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Factors Affecting the Seasonality of Marketing Manufacturing Milk in Eastern South Dakota

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FACTORS AFFECTING THE SEASONALITY OF MARKETING MANUFACTURING MILK IN EASTERN SOUTH DAKOTA

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This thesis is approved as a creditable and independent investigation by a candidate for the degree, Master of Science, and is acceptable as meeting the thesis requirements for this degree, but without implying that the conclusions reached by the candidate are necessarily the conclusions of the major department.

_____ Thesis Adviser Date

_____ Head, Economics Department Date

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CHAPTER I

INTRODUCTION

The problems involved in the marketing of milk are numerous and often complex. One problem facing both the South Dakota producer and processor is the seasonality in production and marketing of manufacturing milk.[1] This has been a problem of long standing in the dairy industry. The fluid milk industry has made some progress in bringing about a more even flow of milk to the market through the various price incentive programs. Seasonal pricing has played a leading role. Little has been done, however, to alleviate the problem in the manufactured milk segment of the industry.

Part of the seasonality problem lies in the fact that the cow's lactation period is only 9 to 10 months of the year and approximately 40 percent of the year's output per cow is produced in the first three months of the lactation period. In addition, milk is highly perishable and must reach the market in a fresh state. Since the demand for milk is relatively constant throughout

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[1] Seasonality of milk production is defined as a wide fluctuation in output per farm between months of low production and months of high production.

the year, any group of producers that does not stagger calving will have enough milk to supply the market in the low production months. However, they will have more than enough to meet the demand during the months of peak production.

Figure 1 shows the variation in milk production in South Dakota. In 1966, approximately 160 million pounds of milk were produced in June, the month of highest production, while in November, the month of lowest production, approximately 115 million pounds were produced. The variation in absolute terms was 45 million pounds. In percentage terms, the variation was 28 percent. During the period 1945-1949, an average of 188 million pounds of milk was produced during the month of June, while only 83 million pounds were produced in November. Thus, the average production during the low month was less than one-half (44 percent) of the production during the peak month. Since a major portion of the plant's costs are fixed, manufacturers are unable to decrease operating costs materially when volume declines.[2]

Although these data indicate that seasonality of production diminished from the 1945-1949 period to 1966, the problem still exists. There is a need for research that will help identify factors associated with the seasonal production of manufactured grade milk.

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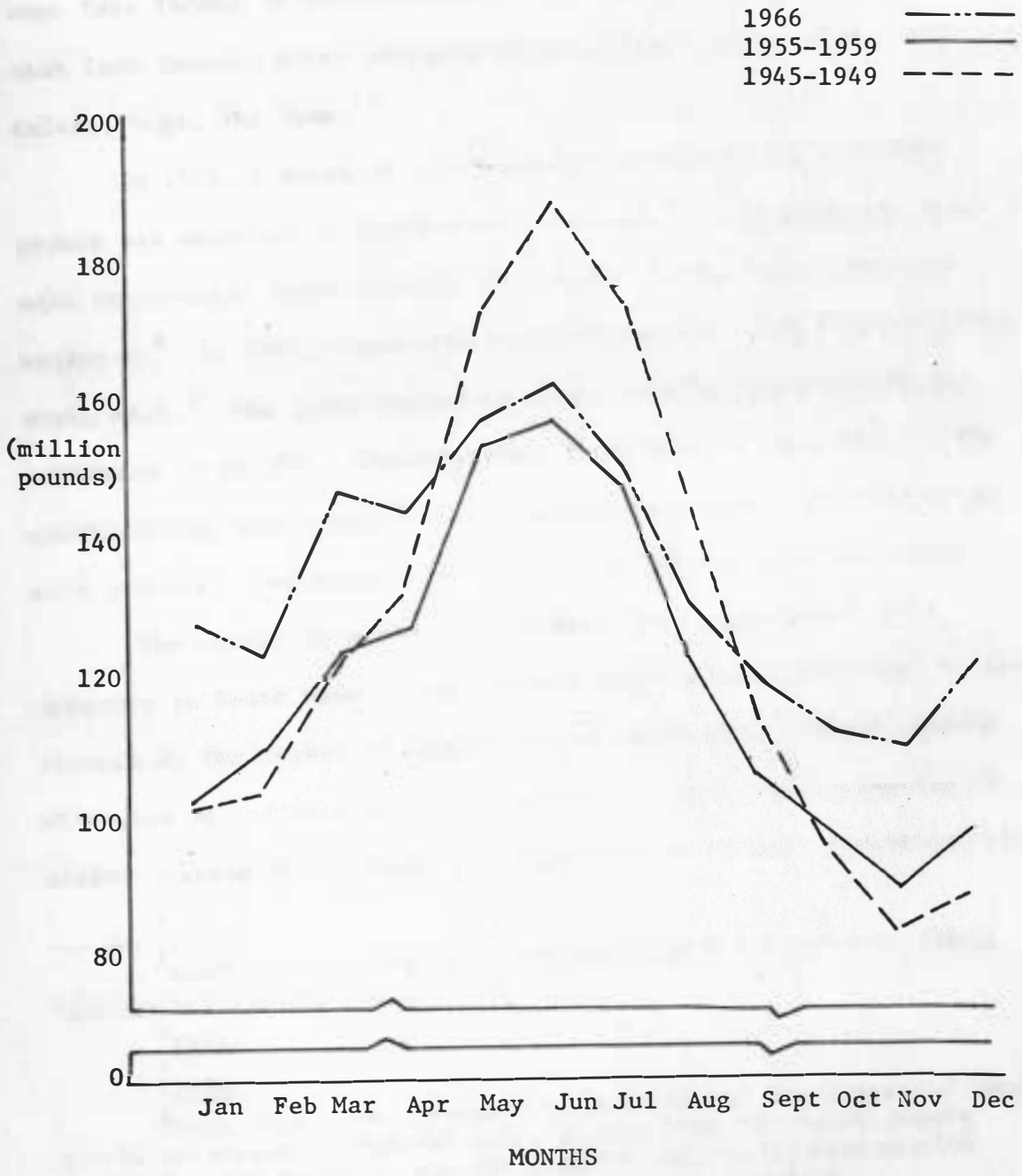
[2]Law Nicholas Brod, "The Effects of Seasonality of Manufacturing Milk Production on Dairy Manufacturing Firms' Efficiency," an unpublished M.S. Thesis, Economics Department, South Dakota State University, Brookings, S.D. June, 1965, P. 1.

Fig. I. Monthly milk production, South Dakota, 1945-1949, 1955-1959, and 1966



Source: South Dakota Crop and Livestock Reporting Service, South Dakota Agriculture, 1955 and 1967.

Characteristics of the South Dakota Dairy Industry

In 1965, dairy products accounted for 5.7 percent of the cash farm income in South Dakota.[3] In relation to other forms of cash farm income, dairy products ranked fourth behind cattle and calves, hogs, and wheat.[4]

In 1965, a total of 1,145 million pounds of milk of both grades was marketed by South Dakota farmers.[5] Manufacturing grade milk represented approximately 83 percent of the total quantity marketed.[6] In 1964, there were in South Dakota 7,640 farms selling whole milk.[7] The total number of farms selling Grade A milk was estimated to be 550. Consequently, there were an estimated 7,090 manufacturing milk producers. In percentage terms, manufacturing milk producers represented 93 percent of the total in the state.

The change in producer concentration in the whole milk industry in South Dakota from 1950 to 1960 is best described by the changes in the number of producers and their size. These changes will give an indication of the industry's growth and economies of scale. During this period, the number of whole milk producers more

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[3] South Dakota Crop and Livestock Reporting Service, South Dakota Agriculture, 1966, p. 90.

[4] Ibid.

[5] Ibid.

[6] This figure was computed by subtracting the pounds of Grade A milk delivered to federal order plants from the total pounds marketed. The residual was the quantity of manufacturing milk marketed and was divided by the total pounds marketed.

[7] United States Bureau of the Census, U.S. Census of Agriculture: 1964, Statistics for the State and Countries, South Dakota, U.S. Government Printing Office, Washington, D.C., 1964, p. 13.

than doubled (3,506 to 7,640), while the average production per farm increased from 35,375 pounds to 134,396 pounds.[8]

During the 1950-1965 period, shifts occurred in the production pattern of the various manufactured dairy products. (See Table 1).

Table 1. Manufactured dairy products, South Dakota, 1950 and 1965.

Year	Creamery butter[a]	American cheese[b]	Cottage, pot and baker's cheese	Non-fat dry milk[c]	Dry or powdered butter-milk	Ice cream	Sher-bets[d]
	1,000 pounds					1,000 gallons	
1950	32,429	1,664	1,126	0	808	2,531	69
1965[e]	35,555	25,083	3,121	45,637	2,788	1,877	96

[a]Including whey butter.

[b]Whole milk.

[c]For human consumption.

[d]Does not include water.

[e]Preliminary.

Source: South Dakota Crop and Livestock Reporting Service, South Dakota Agriculture, 1966, p. 86 and 1955, p. 41.

In the demand side, evidence of changes in consumer tastes and preferences in the United States can be found. (See Table 2).

[8]Ibid.

Table 2. Per capita civilian consumption of selected dairy products, United States, 1950 and 1965.

Year	Fluid milk	Butter	Cream	Cottage cheese	Evaporated whole milk	Low fat milk	Nonfat dry milk	Ice milk
	Pounds							Gallons
1950	278	18.5	9.1	3.1	11.1	15.6	3.5	0.2
1965	266	8.6	5.7	4.6	7.7	34.2	4.8	1.2

Source: United States Department of Agriculture, Economic Research Service, Dairy Situation, Washington, D.C., November, 1966, p. 17.

