

RECRUITING AND MAINTAINING
DAIRY COOPERATIVE MEMBERS:
A STRATEGY FOR REDUCING THE FREE RIDER PROBLEM

by

Kris R. Green

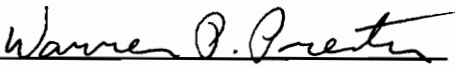
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(ABSTRACT)

Dairy marketing cooperatives provide marketwide services, such as lobbying for higher support prices and negotiating for premiums above marketing order prices, which benefit all dairy farmers in the market. The presence of free riders, people who benefit from these marketwide services without paying any of the costs of these services, can jeopardize the existence of the cooperative. Understanding why members were attracted to the cooperative and why independents (non-members) were attracted to the investor-oriented firm (IOF) allows cooperatives to target specific membership groups. Depending on the cooperative's goals, management can then use this information to focus on either retaining current members or attracting new members or both.

The purpose of this study is to produce practical recommendations for dairy marketing cooperatives for recruitment and retention of members. This study begins

with a background on cooperatives and a conceptual framework based on group and game theory. The data are a result of a regional survey of dairy farmers. The data are then analyzed using t-tests for continuous responses and chi-square tests for categorical responses. This analysis results in a comparison of responses from cooperative members and independents.

The independents stressed immediate benefits over long-run gains. Independents also appeared to have a risk/return trade-off. They received higher prices in exchange for fewer written contracts. Economic issues were important to both groups but significantly more important to independent producers. The two groups exhibited no difference on tradition and loyalty issues. Cooperative members emphasized prices and deductions, but they also highlighted assured markets and field services offered by their cooperatives.

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CHAPTER I

INTRODUCTION

Milk marketing cooperatives furnish their members with an assured market, risk sharing possibilities, and, occasionally, field services and/or supplies. Additionally, milk marketing cooperatives provide public goods to their industry, such as lobbying efforts which benefit all dairy farmers, supply and demand coordination within a market, and increased market competition. For instance, milk marketing cooperatives negotiate with milk handlers for over-order premiums (payments above the milk marketing order prices) and lobby with the government for higher support prices. They also clear surplus milk

from a market and procure milk for a deficit market. A cooperative's presence in a market forces other firms in the market to operate as efficiently as possible to remain competitive. An investor-oriented firm (IOF), operating as the only firm in a market, can behave as a monopsony, controlling the price it pays to dairy farmers. This monopsony can, therefore, minimize its price for milk. Yet, if a dairy marketing cooperative appears in the market, the IOF must increase the price it pays to a level commensurate with the cooperative's price. Even if the cooperative does not provide any other public good, the mere existence of the cooperative in the market can modify the behavior of the IOF. "The cooperative, operating at cost . . . , provides an idea of what is reasonable for both its members and for others" (Cobia,p.132). As a result, both cooperative members and independents (non-cooperative members) profit from favorable legislation and higher market prices.

Dairy cooperatives' provision of these public goods leads to the free rider problem. A free rider is someone who benefits from the efforts of others without bearing the marginal cost of providing those goods or services, or the cost of providing one more unit of the good or service. The free rider may consume these public goods, since consumption will not decrease the amount available to others, and excluding free riders may cost more than just providing the service. The free rider problem for dairy marketing cooperatives arises when individual dairy farmers perceive the benefits of cooperative membership differently. If the independent producers believe that they can gain from the cooperative's public goods, without contributing to the cost of those goods,

then they will continue to sell their output to an IOF. If cooperative members believe that they are receiving lower net benefits compared to independents, and any action/decision made by one member will have a negligible effect on the cooperative, then no incentive exists for them to remain with the cooperative. If a significant amount of members hold this belief, then the exodus of these members from the cooperative may cause a substantial loss of volume for the cooperative. A continuing decline of members may result in either a partial or a complete loss of operations. Thus, a cooperative, by providing goods and services requested by its members, may ultimately lose its members.

Dairy cooperatives in many areas recognize the free rider problem. Dairymen, Inc., headquartered in Louisville, Kentucky, is one of the largest dairy cooperatives operating in the Southeast. As stated by Ray Moss Tucker, President of Dairymen, Inc., in 1990,

"many of our fellow dairymen have lost sight of the need to work with their neighbors to reach pricing levels that will enable all dairy farmers to earn an adequate return on the tremendous investments they have in their dairy operations. Instead, these dairy farmers continue to splinter the industry by fragmenting into dozens of smaller groups. This does nothing but weaken the dairy farmer's voice in the industry, as well as his bargaining power in the marketplace . . . in a period characterized by droughts, an ongoing exodus of dairy farmers from the business, shrinking milk supplies and increasing demand for our product, it is ever important for dairy farmers to work side by side."

