)}{\sqrt{n(\Sigma X^2) - (\Sigma X)^2 \quad n(\Sigma Y^2) - (\Sigma Y)^2}}$$

** The formula to test the significance of "r", when the null hypothesis is:: = 0, and the alternate hypothesis is: = 0.

$$t = r\sqrt{\frac{n - 2}{1 - r^2}}$$

The "r" values for the base building period and production year are highest for Federated, .62 and .77 respectively. These indicate a close relationship. The test of significance of "r" for Federated was .10 and .05 for the two periods, respectively. These represent a high degree of probability that the relationship shown is not due to chance. With "r" significant at the .05 level there are five chances out of 100 that the "r" value is due to chance.

The correlation was lowest for Weber Central indicating that very little relationship existed between base building incentive and production response. Producers from Hi-Land responded to a greater degree than Weber Central but less than Federated.

Sample producers

Monthly shipments of market milk were also obtained for a sample of producers from Federated Milk Producers Association. The sample consisted of 182 of 257 producers who were in production during 1953 and remained in production through 1961, and who did not purchase or sell base during the same period of time.

To analyze the production response of the sample producers they were divided into three size groups. Thirty five producers (small-size producers) shipped an average of less than 10,000 pounds per month in 1956. Ninty six producers comprised the medium-size group and shipped an average of 10,000 to 19,999 pounds per month. The

large-size group, consisting of 51 producers, shipped an average of 20,000 pounds or more per month in 1956.

Total shipments of the sample producers were 23 percent of Federated's total shipments in 1956. This increased to 26 percent in 1961. The sample producers increased total shipments between 1956 and 1961 from 37 million to 47 million pounds or an increase of 29 percent. The average shipments per producer increased from 203 thousand to 261 thousand pounds between 1956 and 1961, table 15.

Table 15. Annual shipments of market milk per producer for Federated sample producers, 1956-61

Year	Total sample	Size group		
		Small	Medium	Large
		thousand pounds		
1956	203	94	167	346
1957	216	106	182	359
1958	221	111	190	354
1959	239	124	205	384
1960	246	133	213	387
1961	261	144	220	418

Shipments by the small and medium-sized producers increased more rapidly than the large ones. The respective increases between 1956 and 1961 were 53, 32, and 21 percent.

Shipments from the sample producers were reduced to average daily shipments per producer and adjusted to remove the upward secular trend. Shipments during the base building period and production year are indicated in Table 16.

From adjusted shipments of milk, percent changes from year to year were calculated for each of the three size groups. The relationship between these changes and base building incentives is shown in Table 17. Correlation coefficients between the production response and base building incentives were calculated. The "r" for the sample groups during the base building period was .68 for the small group, .43 for the medium and .59 for the large, table 18. These were all fairly significant.

Consideration of "r" during the production year gave a different picture. The "r" was lower for the small group and higher for the other groups than during the base building period. The correlation was significant for only the medium and large-size group.

The extreme variation of "r" between the two periods for the small producers may be explained by determining the average number of cows per farm and gross receipts per month for production years 1955-56 through 1960-61. The herd size would range from approximately 15 cows or less with average gross receipts per month for the period studied of $420. This would indicate that the dairy enterprise was not the primary source of income and thus the farmer may

Table 16. Average daily shipments of market milk per producer during the base building period and the production year for Federated sample producers, 1955-1961

Year	Total sample		Size groups					
			Small		Medium		Large	
	Actual shipments	Adjusted shipments	Actual shipments	Adjusted shipments	Actual shipments	Adjusted shipments	Actual shipments	Adjusted shipments
	Base building period, pounds							
1955	482	473	239	233	405	397	792	780
1956	590	546	261	227	487	447	1009	952
1957	617	539	297	236	520	447	1024	921
1958	631	518	320	231	556	451	987	838
1959	694	546	353	237	595	458	1113	919
1960	670	486	374	230	588	418	1025	785
1961	726	508	409	238	614	411	1156	870
	Production year, pounds							
1955-56	505	487	246	232	418	402	847	824
1956-57	580	528	274	233	483	434	976	908
1957-58	595	508	292	223	504	422	981	866
1958-59	625	503	320	224	539	425	988	828
1959-60	684	527	354	231	585	439	1097	891
1960-61	685	493	376	226	589	410	1080	828

Table 17. Base building incentive and production response for Federated, sample producers, 1955-56 through 1960-61