Objectives of the Study

The specific objectives of this study are the following:

(1) to determine factors affecting the seasonal pattern of marketing manufacturing milk;

(2) to determine the necessary price incentives or the adjustments needed for increasing production during seasonally low months;

(3) to identify significant obstacles causing the seasonal supply of manufacturing milk.

Review of Literature

A study of the factors affecting seasonal production of Grade A milk in the Baltimore milkshed was made by Burns and Beal.[9] The factors examined were: (1) size of farm, (2) size of herd, (3) breed of cows, (4) quality of cows, (5) breeding practices, (6) feeding practices, (7) crops and cropping practices, (8) land tenure, (9) age of operator, (10) permanent pasture management, (11) labor, and (12) other types of livestock enterprises.

The results of the study showed that winter (nonseasonal) producers directed their efforts toward obtaining a greater quantity of milk, uniform production, larger herds, a greater percentage of purebred cows, and larger annual output per cow. Cows and heifers were freshened for fall production. Cropping practices were concerned primarily with providing ample grain, hay, and pasture for dairy animals. Cows were fed according to production and received good care in late summer, fall, and winter.

Clarke found that a lack of seasonal adjustment in price was one of the causes of fall shortages of milk in the Charleston, West Virginia, fluid milk market.[10] Grade A producers indicated that in order to produce one tenth more milk than had been produced the preceding fall would require approximately an 86 cents per

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[9] D.J. Burns, G.M. Beal, Farm Practices Affecting Seasonal Milk Production in the Baltimore Milkshed, Bulletin A-58, Agricultural Experiment Station, University of Maryland, College Park, Maryland, October, 1950.

[10] James H. Clarke, Producer Opinions on Seasonal Milk Production Costs and Prices, Bulletin 445, Agricultural Experiment Station, West Virginia University, Morgantown, West Virginia, September, 1960.

hundredweight increase in price over that received in July. Also, an additional $1.04 and $1.30 per hundredweight would be necessary to increase production by one-fifth and one-third, respectively, over the preceding fall. Percentagewise, these prices were 17, 21, and 26 percent higher, respectively, than the average market price during July, 1956. Production costs varied from $3.49 per hundredweight in the spring to $4.50 in the fall and winter.

Obstacles to increasing milk production in the fall months were listed, in descending order, as follows: (1) breeding rotation not properly regulated, (2) deficiencies of roughage, (3) deficiencies of fall pasture, (4) price for added production inadequate, (5) high cost of feed, (6) lack of capital for improvement, and (7) labor costs.

The objectives of a study by Blakley, Brooks, and Boggs were to determine the cause of adjustments in seasonal variation in Grade A milk production under existing programs in the Oklahoma City and Tulsa milksheds.[11]

The results indicated that statistically significant differences existed between the two markets, between the different producer sizes, and between the various seasonal patterns of production. The differences between years did not appear significant for some seasons. Comparisons within markets indicated

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[11] Leo V. Blakley, Elton O. Brooks, and Kenneth B. Boggs, Seasonal Pricing Plans for Class I Milk in Oklahoma, Bulletin B-602, Agricultural Experiment Station, Oklahoma State University, Stillwater, Oklahoma, December, 1962.

that the differences between sizes and between patterns within sizes were significant. However, within a given pattern, size was not always statistically significant. Pattern type appeared to be the most important single source of variation in percentage of average production during each month.

Brod's analysis of the effect of seasonality of manufacturing milk production on firm efficiency showed that an average in-plant savings gained by operating with peak receipts each month of the year would be enough to enable processors to pay 29¢ per hundredweight over and above seasonal prices for additional milk supplies.[12] However, it was found that small savings could be realized only by leveling out the total supply of milk over the entire year.

Procedure

Sampling

The first step in drawing the sample was randomly selecting two of the six cooperative butter-powder plants which process manufacturing grade milk in Eastern South Dakota.[13] Plants

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[12] Brod.

[13] Due to cost and time limitations, the production records of all manufacturing milk producers in Eastern South Dakota could not be reviewed. The producers were broken up initially into creameries, cheese plants, or butter-powder plants. Suppliers of the six cooperative butter-powder plants produce an estimated 63 percent of the total production. These producers are dispersed and cover the eastern section of the state. Therefore, the category of butter-powder plants was chosen. Out of this category, two of the six plants were randomly selected.

selected were Sioux Valley Milk Cooperative Company in Sioux Falls and the Farmers Cooperative Creamery Company in Volga.

In order to become part of the sample, a producer must have been a patron of either of the two plants on June 1, 1966, and had marketed milk for the entire period of December 1, 1964, to January 31, 1966.[14] Approximately 1,100 producers satisfied these requirements. From production records, a seasonality ratio was then computed for each producer.[15] A seasonal producer was defined as one whose seasonality ratio was .3499 or less. A nonseasonal producer was defined as one whose seasonality ratio was .65 or greater. A total of 162 producers were classified as nonseasonal, and 337 as seasonal. A sample composed of 50 seasonal producers and 25 nonseasonal producers (a 15 percent sample) was then chosen at random from the two groups.

Sources of data

Sources of secondary data used in the analysis included South Dakota Crop and Livestock Reporting Service, Federal Milk Order Market Statistics, Cooperative Extension Service, and United States Department of Agriculture. Primary data pertaining to

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[14]The 14 month production period of December 1, 1964, to January 31, 1966, was required to link the milk production in the month of January 1, 1965, (average milk production of December, 1964, and January, 1965) with the milk production in the month of December, 1965, (average milk production in December, 1965, and January, 1966).

[15]Seasonality ratio is the percentage relationship of the three adjacent months of low milk production to the three adjacent months of high production.

general farm characteristics, dairy operations, marketing practices, and seasonality were gathered by personal interview.

Statistical test

Because the questionnaire data were in discrete form, a nonparametric test--chi-square (X^2) test of independence--was used for the analysis. The X^2 test of independence involves finding the discrepancies between the observed frequencies and the hypothetical frequencies.[16] In this study, the X^2 test is used to test for significant differences between the seasonal and nonseasonal producer on the defined variables.[17]

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[16]Jerome C.R. Li, Introduction to Statistical Inference, Edwards Brothers, Inc., Ann Arbor, Michigan, 1957, p. 410.

[17]The defined variables are listed in Tables 7, 8, 13, 17, and 19.

CHAPTER II

DESCRIPTION OF THE TYPICAL SEASONAL AND NONSEASONAL MANUFACTURING MILK PRODUCER

The purpose of this chapter is to briefly characterize the typical seasonal and nonseasonal milk producer. The characteristics included in the description of each group are general agricultural characteristics, management experience, sources of farm income, and herd characteristics and management practices. The analysis of each type of producer follows in Chapter III.

General Agricultural Characteristics

General agricultural characteristics by type of producer are presented in Table 3. As shown, the difference in the average number of acres of land owned by the nonseasonal and seasonal producer was small, but when acres of land rented and total farm size were considered, the difference increased.

Table 3. General agricultural characteristics, sampled producers, Eastern South Dakota, 1966.

Item	Type of producer	
	Seasonal	Nonseasonal
Acres owned	244	243
Acres rented	261	283
Farm size (acres)	382	406
Years renting land	19	15
Years owning land	13	12
Percent owner-operators	26	0
Percent part owners[a]	60	64
Percent renters		

[a]Producer owns and rents land.

The average length of tenure for rented and owned land by a nonseasonal producer was less than for the seasonal producer. Owner-operators were found only in the seasonal group. Approximately the same percentage of seasonal and nonseasonal producers were part owners. Approximately twice as many nonseasonal producers were renters as seasonal producers.

Management Experience

As shown in Table 4, the average number of years of farm background, operating a farm, and dairy management experience was slightly higher for the seasonal producer.

Table 4. Management experience, sampled producers, Eastern South Dakota, 1966.

Item	Type of producer	
	Seasonal	Nonseasonal
Years of farm background	45	38
Years operating a farm	23	19
Years of experience in managing a dairy farm	22	19

Sources of Farm Income

The seasonal producer relied upon a combination of enterprises for generating income with dairy accounting for 38 percent. (See Table 5). It appears that the nonseasonal producer depended more heavily upon the dairy enterprise to stabilize farm income--53 percent of total farm income from dairy.

There are indications that the income structure of both groups of producers has shifted. During the period 1960-1966, the percentage of total farm income derived from beef, dairy, and cash grains increased for the seasonal producer along with decreases in the amount derived from hogs and chickens. The only positive shift in the income structure of nonseasonal producers was the increase in dairying. The proportion of income from hogs, beef, and cash grains decreased.

Table 5. Sources of farm income, 1966, percentage change of farm income, 1960-1966, sampled producers, Eastern South Dakota, 1966.

Item	Type of producer	
	Seasonal	Nonseasonal
Percentage of total farm income from:		
Dairy	38	53
Beef cattle	23	14
Hogs	20	13
Cash grains	14	12
Chickens	3	4
Other[a]	2	4
Percentage change of total farm income from 1960 to 1966 for:		
Dairy	5	8
Beef cattle	8	-1
Hogs	-13	-3
Cash grain	1	-4
Chickens	-1	0
Other[a]	0	0

[a]Other sources of income include sheep, custom work, and other poultry enterprises.

Herd Characteristics and Management Practices

In terms of herd size, composition and total production, the two groups differed considerably. Data in Table 6 indicated that the nonseasonal producer's herd was larger, had a greater percentage of high-grade cows and had twice the production of the seasonal producer.

Segregating is one means of controlling the season of freshening and thus affecting the seasonal pattern of marketing milk. The nonseasonal producer seemed more concerned than did the seasonal producer in segregating first-calf heifers as a means of controlling breeding. However, less than one-fourth of the producers in each group practiced segregation of cows two years and older.