(p.3)

The free rider story is the same in Lawrence, Massachusetts, according to the Chairman of the Board of Agri-Mark, Inc.

"Of course, there are always the 'do nothing' noncooperative producers who bask in the sunlight of cooperative activities without paying their fair share of the action while laughing at the committed, responsible people who stabilize their income and pay the fee. This type of infidelity in the marketplace should not be allowed. These 'free riders' should be made to pay their share of the cost of cooperative services. When that day comes . . . we will see an understanding and a commitment to cooperatives"

(Longo,p.49)

Information on how cooperatives could increase membership and member commitment would assist in reducing the effect of the free rider.

Since the free rider problem can result in a decrease in the number of cooperative members and cooperatives, one must also consider other factors which may contribute to diminishing membership. The Agricultural Cooperative Service reports a historical decline in the total number of dairy cooperatives (Table 1). From nearly 1,600 dairy cooperatives in 1959, the number of dairy cooperatives in the United States dropped to 259 in 1989. The Southern United States¹ headquartered 17 of those dairy cooperatives in 1989. The largest decrease occurred between 1969 and 1974, when 368 dairy cooperatives ceased to exist. If all agricultural cooperatives are any indication of dairy cooperatives, then the following comparison can be made. From 1981-85, 31 percent of the disappearing cooperatives were dissolved, 25 percent were merged², 13 percent were acquired by other firms, and 31 percent were dropped from the Agricultural

¹ The Southern United States refers to a twelve-state region which includes Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and Virginia.

² Mergers include consolidations.

Table 1: Number of Dairy Marketing Cooperatives, United States, 1959-1989

Year	Dairy Cooperatives ^a
1959	1,594
1964	1,320
1969	1,027
1974	659
1978	510
1982	427
1987	298
1989	259

^a Source: Cooperative Historical Statistics. USDA, ACS. (1959-1982)
Farmer Cooperative Statistics, 1988. USDA, ACS. (1987)
Farmer Cooperative Statistics, 1990. USDA, ACS. (1989)

Cooperative Service's list for other reasons³ (Farmer Cooperative Statistics, 1990, Appendix Figure 2). This changing structure of dairy cooperatives adds instability to the industry. If dairy farmers perceive the cooperative form of business to be unstable, then they may be encouraged to stay away from cooperatives, the organizations originally formed to provide stability for dairy farmers. Cooperatives can assist in overcoming this uncertainty through targeted education and membership programs.

Dairy cooperative membership also shows a historical decline, from 695,195 members in 1959 to 136,115 members in 1989 (Table 2). This decline is a natural result of the overall decrease in dairy farms. Yet, cooperative members as a percentage of all dairy farms have increased since 1978. In 1987, 68 percent of all dairy farms marketed their milk through dairy cooperatives, up from only 55 percent in 1978. With this overall increasing membership, dairy cooperatives need to know how it happened, why farmers chose cooperatives over IOFs, to help the growing trend continue.

Almost 10 percent of the 1989 dairy cooperative members were located in the Southern region (Table 3). Over 2,900 Kentucky dairy farmers were dairy cooperative members in 1989. Texas, Mississippi, and Tennessee were next in line; all had dairy cooperative memberships of more than 1,000. As a percentage of total farmers, though, Kentucky ranked tenth out of twelve in a different, 1989 survey⁴. Only 71.4 percent of

³ Other reasons include inactivity, reassignment, and miscellaneous reasons. This information is based on a list of all U.S. agricultural cooperatives maintained by the Agricultural Cooperative Service.

⁴ The Survey of Southern Dairy Farmers will be discussed in detail in Chapter III.