Size group	Year	Base building incentive	Percent change over previous year	
			Base building period	Production year
Small	1955-56	0.125	----	----
	1956-57	0.33	-2.5	0.2
	1957-58	0.33	3.9	-4.0
	1958-59	0.125	-1.9	0.2
	1959-60	0.25	2.3	3.1
	1960-61	0.0	-2.7	-2.1
	1961	0.50	3.2	----
Medium	1955-56	0.125	----	----
	1956-57	0.33	12.5	8.1
	1957-58	0.33	0.1	-2.7
	1958-59	0.125	0.7	0.7
	1959-60	0.25	1.5	3.3
	1960-61	0.0	-8.7	-6.6
	1961	0.50	-1.6	----
Large	1955-56	0.125	----	----
	1956-57	0.33	22.0	10.2
	1957-58	0.33	-3.3	-4.5
	1958-59	0.125	-8.9	-4.5
	1959-60	0.25	9.6	7.6
	1960-61	0.0	-14.6	-7.0
	1961	0.50	10.8	----
Total sample	1955-56	0.125	----	----
	1956-57	0.33	15.4	8.4
	1957-58	0.33	-1.3	-3.8
	1958-59	0.125	-3.9	-1.0
	1959-60	0.25	5.4	4.8
	1960-61	0.0	-11.0	-6.5
	1961	0.50	4.5	----

Table 18. The relationship between base building incentives and production change for Federated sample producers, 1955-1961

Size group	"r"	Test of significance of "r"
	Base building period	
Small	.68	.10
Medium	.43	.25
Large	.59	.15
Total Sample	.67	.10
	Production year	
Small	.06	---
Medium	.70	.10
Large	.63	.15
Total Sample	.63	.15

not be as responsive to base rules and provisions due to time and managerial efforts directed elsewhere. It may further be explained by observing their seasonality of production, figure 3. They maintained a high peak of production during the late spring, with an average seasonal variation from high to low between 1956 and 1961 of 19 percent. Even though they reacted as anticipated during the base building period, the seemingly uncontrolled high peak of production in the spring tended to decrease the correlation for the whole year.

The difference of "r" between the two periods for the medium-size group is due to limited production response and the liberal base building incentive during the base building period of 1961. The limited response can be partially attributed to Federated's request to producers in 1960 to cut back production. When the base building incentive was very liberal in 1961 producers did not respond as would normally be expected. By eliminating the extreme production change of the base building period in 1961, the "r" for the medium-size group becomes .78 indicating a close correlation.

The "r" value for the large producers and the total sample group for the two periods remained fairly constant.

Seasonality of Shipments

Seasonal variation in shipments of market milk lead to marketing problems. As has been discussed previously, one function of the base-excess plan is to reduce seasonality of production. Allowing new base to be formed each year encourages a more uniform level of production throughout the year, or a peak of production in the fall rather than the spring.

> Setting new bases may be limited (closed or semi-closed bases) when the purpose is to control the annual level of deliveries. But unless there is a penalty for deliveries less than base, closed bases greatly reduce the farmer's incentive to control his seasonal pattern. The leveling of seasonal production may be largely sacrificed for production control.

> Dairy farmers generally will support a soundly designed and well-administered base-excess plan that they understand. These requirements may not be easy to attain. (3, p. 111)

To correctly analyze the seasonality of production, secular trend that exists should be removed. If an upward trend exists and trend adjustments are not made, December shipments will tend to be higher than shipments of other months within the same year. The index of seasonality would be low in the first half of the year and high in the second half, presenting an improper picture. (4, p. 91). Having adjusted for secular trend, a seasonal index of shipments can be determined.

All producers

Total market milk shipments for Utah in 1948 had a seasonal variation from high to low months of 27 percent. This decreased to a seasonal variation of 13 percent in 1957 (2, p. 8). Federated, Hi-Land, and Weber Central received approximately 75 percent of the milk.

The average annual seasonal variation from 1955 thru 1961 was 11.9 percent for Federated, 13.1 percent for Hi-Land and 17.1 percent for Weber Central. Seasonal variation among the three cooperatives ranged from a high of 23 percent for Weber Central in 1955 and 1957 to a low of nine percent for Hi-Land in 1958 and 1961, table 19. Federated and Hi-Land have attained a much lower seasonal variation

than Weber Central. However, seasonality of production has tended to decrease for all the cooperatives since 1955.

Table 19. Percent seasonal variation of market milk shipments for Federated, Hi-Land, and Weber Central, 1955-1961

Year	Federated	Hi-Land	Weber Central
		percent variation	
1955	11	19	23
1956	18	16	18
1957	11	19	23
1958	10	9	15
1959	10	10	10
1960	13	10	13
1961	10	9	18
Average variation	11.9	13.1	17.1

A comparison of average seasonality of production during the seven year period for the cooperatives can be observed by arraying the seasonal indexes by month and obtaining the average seasonal index for each month. Federated producers have attained a more uniform pattern of production than either of the other cooperatives, figure 1.