Another factor affecting the seasonality of production is the season of the year in which the herd is freshened. There was a reluctance on the part of both types of producers to freshen first-calf heifers during the summer months. Almost all the seasonal producers freshened heifers in either the spring, fall, or winter months. None of the seasonal producers freshened heifers all seasons of the year.

The freshening pattern for the remainder of the herd differed somewhat from that of the first-calf heifers. Approximately 76 percent of the seasonal producers freshened cows in one of the four seasons, while the remaining 24 percent freshened during all seasons or combination of seasons. A majority of the nonseasonal producers freshened cows all year around.

Table 6. Herd characteristics and management practices, sampled producers, Eastern South Dakota, 1966.

Item	Type of producer	
	Seasonal	Nonseasonal
Total production (000)	106	218
Number of cows in 1960	15	17
Number of cows in 1965	17	25
Number of high grade cows	14	23
Number of low grade cows	3	2
Percentage that segregated first-calf heifers	26	50
Percentage that segregated dairy cows	20	23
Percentage that segregated both first-calf heifers and dairy cows	16	20
Percentage of time of year when freshen		
First-calf heifers		
Spring	33	4
Summer	5	0
Fall	35	39
Winter	20	9
All seasons	0	35
Combination of seasons	7	13

Table 6. (Continued)

Item	Type of producer	
	Seasonal	Nonseasonal
Percentage of time of year when freshen		
Dairy Cows		
Spring	14	0
Summer	2	8
Fall	28	24
Winter	32	4
All seasons	6	52
Combination of seasons	18	12

CHAPTER III

FINDINGS OF THE STUDY

An analysis of the seasonal and nonseasonal producers should provide a better understanding of the seasonality problem as it affects the manufacturing milk industry in Eastern South Dakota. Since the sample for this study was stratified on the basis of seasonality of production, a direct comparison between the two types of producers is possible. The previous chapter was devoted to a description of the typical seasonal and nonseasonal producer. In this chapter, the data are analyzed statistically to determine existing likeness or differences between the two groups.

The General Model

The general procedure followed in the analysis was to group the factors on the basis of presumed commonness. While the factors within each category were analyzed statistically, more meaningful conclusions became apparent when the interrelationships of factors within each group were considered. The five following categories, as well as the basis for each grouping, form the general framework for the analysis.

1) Producer-Processor Relationship Factors

Analyzing these factors should indicate the attitudes of the producers toward processors' practices and policies regarding the seasonality problem. These factors include: (a) attitude toward cooperatives, (b) producers' satisfaction with the pay period, milk pick-up, and butterfat testing, and (c) producers' awareness of problems generated by seasonality of production.

2) Quantum of Information Factors

The producers' ability to make right decisions is often related to the amount of information available. The type of media used for the dissemination of this information can be crucial. The amount of information the producers receive about the seasonality problem is reflected by the quantum of information factors. Quantum of information factors included are: (a) subscriptions to farm magazines, (b) time spent per day with the various types of mass media, and (c) years of formal education.

3) Dairy Operation Factors

Some of the functional causes of the seasonality problems originate at the farm level. Adjustments in one, several, or all of the dairy operation variables by the producer could help alleviate part of the problem. The dairy operation factors include: (a) quality of the dairy herd, (b) breeding practices, (c) amount of concentrates fed, and (d) herd size.

4) Dairy Management Factors

Dairy management factors were not included in the previous section but are associated with the decision-making process. They include: (a) sources for consultation on problems of production and marketing of manufacturing milk, (b) size of producer, (c) attitude toward Grade A production, (d) utilization of bulk tanks, (e) receptivity toward dairy testing associations, (f) dairy management experience, and (g) expected longevity in milk production.

5) General Agricultural Factors

The general agricultural factors will supply the information needed to complete an understanding of the types of producers. These factors are: (a) sources of farm income, (b) farm size, (c) tenure, (d) farm management experience, and (f) age of producer.

Hypothesis

The null hypothesis is that there is no significant difference between the nonseasonal and the seasonal producer with respect to the defined variables. The alternative hypothesis simply states that there is a significant difference. Failure to accept the null hypothesis indicates the variable may be useful in identifying those factors influencing the seasonality of production.

Results of the Study

Producer-Processor Relationship Factors

The extent to which the producer reacts to decisions made by the processor is shown in an analysis of the producer-processor relationship factors. When a producer is dissatisfied with a processor's decision, one reaction may be to change plants. It was found, however, that there was no significant difference between the two groups in the frequency with which they shifted from one plant to another during the past five years.[18] Both groups showed little tendency for shifting between plants. Other areas in which dissatisfaction may arise with their processors are the frequency of milk payments, frequency of milk pick-up, and the low butterfat tests. In all three cases both the seasonal and nonseasonal producers were satisfied.

Communication between producers and processors as a means of gaining a better understanding of processors' problems can be partially achieved through cooperative meetings. According to Table 7, there was no significant difference between the groups in regard to the number of cooperative meetings attended last year. Only a small percentage of both types of producers attended cooperative meetings. However, both types were aware of seasonality as a problem to the processor. Some problems which processors face are the full employment of labor, full utilization of equipment, and a constant demand for milk and milk products over the entire

[18] The level of significance for all computed chi-square (X^2) values was $\alpha = 10$, unless indicated otherwise.

Table 7. Chi-Square (X^2) values for the producer-processor relationship factors, sampled producers, Eastern South Dakota, 1966.

	Variable	Computed X^2 value	Degrees of freedom
1	Change in processing plants during the last five years	.04	1
2	Satisfaction with the frequency of milk payments	.09	1
3	Satisfaction with the frequency of milk pick-up	1.56	1
4	Satisfaction with the butterfat tests	2.10	1
5	Number of cooperative meetings attended last year	1.04	1
6	Benefits from membership in a cooperative	2.41	4
7	Awareness of processors' problems	.55	1
8	Awareness that a decrease in milk production in the fall months is a problem to the processor	.15	1
9	Awareness of why a decrease in milk production in fall months is a problem to the processor	3.07	5

year. These conditions are in conflict with the seasonal nature of production. Producers recognized the problem of full employment of labor as a major one faced by the processor.

Quantum of Information Factors

Information is available to the producers through mass media. By utilizing mass media to the best advantage the processor should be able to communicate some of his problems to the producers.

Farm magazines can be used for disseminating information to the producer. The rate of dispersion of agricultural concepts, more specifically dairy marketing concepts, through farm magazines was not different between the two types of producers. (See Table 8). While a majority of the producers subscribed to two or more farm magazines, most of the producers did not subscribe to a dairy magazine. Those who did subscribe to a dairy magazine read some of the articles.

By knowing how much time is spent by both types of producers in utilizing the various forms of mass media available, the processor can select the form that will be most useful. The data revealed a significant difference in the two groups of producers in terms of the amount of time spent per day reading newspapers. (See Table 9). It appears that the seasonal producers spent more time per day reading newspapers than did the nonseasonal producers.

Table 8. Chi-square (X^2) values for the quantum of information factors, sampled producers, Eastern South Dakota, 1966.

	Variable	Computed X^2 value	Degrees of freedom
1	Number of subscriptions to farm magazines excluding farm magazines strictly on dairying	.81	2
2	Number of subscriptions to farm magazines that are strictly on dairying	.64	1
3	Number of subscriptions to farm magazines that are strictly on dairying in which some article is read in every issue	.97	1
4	Time spent per day reading newspapers	2.8*	1
5	Time spent per day reading farm magazines	.13	1
6	Time spent per day listening to radio or watching television	.22	1
7	Rank of national news in newspaper in terms of percentage of time reading per day[a]	.28	1
8	Rank of state and local news in newspaper in terms of percentage of time reading per day[a]	5.63**	1
9	Rank of agricultural markets in newspaper in terms of percentage of time reading per day[a]	.25	3
10	Rank of sports in newspaper in terms of percentage of time reading per day[a]	.89	1

Table 8 (Continued)

Variable	Computed X^2 value	Degrees of freedom
11 Rank of comics in newspaper in terms of percentage of time reading per day[a]	.08	1
12 Rank of other sections in newspaper in terms of percentage of time per day[a]	.56	1
13 Rank of national news on radio and television in terms of percentage of time watching and listening per day[a]	2.42	3
14 Rank of agricultural markets on radio and television in terms of percentage of time watching and listening per day[a]	5.83*	2
15 Rank of state and local news on radio and television in terms of percentage of time watching and listening per day[a]	1.01	2
16 Rank of sports on radio and television in terms of percentage of time watching and listening per day[a]	.18	1
17 Rank of music on radio in terms of percentage of time listening per day[a]	2.39	1

Table 8 (Continued)

	Variable	Computed X^2 value	Degrees of freedom
18	Rank of other programs on radio and television in terms of percentage of time watching and listening per day[a]	1.8	2
19	Number of years of formal education	2.74*	1

* Significant at the 10 percent level

** Significant at the 5 percent level

a Ranked in descending order with seven representing the highest rank.

Table 9. Observed and expected frequencies for the time spent per day reading newspapers, sampled producers, Eastern South Dakota, 1966.

Time	Seasonal producers Observed	Expected	Nonseasonal producers Observed	Expected
Less than 30 minutes	20.0	23.7	16.0	12.3
30 minutes and over	28.0	24.3	9.0	12.7

Most of the producers spent fewer than thirty minutes a day reading farm magazines. In contrast, most of the producers watched television or listened to radio one to three hours per day.

Time allotted to reading each of the sections of the newspaper will give an indication of newspapers' importance in reaching producers. (See Table 10). The time spent per day

Table 10. Observed and expected frequencies for the rank of state and local news in newspaper in terms of percentage of time reading per day, sampled producers, South Dakota, 1966.