Table 2: Dairy Farms and Dairy Cooperative Members, United States, 1959-1989

Year	Members ^a	Dairy Farms ^{b,c}	Percentage ^c
1959	695,195	1,792,393	39
1964	561,085	1,133,912	49
1969	413,405	568,237	73
1974	278,195	403,754	69
1978	170,500	312,095	55
1982	164,000	277,762	59
1987	137,171	202,068	68
1989	136,115	N/A ^d	N/A ^d

^a Source: Cooperative Historical Statistics. USDA, ACS. (1959-1982)
Farmer Cooperative Statistics, 1988. USDA, ACS. (1987)
Farmer Cooperative Statistics, 1990. USDA, ACS. (1989)

^b Source: 1987 Census of Agriculture.

^c Based on the Bureau of the Census' changing definition of a farm.

^d Census figures not available for 1989.

Table 3: Number of Southern Dairy Cooperatives and Cooperative Members, by State, 1988

State	Members		Cooperative Numbers ^{a,c}
	Total ^a	Percentage ^b	
Alabama	203	49.2	0
Arkansas	628	92.8	0
Florida	317	100.0	2
Georgia	552	91.6	0
Kentucky	2910	71.4	2
Louisiana	779	95.7	1
Mississippi	2036	90.8	1
North Carolina	819	78.8	2
South Carolina	678	91.4	3
Tennessee	1059	57.0	0
Texas	2245	90.4	3
Virginia	913	95.4	3
Region	13,139	83.1 ^d	17

^a Source: Farmer Cooperative Statistics, 1989. USDA, ACS.

^b Source: S-217 Survey of Southern Dairy Farmers, Question 1

^c Number of dairy marketing cooperatives headquartered in corresponding state.

^d Average membership percentage for the region.

Kentucky dairy farmers were dairy cooperative members. Florida placed first, with 100 percent of the farmers surveyed being dairy cooperative members. Louisiana and Virginia followed in second and third place, respectively. Alabama had the lowest percentage of members (49.2 percent).

Dairy cooperatives handle approximately 75 percent of the nation's raw milk, a statistic which has not changed much since 1973 (Martin,p.339). On the other hand, "'control' of 75 percent of the supply of a raw agricultural product such as milk hardly confers the same market power as a similar percentage of the supply of a differentiated consumer product" (Manchester,p.246). For example, where automobile manufacturers can regulate the output they must sell, cooperatives maintain no such power over the volume produced by their members. Therefore, a 75 percent market share is not a clear indication of the power held by dairy cooperatives in America.

All of these issues point toward the necessity of maintaining dairy cooperative membership. Market power goes to those firms that control the market's supply. Therefore, dairy cooperatives must focus on membership to maintain bargaining power. With fewer dairy farmers in existence, cooperatives and IOFs will compete for the farmers' milk to guarantee supply. This increased competition pressures cooperatives to suitably serve their current membership and/or attract new members, or risk losing their supply and market power to IOFs.

Cooperatives should also be aware of the two types of free riders. The first type recognizes that the marketwide benefits he/she receives stem from dairy cooperative

efforts. They also recognize that they can benefit without being a cooperative member, therefore saving on the costs of these marketwide efforts. Cooperatives may never convince these farmers to pay their share of marketwide costs. Legal enforcement of paying for public goods may be the only solution for this free rider category. The second type may not associate the benefits they receive with cooperatives. Dairy cooperatives must focus on educating these farmers to increase membership. Dairy cooperatives begin their membership drive by knowing where to target their efforts. Determining specific target groups is a major goal of this research.

PURPOSE & OBJECTIVES

The purpose of this study is to produce practical recommendations for dairy cooperatives to recruit and retain members. These recommendations will enable cooperatives to position themselves to reduce the free rider problem and to better serve current and potential members. An efficient system for locating suppliers helps minimize both costs and time and can be obtained through targeting a particular type of producer. Segmenting a large, heterogeneous market into smaller, homogeneous target groups permits "(1) more precise market definition, (2) better analysis of competition, (3) rapid response to changing market needs, (4) efficient resource allocation, and (5) effective

strategic planning" (P.Bennett,p.190). This research will also help cooperatives in designing marketing plans around services that address the needs of both potential and existing members.

The specific objectives of this study are:

1. To compare cooperative members with independents, with respect to farm characteristics, farmer characteristics, and farmer attitudes toward milk buyers, and
2. From the analysis conducted under Objective 1, to derive recommendations for cooperatives to recruit new members and retain existing members.

The first step in achieving these objectives is to compare statistically member responses to independent responses, based on questions from a survey of southern dairy farmers. Chi-square tests and t-tests will be utilized in the comparison. Similarities and differences between cooperative members and independents must be identified to establish target groups. The target groups provide a framework for the membership recommendations. Target groups can then be categorized with respect to cooperative goals: recruiting new members, retaining current members, or both.