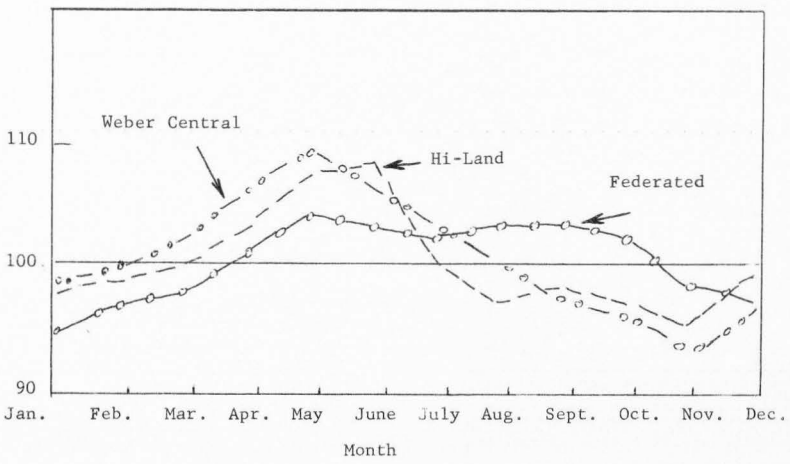

Figure 1. Average indexes of seasonal variation of production for Federated, Hi-Land, and Weber Central, 1955-1961

Changes that are made in the base-excess program, and particularly in the base building provisions, would tend to affect seasonality of production. Liberal base building would encourage less seasonal variation and peak shipments in the fall. From 1955 thru 1961 Federated changed their base building provisions several times. Base building was restrictive in 1955, 1958, and 1960, moderately restrictive in 1956, 1957, and 1959, and fairly liberal in 1961.

Hi-Land's base building program was moderately restrictive from 1955 thru 1959, becoming restrictive in 1960 and 1961. Weber Central's base building program was liberal during 1955 thru 1957 and in 1959, moderately restrictive in 1958 and restrictive in 1960 and 1961.

To see the effect changes in base building provisions have on seasonality of production, seasonal variations during the years indicated above for each cooperative are shown in Figure 2.

Federated producers responded to the base building provisions by generally maintaining a spring production peak during those years when base building was restrictive. As base building became more liberal or only moderately restrictive, they attained a fall production peak. In 1960, Federated's restrictive base building program, the 10 percent reduction in individual base on June 1, and the letter requesting producers to decrease production caused a shift in the peak production period from fall to spring and an increase in seasonal variation. The fairly liberal program immediately following 1960 encouraged producers to decrease seasonality, but due to the short time period involved and a possible continued reaction to the previous year's program, producers did not attain a fall production peak.

Hi-Land producers did not seem to respond to changes in base building rules. They did not attain a peak of production in the fall nor increase seasonality of production when base building provisions became more restrictive in 1960 and 1961. However, from 1955 thru 1961 they did decrease their seasonal variation. This may be due to better

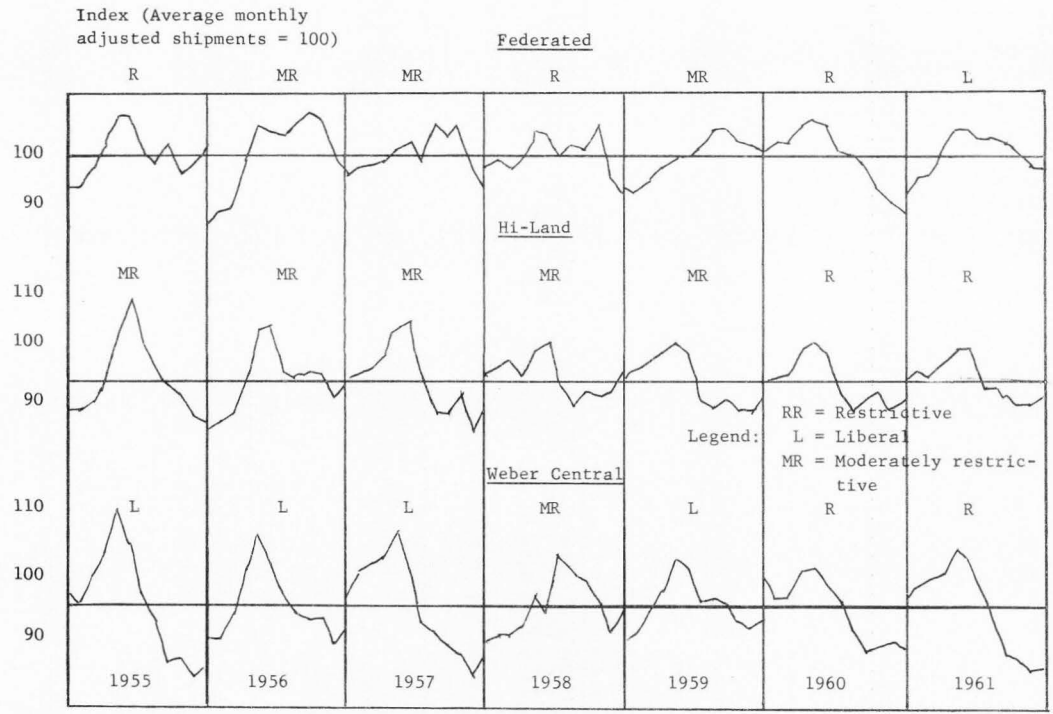

Figure 2. Indexes of seasonal variation of monthly shipments of market milk for Federated, Hi-Land, and Weber Central, 1955-1961

producer understanding of the base-excess plan gained toward the latter part of the study period and the change from a two to a one-period base building system.