Rank	Seasonal producers Observed	Expected	Nonseasonal producers Observed	Expected
1-5	15.0	12.3	4.0	6.7
6	16.0	14.2	6.0	7.8
7	13.0	17.5	14.0	9.5

reading national news, agricultural markets, sports, comics, and other sections except state and local news was not different between both types of producers. The amount of time spent per day reading state and local news was, however, significant. It appears that a greater number of nonseasonal producers were spending more time reading state and local news. This indicates that information released through newspapers to reach nonseasonal producers should be in such a form that it has a local or state connotation.

By analyzing the various types of programs on radio and television, an indication is possible of the importance of each in disseminating information to the producers. There was a significant difference between the two types of producers for agricultural markets on radio and television. (See Table 11). The seasonal producers did not have as much contact with agricultural markets as the nonseasonal producers did. This

Table 11. Observed and expected frequencies for the rank of agricultural markets on radio and television in terms of percentage of time watching and listening per day, sampled producers, Eastern South Dakota, 1966.

Rank	Seasonal producers		Nonseasonal producers	
	Observed	Expected	Observed	Expected
1-4	5.0	8.6	8.0	4.4
5	20.0	17.2	6.0	8.8
6-7	20.0	19.2	9.0	9.8

tends to indicate that the processors should be using television and radio as a means of dispersing information to the seasonal producer about the problem of low milk production in the fall months.

Formal education was included in this section of factors because of the relationship between education and the ease of assimilating information. Table 12 shows that nonseasonal producer's ability to assimilate information would be better than that of the seasonal producer. That is, the educational level

Table 12. Observed and expected frequencies for number of years of formal education, sampled producers, Eastern South Dakota, 1966.

Time	Seasonal producers		Nonseasonal producers	
	Observed	Expected	Observed	Expected
11 years and under	36.0	32.4	13.0	16.6
12 years and over	13.0	16.8	12.0	8.4

of the nonseasonal producer is higher than that of the seasonal producer.

Dairy Operation Factors

A change in herd size indicates the changing importance of the dairy enterprise in the farm operation. The dynamics are signified by the number of producers who changed herd size from 1960-1965, amount of change in herd size, reasons for changing, and/or reasons for not changing. (See Table 13). In general, the data showed a distinct similarity between groups in the

Table 13. Chi-square (X^2) values for the dairy operation factors, sampled producers, Eastern South Dakota, 1966.

	Variable	Computed X^2 value	Degree of Freedom
1	Change in dairy herd size from 1960 to 1965	4.60	4
2	Reasons for dairy herd size to change from 1960 to 1965	6.84	7
3	Number of producers who changed herd size from 1960 to 1965	.51	1
4	Reasons for not changing dairy herd size from 1960 to 1965	2.24	3
5	Different types of breeding practices used	3.52	2
6	Segregation to control time of breeding of first-calf dairy heifers	2.70*	1
7	Segregation to control time of breeding of other dairy cows	.05	1
8	Segregation to control time of breeding of both first-calf dairy heifers and other dairy cows	2.47	1
9	Season when a majority of a dairy herd freshened	21.35**	2
10	Season when a majority of the dairy heifers freshen	13.7**	1

Table 13 (Continued)

Variables	Computed X^2 value	Degree of freedom
11 Any variation of concentrates fed to the dairy herd	1.56	1
12 Reasons for variation of concentrates fed to the dairy herd	1.50	1
13 Number of dairy cows two years and older of low quality	.24	2
14 Number of dairy cows two years and older of high quality	2.65	2

* Significant at the 10 percent level

** Significant at the 5 percent level

absolute change of herd size from 1960 to 1965 as well as the reasons given for the change. Both seasonal and nonseasonal producers increased the herd size during this period. The amount of the increase ranged from 1 to 14 cows. The major reasons given for this increase were to increase net income and to increase utilization of the present facilities. The major reason given by some producers for not increasing herd size was that the current dairy operation was approaching the capacity of the facilities.

Since a large percentage of milk is produced in the early months of the lactation periods, selecting the most desirable seasons to freshen is important. Segregation of the herd is one method of controlling the time of freshening. The use of segregation to control the time of breeding of first-calf dairy heifers and cows is an important factor in leveling out milk production. The data indicated that seasonal producers were not concerned with segregation of a first-calf heifer. (See Table 14).

Table 14. Observed and expected frequencies for segregation for breeding of first-calf heifers, sampled producers, Eastern South Dakota, 1966.

	Seasonal producers		Nonseasonal producers	
	Observed	Expected	Observed	Expected
Yes	11.0	14.3	10.0	6.7
No	32.0	28.7	10.0	13.3

The nonseasonal producer, however, was concerned about the use of segregation. However, both the seasonal and nonseasonal producers

showed a lack of interest in controlling the breeding time of the dairy cow after the first calf.

Another indicator of the breeding practices that are being implemented is the season(s) of the year when a majority of the dairy heifers and cows freshened. The season when a majority of the dairy herd was freshened was significant at the 5 percent level. The data in Table 15 revealed that nonseasonal producers were freshening their dairy herds throughout the year. As shown in Table 16, seasonal producers were not freshening their dairy heifers year around.

Table 15. Observed and expected frequencies for season when majority of dairy herd freshen, sampled producers, Eastern South Dakota, 1966.

Seasons of the year	Seasonal producers		Nonseasonal producers	
	Observed	Expected	Observed	Expected
One particular season	38.0	31.3	9.0	15.7
All seasons	3.0	10.7	13.0	5.3
Combination of seasons	9.0	8.0	3.0	4.0

Table 16. Observed and expected frequencies for the season when majority of dairy heifers freshen, sampled milk producers, Eastern South Dakota, 1966.

Seasons of the year	Seasonal producers		Nonseasonal producers	
	Observed	Expected	Observed	Expected
One particular season	37.0	31.1	12.0	17.9
Combination of seasons	3.0	8.9	11.0	5.1

A change in the quantity of concentrates fed to the dairy herd could have an effect on the production level. Neither type of producer varied the concentrate level during the year. Of the few producers who did change the concentrate level none of the reasons given were significant.

If the quality of the dairy cows can be improved, there can be an increase in milk production. Some of the increased milk production will occur during the seasonal time period. Both types of producers' herds contained a large number of high quality cows.

Dairy Management Factors

Information is needed by the producer to make profitable management decisions. Sources of information on problems of production and marketing of milk available to producers are plant fieldmen, haulers, neighbors, vocational agricultural instructors, and others.[19] There was no significant difference between the two types of producers in the use of these sources. (See Table 17).

One segment of the changing structure of the manufacturing milk industry is the change in number of producers. A majority of both types of producers planned to continue the dairy enterprise indefinitely. The reason given most frequently by those planning to discontinue the dairy enterprise was retirement.

Another factor that could influence the number of manufacturing milk producers is the shift to Grade A production.

[19]Other sources included friends, veterinarians, farm magazines, family, and board members of the processing plant.

Table 17. Chi-Square (X^2) values for the dairy management factors, sampled producers, Eastern South Dakota, 1966.

Variable	Computed X^2 value	Degree of freedom
1 Hauler as a source of consultation on problems of production and marketing of manufacturing milk	.01	1
2 Plant fieldman as a source of consultation on problems of production and marketing of manufacturing milk	1.44	1
3 Neighbor as a source of consultation on problems of production and marketing of manufacturing milk	.23	2
4 Vocational agricultural instructor as a source of consultation on problems of production and marketing of manufacturing milk	.17	1
5 Others as a source of consultation on problems of production and marketing of manufacturing milk	.21	1
6 Expected years to continue in dairying	1.15	1
7 Reasons for discontinuing dairying as an enterprise versus continuing dairying as an enterprise	3.06	4
8 Intentions of shifting to Grade A milk production	.55	1
9 Obstacles preventing a shift to Grade A milk production	8.08	6
10 Price differential needed for a shift to Grade A production	1.08	1

Table 17 (Continued)

Variable		Computed X^2 value	Degree of freedom
11	Familiarity with Grade A seasonal pricing programs	.42	1
12	Total years of dairy management experience	1.07	1
13	Years of manufacturing milk management experience	3.29	3
14	Herd size	12.31**	1
15	Price increase needed to install bulk tank	1.70	2
16	Reasons for not having a bulk tank installed	1.80	6
17	Reasons for having a bulk tank installed	4.30	4
18	How the bulk tank was financed	6.19	4
19	Participation in owner sample	2.10	1
20	Reason for not participating in owner sample	5.38	6
21	Reason for not being a member of DHIA	3.56	7

* Significant at the 10 percent level

** Significant at the 5 percent level

Neither the nonseasonal nor the seasonal producers indicated any intention of shifting to Grade A milk production. A lack of desire was the most important obstacle preventing this shift by both types of producers. Most of the nonseasonal and seasonal producers desire a price differential of more than $1.75 per hundredweight to shift to Grade A production. No difference in familiarity with Grade A seasonal pricing programs was found.

Because of the rapid adoption of technology in agriculture, knowledge has become increasingly important to the dairy producer. Experience is one method of gaining knowledge. There was no difference between the seasonal and nonseasonal producer in the number of years of experience in both managing a manufacturing milk operation and the total years of dairy management. A majority of the producers had 10-29 years of dairy management experience and 5-9 years of manufacturing milk experience.

Size is important because the producer with a large volume is more apt to have greater production in the seasonally low months. In this study, the amount of production was significant. (See Table 18). As can be expected, the volume of milk produced

Table 18. Observed and expected frequencies for size of manufacturing milk producers, sampled producers, Eastern South Dakota, 1966.