The findings of this study will assist dairy cooperative management in increasing membership. This increased membership should lead to additional control over the milk supply, potentially reducing the free rider problem and enlarging the cooperative's bargaining power within the marketplace. The farmers themselves will also gain from these results. Cooperative members, as owners of the cooperative, can profit through a reduction in costs created by more efficient recruiting practices. Dairy farmers, in

general, may be better able to find desired services. To attract certain producers, cooperatives may begin offering new services that are in demand. Ultimately, as the organizations are able to decrease costs through targeting possible members, the consumers of the final product will benefit as well.

STUDY POPULATION & METHODS

In December 1988, the land grant universities in twelve southern states⁵ conducted a survey of Southern dairy farmers. Initiated by a regional committee, "Economic and Technical Forces Shaping the Southern Dairy Industry", the survey project began as an attempt to characterize dairy farmers in the South. The committee chose three categories of information in which they were interested: individual farmer characteristics, information about the farm itself, and a marketwide description. Questions ranging from the farmer's age to herd size to cooperative membership and services filled the survey, which was distributed throughout the region. The survey focused on milk marketing, with the intent of describing both the dairy farmers and the dairy industry. The project was partially funded by the USDA's Agricultural Cooperative Service.

⁵ The twelve states included Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and Virginia.

This study utilizes the survey data taken from the Southern United States. A statistical comparison of responses will be performed to find similarities and differences between cooperative members and independents with which to build recommendations. This study will compare the responses of cooperative members and independent producers regarding such issues as satisfaction with the current buyer; reasons for changing, or remaining with, buyers; and rating the services provided by the buyers.

THESIS ORGANIZATION

This thesis consists of five segments. This section concludes the introductory chapter. Chapter II gives a brief overview of agricultural cooperatives, cooperative theory, and group and game theory. Chapter III describes both the data and the methods employed in this study. Chapter IV deals with the statistical analysis and the results. Finally, Chapter V examines the conclusions and recommendations which stem from the research.

CHAPTER II

BACKGROUND & CONCEPTUAL FRAMEWORK

This chapter briefly describes the dairy industry, dairy pricing systems, and dairy marketing cooperatives. This research requires an understanding of these three areas for interpreting the results and making the final recommendations. Group theory and game theory are also included, providing a theoretical explanation for human behavior with respect to decisionmaking.

DAIRY INDUSTRY

Although a dynamic industry, few characteristics of the dairy industry have changed over time. Entry to and exit from the dairy industry are relatively costly, since dairying requires a considerable commitment of time and specialized inputs. Much of the equipment and facilities necessary for dairy farming are not easily transferred to other uses. The farmer can also have difficulty in applying specialized knowledge about the dairy industry to another career. Perhaps the most important constant is the daily production of milk. The milk must be shipped from the farm at least every other day. Hence, the flow of milk stays relatively constant on a daily basis. On the other hand, the milk supply does vary from season to season, as does the commercial disappearance of milk. For instance, the demand for milk peaks in the fall when schools are back in session. These fluctuations in supply and demand require efficient coordination by the middlemen of the industry to avoid spoilage.

Dairy marketing cooperatives assist in coordinating the supply and demand of milk and milk products. Supply and demand balancing helps stabilize market prices over time. Any given market could have a surplus during one quarter and be a deficit market the following quarter. In fact, the variation could even occur during a shorter time span. By allocating surplus milk to deficit markets, dairy cooperatives balance the macro-market, thereby minimizing price fluctuations at the micro level. Dairy cooperatives also agree to buy their members' milk, thus providing an assured market and reducing the

farmer's marketing risk. The primary task of any agricultural cooperative is to provide farmers with greater bargaining power through group action. It is this bargaining power which allows cooperatives to negotiate and lobby for higher prices and to guarantee a market for their members' products.

DAIRY PRICING

Prior to the 20th century, individual processors determined the price received by dairy farmers, according to local supply and demand. Known as "flat pricing," this system paid the same price to all farmers for all milk. Farmers maintained very little negotiating power, since the decisions rested in the hands of the processors. The buyers' power in determining market price concerned dairy farmers. Buyers took advantage of seasonal production variations through exaggerated price swings, creating more market instability.