Weber Central producers also did not seem to respond to changes in base building provisions. They maintained a late spring production peak thru 1961 with the exception of 1958 when base building was moderately restrictive. Although Weber Central producers did not shift their production peak nor increase or decrease seasonal variation to correspond to changes in base building rules, they did tend to decrease seasonality between 1955 and 1961.

Sample producers

The seasonal variation for the sample producers from high to low production months each year from 1956 thru 1961 averaged 12.7 percent with a range from 21 to 8.5 percent. The seasonal variation for the different producer size groups tended to be highest for the small-size group and lowest for the large group, table 20. However, the degree of seasonality of production tends to decrease between 1956 and 1961 for each group.

The average seasonality of production of the different producer size groups during the six-year period can be seen in Figure 3. The large producers had the lowest seasonal variation with a production peak in the fall. The small-size producers had the highest degree of seasonality and a production peak in the late spring.

Table 20. Percent variation of shipments of market milk from high to low production months for Federated sample producers, 1956-1961

Year	Total sample	Size groups		
		Small	Medium	Large
		percent variation		
1956	21.0	24.5	22.0	22.7
1957	12.7	27.6	14.6	12.0
1958	8.5	21.0	16.0	8.4
1959	14.0	15.4	16.0	15.6
1960	10.0	15.4	10.0	11.0
1961	9.6	14.3	13.7	7.0

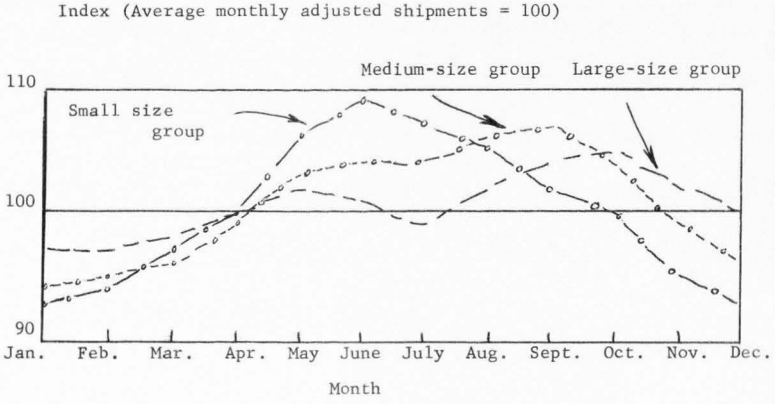

Figure 3. Average indexes of seasonal variation of production for Federated sample producers, 1956-1961

Changes in seasonal variation and shifts in production peaks in response to changes that are made in base building provisions for the producer sample can be examined in the same manner as total shipments to cooperatives, figure 4.

The small-size group changed their seasonal pattern very little from 1956 thru 1960. However when base building became fairly liberal in 1961 they decreased seasonal variation and shifted their peak production period from late spring to fall.

The largest changes in seasonal patterns were experienced by the medium- and large-size groups. Both maintained a fall production peak during the moderately restrictive base building periods. The restrictive building program in 1960 caused the medium- and large-size groups to shift their peak production from the fall to late spring. The liberal base building provisions of 1961 encouraged the two groups to increase their fall production, but the large producers were more successful than the medium group in attaining a lower seasonal variation and above average shipments during the fall. All size groups decreased their seasonal variation between 1956-1961.