Pounds of milk	Seasonal producers		Nonseasonal producers	
	Observed	Expected	Observed	Expected
1-999	31.0	23.3	4.0	11.7
1000 and over	19.0	26.6	21.0	13.4

is greater for a nonseasonal producer than for a seasonal producer.

Using a bulk milk tank is an accepted innovation in storing and cooling milk. The major reason given by both types of producers for installing a bulk tank was the ease in cooling and storing milk. In addition, processors have offered premiums on milk stored in bulk tanks. As a result, approximately 83 percent of the producers now use bulk tanks. A majority of the producers financed their bulk tank through a contractual arrangement with the processor. The most frequent reason given for not using a bulk tank was the sufficiency of the present cooler.

Cooperation in a production testing program provides an additional source of information useful in making management decisions. Only a limited number of producers in both owner groups participated in the sample testing program. Of the producers who did not participate in either the owner-sample or DHIA testing program most of them did not express a reason for not participating. Encouraging participation in either the owner-sample or DHIA program would prove desirable from the standpoint of improving management decisions.

General Agricultural Factors

It is recognized that the farm firm has various sources of farm income. The magnitude of each source of income is often reflected by the operator's interest in that enterprise. Dairy income was more important to the nonseasonal producer than the seasonal producer. (See Table 19). Since income from dairying

Table 19. Chi-square (X^2) values for the general agricultural factors, sampled producers, Eastern South Dakota, 1966.

Variable	Computed X^2 value	Degree of freedom
1 Rank of income from dairy in terms of percentage of gross farm income[a]	11.82**	1
2 Rank of income from cattle in terms of percentage of gross farm income[a]	1.8	2
3 Rank of income from hogs in terms of percentage of gross farm income[a]	3.18*	1
4 Rank of income from cash grain in terms of percentage of gross farm income[a]	.48	2
5 Rank of income from chickens in terms of percentage of gross farm income[a]	.27	1
6 Rank of income from other forms of farm income in terms of percentage of gross farm income[a]	.44	1
7 Rank of labor used by dairy in terms of percentage of total farm labor[a]	.93	1
8 Rank of labor used by cattle in terms of percentage of total farm labor[a]	1.37	1

Table 19 (Continued)

	Variable	Computed X^2 value	Degree of freedom
9	Rank of labor used by hogs in terms of percentage of total farm labor[a]	2.38	1
10	Rank of labor used by cash grain in terms of percentage of total farm labor[a]	.73	1
11	Rank of labor used by chickens in terms of percentage of total farm labor[a]	.44	1
12	Rank of labor used by other forms of farm income in terms of percentage of total farm labor[a]	.13	1
13	Acres of land owned	.04	1
14	Acres of land rented	4.09	2
15	Total acres of land owned and rented	3.30*	1
16	Type of ownership of land	3.78*	1
17	Years of being a land owner	1.08	1
18	Years of being a land renter	4.17	2

Table 19 (Continued)

Variable	Computed X^2 value	Degree of freedom
19 Years spent on a farm	9.75**	2
20 Years of operating a farm	4.93*	2
21 Age of producer	2.05	1

* Significant at the 10 percent level

** Significant at the 5 percent level

a Ranked in descending order with seven representing the highest rank.

was a high percentage of the total farm income, the producer will be more concerned with the dairy operation. This is indicated by the higher ranking of dairy income by nonseasonal producers and a lower ranking by the seasonal producers. (See Table 20).

Table 20. Observed and expected frequencies for rank of income from dairy in terms of percentage of gross farm income, sampled producers, Eastern South Dakota, 1966.

Rank	Seasonal producers		Nonseasonal producers	
	Observed	Expected	Observed	Expected
1-6	26.0	18.8	2.0	9.2
7	23.0	30.2	22.0	14.8

Each of the various enterprises on the farm firm will have a demand for labor as a resource input. If the input differs between types of producers for an enterprise, then one type of producer is putting a significantly larger quantity of labor in that enterprise as compared to the other type of producer. The data indicated that both types of producers ranked approximately the same as to the amount of labor used in each enterprise.

If another source of income is ranked higher than dairy, dairy's position is competitively less favorable than the other source. The data in Table 21 revealed that income from hog production was considered a significant source of farm income by seasonal producers, while the converse was true of nonseasonal producers. This indicates that some of the seasonal producers'

Table 21. Observed and expected frequencies for rank of income from hogs in terms of percentage of gross farm income, sampled producers, Eastern South Dakota, 1966.

Rank	Seasonal producers Observed	Seasonal producers Expected	Nonseasonal producers Observed	Nonseasonal producers Expected
1-6	18.0	20.7	12.0	9.3
7	13.0	10.3	2.0	4.7

resources are being taken away from dairy production and being used for hog production. That is, seasonal producers' returns from hog production must be greater than returns from dairy.

With the increase in agricultural specialization and importance of size of operation, land tenure can have an effect on the amount of financial resources available for dairy. That is, if these resources are being employed for purchasing of land, they are being bid away from dairy. The number of nonseasonal producers who were tenants was greater than the number of seasonal producers who were tenants. (See Table 22). The data

Table 22. Observed and expected frequencies for type of ownership, sampled producers, Eastern South Dakota, 1966.

Type of Tenure	Seasonal producers Observed	Seasonal producers Expected	Nonseasonal producers Observed	Nonseasonal producers Expected
Owner & Part owner	43.0	39.3	16.0	19.7
Tenant	7.0	10.7	9.0	5.3

indicated that most of both types of producers rented 320 acres and less. The number of producers owning 160 acres or less was approximately the same as over 160 acres. The total farm size of a nonseasonal producer was larger than the seasonal producer. (See Table 23).

Table 23. Observed and expected frequencies for total acres of land owned and rented, sampled producers, Eastern South Dakota, 1966.

Acres	Seasonal producers		Nonseasonal producers	
	Observed	Expected	Observed	Expected
1-320	31.0	27.3	10.0	13.7
321 and over	19.0	22.7	15.0	11.3

Producers' ages can be considered as a factor because of its relationship to the continuousness of past practices. That is, as age increases the likelihood of changing to new concepts is less. A majority of the nonseasonal and seasonal producers were between the ages of 36 and 50 years.

The last factors to be analyzed in this chapter are those relating to length of association with the farm. They can have an impact on the quantity and quality of managerial skill that a producer possesses. This, in return, can have an effect on the decisions made. The data revealed that the nonseasonal producer has fewer years of farm background and years of operating a farm than the seasonal producer. (See Tables 24 and 25).

Table 24. Observed and expected frequencies for years of farm background, sampled producers, Eastern South Dakota, 1966.

Years	Seasonal producers		Nonseasonal producers	
	Observed	Expected	Observed	Expected
1-39	11.0	16.7	14.0	8.3
40-54	28.0	24.7	9.0	12.3
55 and over	11.0	8.7	2.0	4.3

Table 25. Observed and expected frequencies for years of operating a farm, sampled producers, Eastern South Dakota, 1966.

Years	Seasonal producers		Nonseasonal producers	
	Observed	Expected	Observed	Expected
1-14	7.0	10.7	9.0	5.3
15-29	31.0	28.7	12.0	14.3
30 and over	12.0	10.7	4.0	5.3

CHAPTER IV

PRICE, DAIRY OPERATIONS, AND OBSTACLES TO LEVELING THE SEASONAL FLOW OF MILK

This chapter includes an analysis of the producers' reactions to: (1) changes in price of milk, (2) adjustments in dairy operations, and (3) obstacles to leveling out the seasonal flow of milk to the market.

Seasonal Pricing

The purpose of a seasonal price plan is to conceptualize a pricing plan which would offer financial incentive to the producer for increasing production during the seasonally low production months.

Theoretical Considerations

The producer is concerned with the equality of marginal return and marginal cost. A need exists for the determination of the maximum conditions for a supply function of an additional quantity of goods and services offered during specified low production months that is beyond the normal total supply function. These supply functions are derived from maximizing profits subject to the production function constraint.[19] This condition implies

[19] Lawrence R. Klein, An Introduction to Econometrics, Prentice-Hall Inc., Englewood Cliffs, New Jersey, 1962, p. 126.

a final equilibrium position of the firm and a given relation between output and market price. Competitive conditions exist, so price is outside the control of the individual firm.

In firm theory, the market supply function is

$$x = f(q_1, q_2, \ldots, q_r) = g(\frac{w_1}{P}, \frac{w_2}{P}, \ldots, \frac{w_r}{P})$$ [20]

where x is the quantity supplied, q is the marginal productivity function for each factor, w is the cost of each factor, p is the price, and f and g are the function indicators. The terms on the left side of the equation represent the marginal productivity and the terms on the right side represent real factor cost. When the equation is in equality, the marginal productivity of all factors is equated to real factor cost of all factors for a given amount of the quantity supplied. In order to maximize returns, a firm employs productive factors until the marginal factor unit costs are equal to the present value of the marginal productivity with respect to each of the factors.

The price required to bring forth additional quantities of goods and services during specified low production months is defined as the supply price. A schedule of supply prices portrays a supply price curve. For each point on the curve, various quantities of additional supplies of goods and services would be offered if the alternative price existed. The supply price of a given quantity must be that price which is sufficient to attract needed resources. It must therefore be large enough to cover the

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[20] Ibid., p. 127.

value of the inputs and a normal profit.[21] (Normal profit is the least sum which must be paid to the seller to persuade him to allow his capital to be used in the process.)[22]

Any change in the supply price, should bring forth a corresponding change in the quantity supplied. An estimate of the degree of responsiveness is the coefficient of elasticity of supply.[23]

When supply is elastic, the responsiveness of sellers to small changes in price is relatively great. If the response of the seller is relatively small, supply is inelastic. When the change in price produces an equal proportionate change in quantity, supply has a unitary elasticity.

If supply is relatively elastic, a given increase in the output of a single firm produces only a small increase in the marginal cost of production in the firm. Also, a given increase in the price makes it profitable for a large number of additional firms to enter the industry or existing firms to expand output. In contrast, if supply is inelastic, the marginal cost curve will have a relatively steep slope. Entering into production or

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[21] Kenneth E. Boulding, Economic Analysis, Vol. I. Fourth Edition, Harper and Brothers, New York, 1966, p. 250.

[22] Ibid., p. 250.

[23] The following formula is used in deriving the coefficient of elasticity of supply

$$E_S = \frac{\Delta q/(q_1 + q_2)}{\Delta p/(p_1 + p_2)}$$ where

E_S is the coefficient of elasticity of supply, p is the supply price and q is the quantity supplied.

expending the production of firm is harder as the marginal cost curve becomes steeper.[24]

Application of Theory

The hypothesis suggested here is that producers will supply the additional quantity of milk during the low production months if the marginal return is at least equal to marginal cost. This condition assumes profit maximization.

In this study, a price at which an increased quantity of milk would be supplied during the seasonal time period was defined as the seasonal supply price. The supply price assumes the conditions of pure competition. Since these conditions prevail, the price was set by an impersonal market mechanism outside the control of any one seller. A schedule of these seasonal supply prices portrayed a supply curve. It was identified as the seasonal incentive supply curve[25] and represented graphically in Figure II.

To measure an estimate of response of changes between seasonal quantities and prices, coefficients of arc elasticity of supply were computed. Since the distance between the points was widespread, emphasis will be on the points not on the line. This condition causes some limitations. An estimate of responsiveness was .51 for a 100 to 105 percent change in seasonal quantity. This coefficient means that through this arc a change in the seasonal quantity of 1

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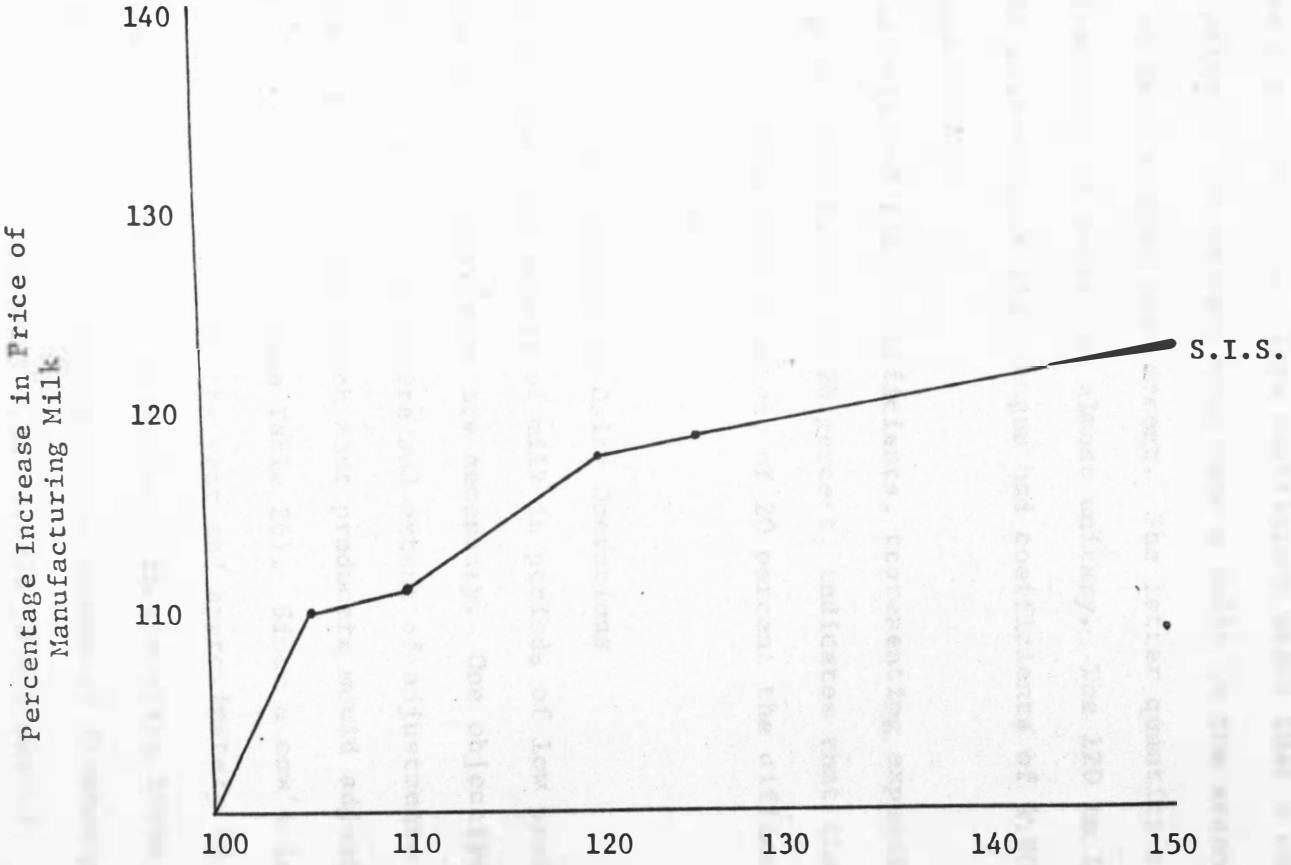
[24] Boulding, p. 407.

[25] Total seasonal incentive supply is defined as the increased quantity of milk above the normal deliveries in the months of low production.

Fig. II. Producers' seasonal incentive supply, sampled producers, Eastern South Dakota, 1966.



#Base price of $3.81 per cwt. equals 100 percent.

percent will have a corresponding change in seasonal price of less than one percent. The quantity changes of 105 to 110 and 110 to 120 percent had coefficients of 5.26 and 1.65, respectively. The first change was highly elastic. This coefficient means that a change in seasonal price of one percent will have a shift in the seasonal quantity of greater than one percent. The latter quantity range had an elasticity of supply of almost unitary. The 120 to 125 and 125 to 150 percent quantity changes had coefficients of 4.80 and 5.45, respectively.

The value of these coefficients, representing expansion of seasonal production from 0 to 20 percent, indicates that the changes will be hard. Expansion in excess of 20 percent the difficulty of expansion will be less.

Adjustments of Dairy Operations

To increase the supply of milk in periods of low production, some adjustments in operations are necessary. One objective of this study was to determine the nature and extent of adjustments needed.

The dairy operation which most producers would adjust was the season of freshening. (See Table 26). Since a cow's lactation period is only 9-10 months of the year and approximately 40 percent of the year's output per cow is produced in the first three months of the lactation period, a change in the season of freshening can have an impact on the seasonal flow of milk to the market. More than one-half of the producers listed this as being one important factor.

Table 26. Dairy adjustment responses for increased seasonal production, sampled producers, Eastern South Dakota, 1966.

Dairy operations	Number
Change in the season of freshing	42
Increase dairy herd size	37
Improve the quality of the dairy herd through replacement with higher producing cows	36
Improve feed ration	27
Improve the quality of the dairy herd through improved breeding practices	13

When improvement in the quality of the dairy herd through replacement with higher producing cows and improved breeding practices were combined, they have a greater response than change in season of freshening. Improving the quality of the dairy herd would have an effect not only on the seasonal milk supply but on total supply. These changes could be considered as overall herd improvements.

Almost one-half, or 37, of the producers listed an increase in herd size as one method of adjusting seasonal production. Improving the feed ration for the dairy herd during the season of low production was mentioned by 27 of the respondents. Since the amount of feed is divisible into relatively small quantities, the additional inputs in feed are continuous rather than lumpy. This condition, however, was not true with other dairy operations.

Obstacles Preventing Seasonal Adjustment

In modifying the marketing pattern, there are many obstacles to overcome. To get some idea of the extent and magnitude of these, each producer was asked to list three of the major obstacles preventing an increase in production during the months of normally low production. In each case, a follow-up question was asked to determine the nature of these obstacles.

Shortage of fall pasture and hay was the most frequently cited obstacle. Appendix Table 28 shows that weather conditions were listed as the major reason why shortage of fall pasture and hay was an obstacle.

The factors, additional units of cows or labor, are shifts that are of large increments. If additional cows are bought for the seasonal time period and are sold afterwards, and likewise with the hiring and releasing of additional labor, these changes will only increase milk production during the seasonal time period. But if the additional cows and labor are retained, total milk supply will probably increase with little or no effect upon the problem of seasonality.

Inadequate price per hundredweight and higher cost of feed were listed as obstacles by 8 and 16 respondents, respectively. (See Table 27). Since these obstacles are price oriented, these 24 producers are probably ready to make production adjustments if given the proper price incentive. A low number of respondents indicated lack of operating capital as an obstacle for seasonal

Table 27. Obstacles presenting changes in seasonal milk production, sampled producers, Eastern South Dakota, 1966.

Obstacles	Number
Shortage of fall pasture and hay	60
Breeding rotation	32
Insufficient number of cows	27
Labor supply	23
Higher cost of feed	16
Lack of operating capital	12
Already producing heavily in the fall months	10
Inadequate price per hundredweight	8
Other obstacles[a]	13
TOTAL	201

[a]Other obstacles are the following: (1) dairy herd is already at capacity, (2) hot weather, (3) vacation, (4) flies, (5) lack of interest, (6) other enterprises, and (7) unable to feed the dairy herd better.

expansion. This fact illustrated the willingness of both the producers to procure and financial institutions to provide finance.