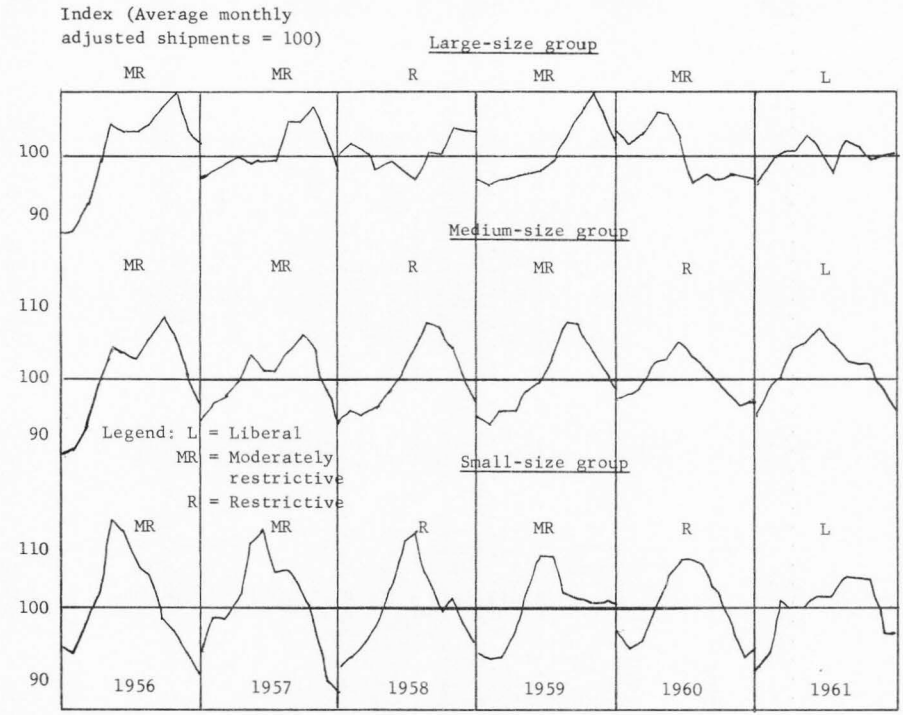

Figure 4. Indexes of seasonal variation of monthly shipments of market milk for Federated sample producers, 1956-1961

PRODUCER RESPONSE TO PRICE CHANGES

The price of milk received by farmers, the variable cost of production, and the possible returns from a competing enterprise have a definite effect on the production of market milk. The effect changes in these factors have on milk shipments can generally be seen over a long-run period. A marketing area having no control on entry of additional producers may experience more noticeable change in milk shipments during a short-run period as a result of price changes. However, cooperatives in the Great Basin area have control on the entry of new producers through provisions of the base-excess plan. Thus shipment response to price changes would tend to be limited and hard to observe in a short-run period.

Price of Milk

The average price paid producers for market milk by the three cooperatives tended to decrease between 1955 and 1959 and increased during 1960 and 1961. Federated had the highest average price for the seven-year period, $4.53 per hundred weight of milk with 3.5 B.F. content. Hi-Land paid an average of $4.33 and Weber Central paid an average of $4.15, table 21. To accurately observe shipment response to price changes, prices were adjusted for equal purchasing power.

Table 21. Average price paid producers for market milk by Federated, Hi-Land, and Weber Central, 1955-61

Year	Federated		Hi-Land		Weber Central	
	Actual prices	Adjusted prices[a]	Actual prices	Adjusted prices[a]	Actual prices	Adjusted prices[a]
1955	4.76	2.05	4.38	1.89	4.00	1.72
1956	4.68	2.04	4.48	1.95	4.22	1.83
1957	4.65	1.98	4.46	1.90	4.19	1.78
1958	4.41	1.76	4.31	1.72	4.03	1.61
1959	4.29	1.79	4.21	1.76	3.95	1.65
1960	4.40	1.89	4.21	1.76	4.29	1.80
1961	4.54	1.89	4.30	1.79	4.40	1.83

[a] Actual price divided by index of prices received by farmers, 1910-14 = 100.

Changes in producer shipments during the production year compared to changes in average prices paid for milk can be seen in Figure 5. Shipments were lagged one year, assuming that it takes about one year for producers to respond to price changes.

Although shipments by Federated producers changed in the same direction as prices paid for milk from 1955-56 thru 1958-59, they moved in the opposite direction during 1959-60 and 1960-61. There was little if any relationship between producer shipments and prices paid for milk by Hi-Land and Weber Central.

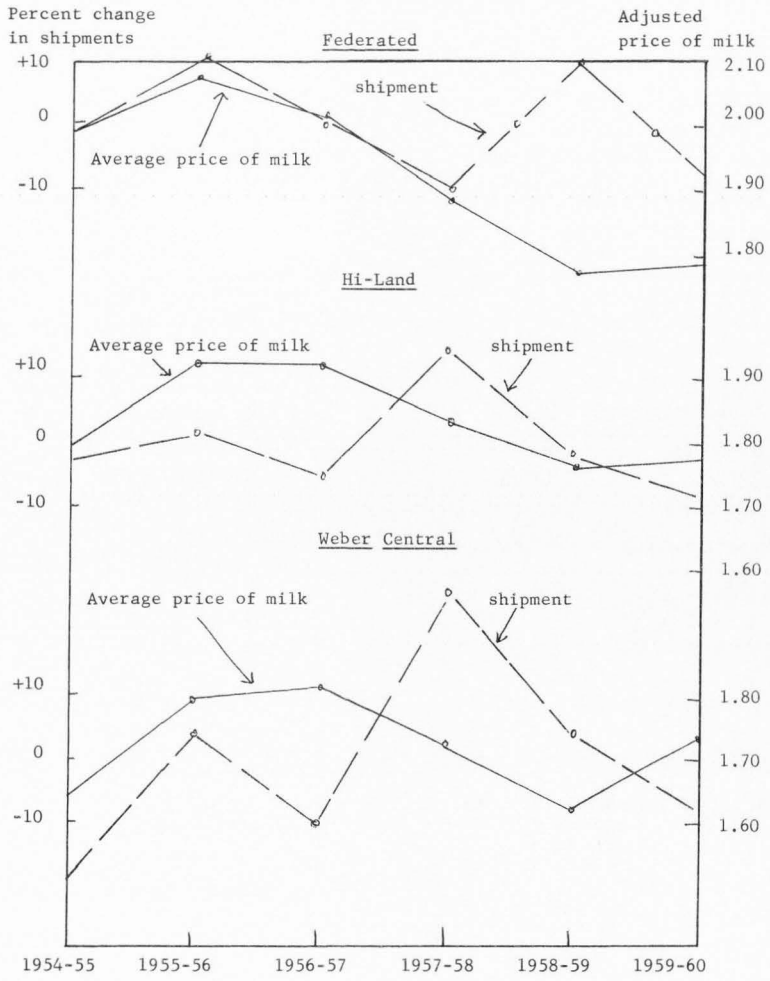

Figure 5. Average adjusted price of milk and shipment response for Federated, Hi-Land, and Weber Central producers, 1954-55 through 1959-60

It appears that during the short period of time studied prices had little affect on producer shipments of milk and that changes were due mainly to other factors.

Price of Feed and Beef Cattle

The average price of mixed dairy feed under 29 percent protein content in Utah was used to represent the variable production cost in producing market milk. This cost was used in place of a more comprehensive cost estimate because of the time that would be required to obtain other production cost and because feed represents almost half of total production costs.

The prices received by producers in an alternative enterprise to dairy farming can also affect total production of market milk. The average price received for all beef cattle in Utah was used to represent an alternative enterprise.

Feed prices have tended to decrease gradually from 1955 thru 1961. The average price of cattle tended to fluctuate more, increasing $6.73 per hundredweight between 1955 and 1958 and decreasing $2.89 between 1958 and 1961, table 22.

To evaluate the net effect of change in milk and feed prices and the possible price advantage in beef cattle, milk/feed and milk/beef price ratios were calculated, table 23. The larger the ratio the more advantageous the price situation is for the production of milk.

Table 22. Average prices paid for mixed dairy feed under 29 percent protein content and average prices received for all beef cattle in Utah, 1955-1961

Year	Mixed dairy feed prices		Cattle prices	
	Actual prices	Adjusted prices[a]	Actual prices	Adjusted prices[b]
1955	3.77	1.46	14.32	5.92
1956	3.62	1.47	13.28	5.77
1957	3.62	1.36	16.14	6.87
1958	3.38	1.23	21.05	8.41
1959	3.54	1.29	20.83	8.68
1960	3.50	1.27	18.08	7.49
1961	3.48	1.26	18.16	7.57

[a] Actual prices divided by index of prices paid by farmers, 1910-14 = 100.

[b] Actual prices divided by index of prices received by farmers, 1910-14 = 100.

Changes in producer shipments during the production year compared to changes in the milk/feed price ratio can be seen in Figure 6. Shipments were lagged one year. The milk/feed price ratio during the short period studied seems to have had little or no effect on shipments of market milk to the cooperatives.

If we assume a high price for beef and a low price for market milk, the milk/beef price ratio will be low thus encouraging producers to cull their herds more thoroughly. Some producers will diversify their operation by including a beef enterprise and decreasing the size of their

dairy enterprise, causing a reduction in total shipments of market milk. A high milk/beef price ratio would have the opposite affect, thus increasing shipments of market milk.

Table 23. Milk/feed and Milk/beef price ratios for Federated, Hi-Land, and Weber Central, 1955-1961

	Federated		Hi-Land		Weber Central	
Year	Milk/ feed ratio	Milk/ beef ratio	Milk/ feed ratio	Milk/ beef ratio	Milk/ feed ratio	Milk/ beef ratio
1954-55	1.36	.332	1.20	.280	1.13	.256
1955-56	1.46	.363	1.35	.335	1.26	.312
1956-57	1.46	.329	1.38	.318	1.31	.301
1957-58	1.47	.240	1.43	.240	1.35	.225
1958-59	1.41	.200	1.36	.195	1.28	.183
1959-60	1.40	.226	1.38	.239	1.34	.246

A comparison of changes in shipments during the production year to changes in the milk/beef price ratio can be seen in Figure 7. Shipments were lagged one year.