CHAPTER V

SUMMARY, IMPLICATIONS, AND CONCLUSIONS

Summary

Since the volume of manufacturing milk produced and marketed varies from season to season during the year, a seasonality problem is present. Seasonality of milk production is defined as a wide fluctuation in output per farm between months of low production and months of high production. This study examined 75 seasonal and nonseasonal manufacturing milk producers in eastern South Dakota. Price and non-price factors associated with seasonality were studied and analyzed.

Data for determining the degree of seasonality for each of the sampled producers were taken from the patrons' production records. Additional data about each of the sampled producers were collected through personal interviews and used to analyze the following areas: (1) general farm characteristics, (2) dairy operations and management, (3) general dairy marketing practices, and (4) seasonality of dairy marketing.

In this study 84 variables were statistically analyzed by the chi-square test of independence. Of these 84 variables, 14 were significantly different with relation to the nonseasonal and

seasonal producer. In other words, the null hypothesis--no significant difference between the nonseasonal producer and the seasonal producer--was not accepted for these 14 variables, and the alternative hypothesis--a significant difference was accepted.

Producer-Processor Relationship Factors

Almost all of the milk producers were satisfied with the processors' decisions relating to them. There was a satisfactory communication flow between producers and the processors, but this flow did not take place at meetings. Both types of producers were aware of seasonality as a problem to the processor.

Quantum of Information Factors

The seasonal producers spent more time per day reading newspapers than did the nonseasonal producers. A greater number of nonseasonal producers were spending more time reading state and local news. Seasonal producers had greater contact with agricultural markets on the radio and television. The educational level of the nonseasonal producer was higher.

Dairy Operation Factors

Changes in herd size from 1960 - 1965 was the same for both types of producers. Nonseasonal producers used segregation to control time of breeding of first-calf heifers. Neither type of producer used it on cows. The nonseasonal producers freshened their herds year around, while the seasonal producers did not. Both types of producers have high quality herds.

Dairy Management Factors

Most producers plan to continue in dairy indefinitely. Neither type of producer desired to shift to Grade A production. Both types of producers had about the same amount of dairy management experience. The nonseasonal producers have a larger production. A majority of the producers use bulk tanks. Very few producers were members of dairy production testing programs.

General Agricultural Factors

Income from dairying ranked higher for nonseasonal producers. Income from hogs ranked higher for seasonal producers. Total farm size was greater for nonseasonal producers. The nonseasonal producer had fewer years of farm background and farm operating experience.

Seasonal Pricing

The change in seasonal production from 100 to 105 percent was inelastic, from 105 to 110 was highly elastic, and from 110 to 120 was nearly unitary elastic. From 120 to 150 percent, the change was highly elastic.

Adjustments of Dairy Operation and Obstacles Preventing Seasonal Adjustments

The operation that most of the producers would change was the season of freshening. The obstacle most cited was the shortage of fall pasture and hay.

Implications

For a creamery enterprise to be successful, there is a need for a good relationship between the manager and members. This relationship can be developed through knowledge of each ones problems and responsibilities. The processors' responsibilities are the technical business problems and membership public relations. The members' problems are knowledge of the problems and responsibilities of each. The results of the producer-processor relationship variables implied that there was a liaison between the processors and producers. Because of this intercommunication the producers can become aware of processors' problems.

For intercommunication to continue, communication lines are needed. One factor in selecting a means to disseminate information to the producers is that farmers receive their impressions and ideas through the utilization of multiple forms of mass media. One method is to use the firm's news bulletin plus a follow-up with television or personal appearance.

Results of the study indicate that the seasonal producers had more contact with agricultural markets on radio and television and read newspapers more than the nonseasonal producers. This fact implies that the processors should disseminate seasonality problem information to the seasonal producers through both forms of mass media.

The functional area within the framework of the dairy farm firm that producers can manipulate to change the seasonal flow of milk production is the dairy operations.

The results of the study indicate that controlling the breeding time of the first-calf heifers so that they will freshen throughout the year was an accepted dairy operation practice by the nonseasonal producers. However, the nonseasonal producers had no more concern than the seasonal producers had about controlling the breeding time of the remainder of the herd. If the nonseasonal producers would follow through with controlling the time of breeding of the cows as he did with the heifers, there could be an improvement in the seasonal flow of milk.

For the decisions to be right that affect the profitability of the dairy business and the amount of the seasonal flow of milk, the producer needs to recognize decision-making tools and to know their functions. This ability is developed through years of formal and informal education and experience.

The study indicated only a few producers were members of a dairy production testing program. This condition implies that in terms of production information a void exists for a majority of producers. Since the nonseasonal producer was a larger producer, the condition of seasonality can be overcome through a large volume operation. Because neither type of producer expressed a desire to convert to Grade A production, even with a price differential of $1.10 to $2.00, the size of the operation and requirements for membership in a Grade A program are decisive obstacles.

The nonseasonal producers were putting similar amounts of labor inputs into dairy and getting greater income returns than the seasonal producers. This condition implies the nonseasonal

producers have a better relationship of labor inputs to income returns from the dairy operation. Most of the seasonal producers had more years of farm background and operating a farm, however, these conditions have not helped alleviate the seasonality problem.

An estimate of the degree of responsiveness for changes in the supply price to quantity change is the coefficient of elasticity. Since the coefficients of arc elasticity for changes of 100-120 percent in the seasonal milk supplies were either relatively inelastic or unitary except for 105-110 percent, increasing seasonal milk production will be somewhat difficult. From 120-150 percent change the coefficients were relatively elastic. This implies that after a 120 percent increase the ease of increasing production in the seasonally low months should be relatively easy with small increase in the seasonal supply price.

Since a lack of fall pasture and hay was the most frequently mentioned obstacle, there is an implication that there could be a lack of feedstuffs available to the dairy herd in the fall and winter months. Another implication would be that the present price for milk will not cover the cost of replacing the inexpensive feedstuffs available in the spring and summer months.

Conclusions

The conclusions of this study are the following:

1. Because increasing supply price to change the seasonal production of milk was proven to be somewhat ineffective, nonprice methods should be considered.
2. Because of costs incurred with overcoming obstacles in increasing the seasonal flow of milk, a seasonal price incentive plan by the processor will be needed.
3. The processor should inaugurate an educational program to improve the flow of information to the manufacturing milk producers about the seasonality problem. The educational program would identify the role of the producers with respect to the seasonality problem.

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APPENDIX - A

Table 28. Frequency of reasons why a shortage of fall pasture and hay prevents changes in seasonal milk production.

Reasons	Number
Lack of rain	49
Shortage of acres of pasture	9

Table 29. Frequency of reasons why the breeding rotation prevents changes in seasonal milk production.

Reasons	Number
Breeding rotation for the herd is already established	13
Nothing preventing a change in the breeding rotation of the dairy herd	9
Would have to miss a calf	2
Lack of labor to control breeding cycle	2
Tenure of ownership of dairy herd	1
Dairy cows not ready for breeding	1
Use a bull for breeding the dairy herd	2

Table 30. Frequency of reasons why the cost of feed prevents changes in seasonal milk production.

Reasons	Number
Feed cost for the dairy herd is on a constant rise	3
Poor crops	7
Supply of feed for the dairy herd is less than the demand	2
Price of milk	2

Table 31. Frequency of reasons why an insufficient number of cows prevents changes in seasonal milk production.

Reasons	Number
Shortage of feedstuffs	1
Lack of facilities to handle a larger dairy herd	3
Lack of labor available to handle a larger dairy herd	2
Lack of finance available to increase the size of the dairy herd	4

Table 32. Frequency of reasons why the labor supply for the dairy herd prevents sampled changes in seasonal milk production.

Reasons	Number
Lack of additional labor supply to milk the dairy cows	9
Sons as a source of labor supply left home	3
Labor supply, other than presently used by the dairy enterprise, is used by other enterprises	4
Age of the manufacturing milk producer	2
Wage rate is too high to hire additional labor	4

Table 33. Frequency of reasons why a lack of capital for changes prevents changes in seasonal milk production.

Reasons	Number
Risk aversion	4
Lack finance available	5
Requirements for finance too high	1
Lack of cooperation from landlord	1

Table 34. Frequency of miscellaneous reasons* that prevents changes in seasonal milk production.

Reasons	Number
Dairy operation is at capacity	2
Hot weather	4
Vacation	1
Fly problem	1
Lack of interest in dairying as one enterprise	2
Other enterprises	1
Unable to feed the dairy herd better	1

*The miscellaneous reasons are those reasons listed in this table.

APPENDIX - B

CONFIDENTIAL

South Dakota State University
Agricultural Experiment Station
Economics Department

Seasonality of Marketing of Manufacturing Milk

Schedule No._____

Name_____

Address_____

Date_____

Enumerator_____

FARM MANAGEMENT

1. What size farm are you currently operating?

   Owned_____A.

   Rented_____A.

   Total_____A.

2. What type of ownership or tenure arrangements do you have?

   (Check one)

   Owner-operator_____ Part owner_____

   Partnership_____ Hired manager_____

   Corporation_____ Other (Specify)_____

3. How many years of farm experience have you had?_____

   (A) How long have you operated a farm?_____years

   (B) How many years of dairy management experience do you have?_____

   (1) Grade A_____

   (2) Manufacturing milk_____

4. If owner, how many years have you owned the land?_____

5. If a renter, how many years have you rented the land?_____

6. What is your present age?_____years

7. What was the highest grade in school you attained?_____

8. Last year did you do any non-farm labor for wages?
( ) Yes ( ) No

9. What percent of gross income was from farming?_____percent

10. What percent of gross farm income was from the following enterprises:

	Percent of gross farm income		Percent of total farm labor	
	Currently	5 yrs ago	Currently	5 yrs ago
(a) Dairying				
(b) Beef				
(c) Hogs				
(d) Cash grain				
(e) Other important enterprise				

11. Currently about how much time per day do you spend in reading farm magazines?
(1) less than 30 minutes
(2) 30 minutes
(3) 1 hour
(4) more than 1 hour

12. How many farm magazines (excluding those farm magazines which are strictly on dairying) do you subscribe to?
(1) 0
(2) 1
(3) 2 or 3
(4) 4 to 6
(5) 7 or more

13. How many magazines do you receive that are strictly on dairying?
(1) 0
(2) 1
(3) 2 or 3
(4) 4 to 6
(5) 7 or more

14. How many magazines that are strictly on dairying do you read some article in most every issue?
(1) 0
(2) 1
(3) 2 to 3
(4) 4 to 6
(5) 7 or more

15. Currently how much time per day do you spend in reading newspapers?
(1) less than 30 minutes
(2) 30 minutes
(3) 1 hour
(4) more than 1 hour

16. Currently how much time do you spend on each section of the newspaper per day? (Rank in order of importance)

National news _____
Local and state news _____
Agricultural markets _____
Sports _____
Comics _____
Other _____

17. About how often do you listen to the radio or watch TV each day?
(0) less than one hour
(1) about an hour
(2) 2 to 3 hours
(3) 4 to 5 hours
(4) over 5 hours

18. Presently, how much time per day do you come in contact with these various types of programs? (Rank in order of importance)

National news _____
State and local news _____
Agricultural markets _____
Sports _____
Music _____
Other _____

DAIRY OPERATIONS

1. What is the size of the dairy herd?

Year	2 yrs. or older	No. of heifers	Total
1960			
1965			
1970			
1975			

2. a. If the number of cows changed from 1960 to 1965, indicate reasons for change:
   (a) ( ) To increase net income
   (b) ( ) To maintain net income
   (c) ( ) Health, sickness, or death of operator
   (d) ( ) Retirement or partial retirement, actual or planned
   (e) ( ) To more fully utilize existing labor, management, buildings, etc.
   (f) ( ) Better opportunities in other farm enterprises
   (g) ( ) Encouraged or required by loan company
   (h) ( ) Other_____

   b. If there is no change, why?_____

3. a. If a change in the herd size is planned for 1970, indicate reasons for change:
   (a) ( ) To increase net income
   (b) ( ) To maintain net income
   (c) ( ) Retirement or partial retirement
   (d) ( ) To more fully utilize expected labor, management, buildings, etc.
   (e) ( ) Better opportunities in other farm enterprises
   (f) ( ) Other_____

   b. If there is no change, why?_____

4. a. If a change in herd size is planned for 1975, indicate reasons for change:
   (a) ( ) To increase net income
   (b) ( ) To maintain net income
   (c) ( ) Retirement or partial retirement
   (d) ( ) To more fully utilize expected labor, management, buildings, etc.
   (e) ( ) Better opportunities in other farm enterprises
   (f) ( ) Other_____

   b. If there is no change, why?_____

5. Currently, how many cows 2 years and older of the total dairy herd are:
Registered_____
High grade_____
Low grade_____

6. Indicate which method of breeding practice was used in 1965?
Bull_____

Artificial Insemination_____

Both_____

7. Was segregation used as a means to control breeding time for:
First calf heifers_____
All other cows_____
Both_____

8. What season(s) of the year was a majority of the herd freshened?
_____

9. What season(s) of the year were the first calf heifers freshened?
_____

10. Is there any variation in the daily amount of concentrates fed during the year? Yes ( ) No ( )

11. If yes, indicate the reasons why you varied the amount of concentrates fed.
(a) season of the year_____
(b) production per cow_____
(c) price of milk_____
(d) price of concentrate_____
(e) price of other feeds_____

MARKETING PRACTICES

1. What plant is your milk shipped to?_____

2. How many years have you shipped milk to this plant?_____

3. If you have changed plants in the past 5 years, why?_____
_____

4. How many cooperative creamery meetings did you attend last year?_____

5. In the last three years how many cooperative creamery committees have you been a member?_____

6. In the past five years how many times have you been an officer in the cooperative creamery? _____

7. What benefits have you derived from membership in the cooperative creamery? _____
_____

8. Are you a current member of DHIA? Yes ( ) No ( );
Ever a member? Yes ( ) No ( )

9. What is the reason for being or not being a current member?
_____

10. If no to question 8, currently do you participate in owner-sample? Yes ( ) No ( )

11. What is the reason for participating or not participating in owner-sample?_____
_____

12. a. From the following sources who have you consulted with on problems of the production and marketing of milk?
Plant fieldman_____
County agricultural agent_____
Vocational agricultural instructor_____
Neighbor_____
Hauler_____
Other_____

b. (After the producer has indicated his source of information, ask the producer to rank these sources.)

13. Last year did the plant manager call a meeting of producers other than the annual association meeting? Yes ( ) No ( )

14. If there were meetings, how many meetings were called?_____

15. Do you feel these meetings were useful? Yes ( ) No ( )

16. If yes, how were the meetings useful?_____
_____

17. If no, why weren't the meetings useful?_____
_____

18. Do you feel that the number of times per month that you receive your milk check is (check one) _____unsatisfactory;
_____satisfactory.

19. If unsatisfactory, why?_____

_____

20. How often is your milk picked up?_____

21. Is this satisfactory? Yes ( ) No ( )

22. How often is the percent of butterfat in your milk checked?
_____

23. Is this satisfactory? Yes ( ) No ( )

24. For what reason(s) did you choose production of manufactured milk as an enterprise?
Financial opportunities available_____
Present building structures are designed for milk production_____
Influenced by your parents_____
Interest in the marketing of manufactured milk_____
Other_____

25. Do you have any intention of changing to Grade A milk production?
Yes ( ) No ( )

26. If yes, why?_____

_____

27. If no, what obstacles are preventing a shift?
_____Not enough difference between manufactured milk price and Grade A milk price
_____Unable to get a contract with a Grade A milk plant
_____Lack of capital necessary for improvement of buildings and equipment
_____Shortage or high cost of labor
_____Lack in finance for increasing the number and quality of cows
_____No desire for being on a Grade A milking program
_____Other

28. Last year the average price spread between Grade A and manufacturing milk was $1.10. How much of an increased price differential would be needed for you to shift to Grade A production.

	$1.20____	$1.40____	$1.75____
$1.10____	$1.30____	$1.50____	$2.00____

29. Do you have a bulk tank? Yes ( ) No ( ) (If the producer answers no, then ask question 29 through 34; if the producer answers yes, then ask question 35)

30. If no, do you plan to install one? Yes ( ) No ( )

31. If no, what premium per hundredweight is necessary to get you to install a bulk tank? _____

32. What are your reasons for not now using a bulk tank?_____

_____

33. If a bulk tank was a prerequisite for selling manufactured milk would you install one? Yes ( ) No ( )

34. If no, why?_____

_____

35. If yes to question 29, what is the size of bulk tank?_____

What year did you convert?_____
(a) Why installed?_____
(b) What was the herd size at the time of conversion?_____
(c) How many cows added to herd during?
    (1) the year following conversion_____
    (2) the following two years_____

36. Indicate the year of each exit from dairying and reason(s) since 1950.

_____

37. Indicate the year of each re-entry into dairying and reason(s) since 1950.

_____

38. How long do you plan to stay in dairying:
(a) Expect to be out of dairying within 2 years ( ); within 5 years ( ); within 10 years ( ): Reason_____
(b) Expect to continue in dairying indefinitely ( ).

39. Will the recent increase in commodity milk price support increase your milk production this year? Yes ( ) No ( )
Next year? Yes ( ) No ( )

40. How many pounds?_____

41. If this increase lasted for three years, would this affect your production in the next three years? Yes ( ) No ( )

42. How many pounds?_____

SEASONALITY OF MARKETING MILK

1. Are you familiar with Grade A seasonal pricing plans such as fall premium or base excess? Yes ( ) No ( )
(If no, explain to the producer each plan)

2. Indicate the price per cwt. needed for each given percentage increase in production during the months (October-February) of low production.

Percentage increase in production	Price per cwt.
1/20	5
1/10	10
1/5	20
1/4	25
1/2	50

3. Indicate which one or a combination of the following dairy operations would change if you increased your production in the months of low production?

_____increase dairy herd size
_____improve feed ration
_____improve the quality of the dairy herd by selling the low producing cows and buying high producing cows
_____improve the quality of the dairy herd through better breeding
_____change the season of freshening

4. What three obstacles would prevent you from increasing production in the low production months? (Only ask the follow-up questions on the indicated obstacles).

_____Breeding rotation not properly regulated

What problem(s) prevented you from regulating the breeding rotation?_____

_____Shortage or poor quality of hay and silage

What was (were) the reason(s) for the shortage or poor quality of hay and silage?_____

_____Shortage or poor quality of fall pasture

What was (were) the reason(s) for the shortage or poor quality of fall pasture?_____

4. (Continued)

_____High cost of feed

What caused the cost of feed to be high?_____

_____

_____Shortage or high cost of labor

What was (were) the reason(s) for the shortage or poor quality of labor?_____

_____Lack of capital available for improvement

What prevented you from getting the money needed to increase capital?_____

_____

_____Already producing heavily in the fall

_____Insufficient number of cows

What prevented you from increasing your herd size?_____

_____

_____Price per cwt.

_____Some other reason or reasons

What are those reasons?_____

_____

5. Are you aware of any problem(s) that the processor has?
Yes ( ) No ( )

6. If yes, what are some of these problems?_____

_____

7. If no, do you feel that a decrease in the production of milk in the fall and winter months is a problem to the processor?
Yes ( ) No ( ) Why?_____

_____