Although changes in shipments and changes in milk/beef price ratios move in the same direction during the first part of the study, little if any relationship toward the latter part of the study indicates that response may be due to other factors.

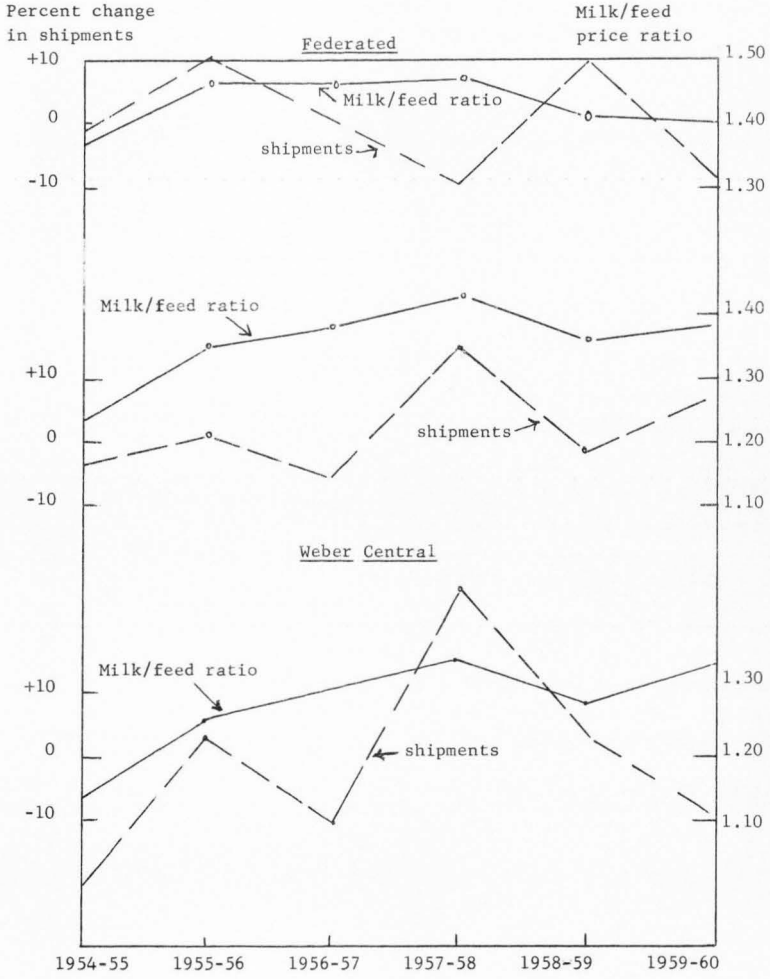

Figure 6. Milk/feed price ratio and shipment response for Federated, Hi-Land, and Weber Central producers, 1954-55 through 1959-60

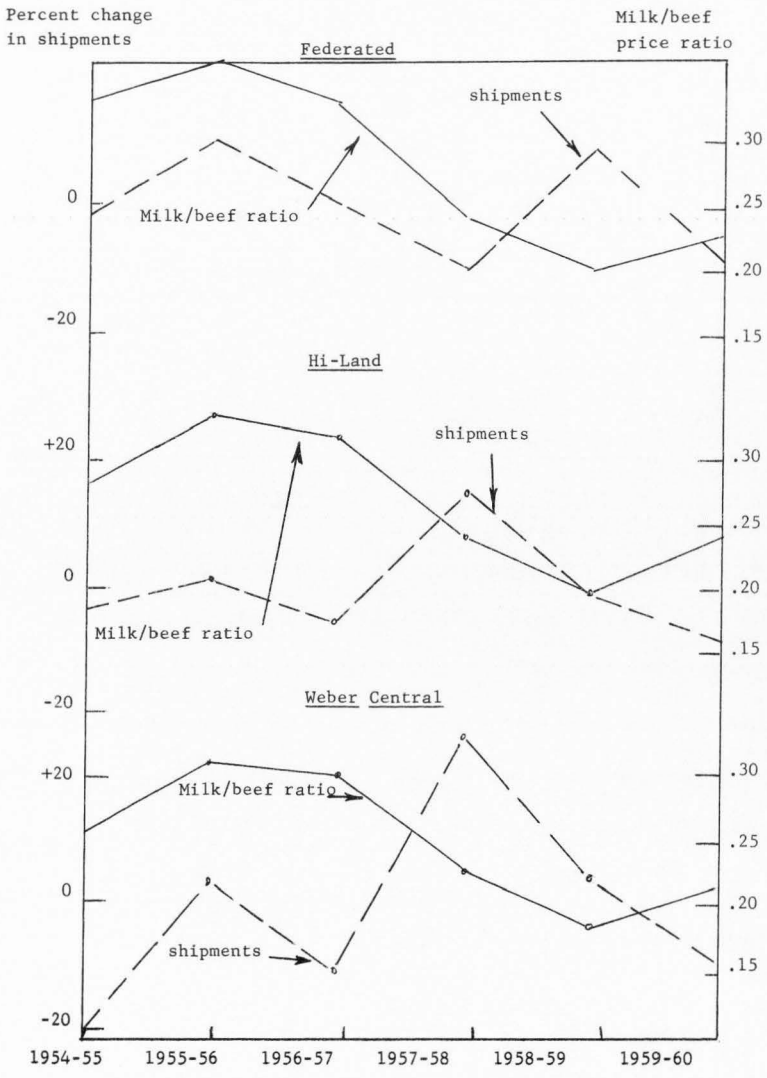

Figure 7. Milk/beef price ratio and shipment response for Federated, Hi-Land, and Weber Central producers 1954-55 through 1959-60

SUMMARY AND CONCLUSIONS

The constant increase of market milk over the last two decades and seasonal variation in shipments have caused a problem in the dairy industry of Utah. To help alleviate the problem milk cooperatives have used the base-excess plan to: (a) encourage a more even level of market milk shipments and (b) attempt to control total shipments of milk. The milk cooperatives are interested in determining how well the base-excess plan has accomplished these two objectives.

To evaluate the effectiveness of the base-excess plan, changes in shipments, base programs, and average prices paid producers were obtained from Federated, Hi-Land, and Weber Central. To determine producers shipment response a comparison was made between changes in milk shipments and base building incentives.

The base building incentive was determined by the rate of base increase allowed each year. Between 1955 and 1961 Hi-Land maintained a semi-open base building program; Federated had a semi-open program during 1955 thru 1959 and in 1961, and a closed program in 1960. Weber Central had an open program during 1955 thru 1957 and in 1959, a semi-open program in 1958, and a closed program in 1960 and 1961.

Two methods used by producers to increase base were building base and purchasing additional base. The cooperatives have allowed

100 percent of base to be transferred with the sale of a dairy farm having an established base. The amount of base allowable for transfer with the sale of only the cows varies from 100 to 50 percent.

The cooperatives have indicated that base has been granted to new producers at various times.

The administration of base programs has varied among cooperatives. Federated maintained a strict program that has not been arbitrarily changed once established, they have thoroughly acquainted members with the operation of the program and have kept members aware of changes that have been made in the program through a monthly producer news letter and annual producer's meeting. Although Hi-Land has maintained a strict base program they have not used a monthly producer news letter to acquaint members with the program. Weber Central has been lax in the administration of the program and does not submit a producers news letter to inform members of the operation and changes in the program.

Between 1955 and 1961 annual shipments of market milk per producer increased 97 percent for Federated, 103 percent for Hi-Land and 147 percent for Weber Central. Changes in shipments per producer adjusted for secular trend compared to base building incentives indicates a fairly high correlation for Federated producers, .62 and .77 for the base building period and production year respectively. Hi-Land producers were next with an "r" of .21 and .46, and Weber Central producers indicated a negligible response with an "r" of .19 and -.35.

Shipments for the sample producers showed that the large-size producers had the highest degree of correlation of .59 during the base building period and .63 during the production year. The "r" values for the medium- and small-size groups were .43 and .68 respectively during the base building period and .70 and .06 respectively during the production year.

The seasonal variation of shipments from high to low months of the year between 1955 and 1961 has tended to decrease for all three cooperatives. The average variation over the seven-year period was 11.9 percent for Federated, 13.1 percent for Hi-Land and 17.1 percent for Weber Central.

During fairly liberal and moderately restrictive base building periods, Federated producers attained a fall peak of production. When base building was restrictive and thus a decreased incentive, they shifted their peak of production from a fall to a spring peak. Hi-Land and Weber Central did not change seasonal patterns with changes in the base building incentive.

Large- and medium-size producers also responded to changes in incentives by shifting their seasonal production pattern in the same manner as all producers associated with Federated. Small-size producers did not change their seasonal patterns with a change in incentives.

The effect of milk, feed and beef cattle prices on milk shipments can generally be seen over a long-run period. But because of the short period studied and the control by cooperatives on entry of new producers, the response of producer shipments to price changes was limited and difficult to observe.

The results of this study indicate that:

1. A base-excess plan well organized and administered does have an influence on the production of market milk and it can be used as a means of controlling total as well as seasonal shipments.

2. The large- and medium-size producers responded to changes that were made in base building incentives. The small-size producers showed little or no response to incentive changes.

3. A base-excess plan that is not strictly administered and fully understood by producers does not provide dairies with a tool that can be used to control total as well as seasonal shipments.

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