To improve both market stability and the producers' market power, producer and dealer organizations met in the early 1900s and developed a base-excess pricing plan. Base-excess pricing began with a base production amount established for each farmer. The base was calculated using prior low production. The producer received the fluid milk price for the base amount of milk and the manufacturing milk value for any excess

amount of milk. Unfortunately, every farmer received a different price for milk under the base-excess plan, since each farmer had a different base amount. These variances caused dissension among neighbors, thus weakening the dairy farmers' group market power.

By the 1920s, dairy cooperatives had emerged to assist the farmers with marketing problems. The cooperatives formulated an unregulated, classified pricing system, wherein handlers paid for milk in accordance with its end use: fluid consumption or manufactured products. Fluid milk received a higher price than milk for manufactured products, thus acknowledging the varying costs involved with transporting the distinctive forms of milk (Manchester). Originally, these price differences were associated with transporting fluid milk from surplus markets to deficit markets. The industry wanted to ensure an adequate supply of fluid milk, so they needed to pay a higher price to compensate for higher transportation costs (McDowell, Fleming, and Fallert). Fluid milk is a bulky, highly perishable good. In comparison, most manufactured dairy products are a condensed version of fluid milk which also maintain a longer shelf life. Therefore, manufactured dairy products are easier to handle and cheaper to transport. Such price discrimination forced all processors to share surplus milk costs (Brooks). Intended benefits of classified pricing included reducing uncertainty and instability in the market and increasing returns to producers.

The notion of marketwide pooling was derived from the concept of classified pricing. Without pooling, classified pricing separated dairy farmers yet again by paying different

prices. Therefore, cooperatives needed a way to equate the prices received by all farmers. Pooling allowed sharing of classified prices. Regardless of where a farmer shipped milk, the same weighted average price would be received from the marketwide pool (Manchester). This price was determined by calculating the percentage of milk in the market used for each purpose (fluid and manufacturing) and then multiplying the percentage by the corresponding class price.

Following the Agricultural Marketing Agreement Act of 1937, Federal milk marketing orders became the basis for fluid milk pricing. According to the Capper-Volstead Committee of 1976,⁶

"a milk marketing order is a legal instrument issued to regulate transactions between farmers and buyers of Grade A milk in a specified geographic area. Milk orders establish minimum prices . . . according to how the milk is used"

(p.4)

This systematic, milk marketing framework provided stable returns for the nation's dairy farmers. The prices received were based on market supply and demand, given the minimum Federal order price. Federal marketing orders utilized the classified pricing system.

The government also provided a support price as required by the Agricultural Act of 1949. This Dairy Price Support Program supported the prices of manufactured dairy products, thus placing a lower limit on the price of milk classified as such. Hence, the

⁶ The Capper-Volstead Committee was appointed by the United States Department of Agriculture to review dairy cooperatives' pricing within Federal marketing orders.

pricing power moved from individual buyers to the Federal government.

Since the inception of the Dairy Price Support Program, few changes have occurred with dairy pricing mechanisms. However, the final ingredients in dairy pricing were premium payments. Premiums stressed various attributes of milk. Seasonal premiums attempted to level out the seasonal pattern of milk production by adjusting prices. These premiums assisted in balancing supply and demand throughout the year. Protein premiums recognized the important role of protein in cheese production. Large producers may have received volume premiums or other incentives, which acknowledged the economies of scale associated with dealing with larger producers. Farmers also received quality premiums when they shipped milk with low bacteria and somatic cell counts (Mengel).

COOPERATIVES

Dairy marketing cooperatives were created to stabilize milk prices and to provide adequate returns to the producers. This was accomplished through collective action by the dairy farmers. Yet, what is a cooperative? "A cooperative is a user-owned and user-controlled business that distributes benefits on the basis of use" (Cobia,p.1). More specifically, agricultural cooperatives are business organizations that are owned by and

operated at cost for the farmer-members. Agricultural cooperatives return net income based on the farmer's utilization of the firm. That is, cooperatives pay patronage refunds commensurate with the farmer's patronage of the cooperative. Businesses other than cooperatives are referred to as investor-oriented firms (IOFs), since they return net income based on an individual's investment in the company. This return is not contingent on the investor using the IOF's goods or services but is based solely on investment.

Agricultural cooperatives are established for several reasons. Cobia states that the reasons include

"(1) to obtain a fair or efficient price (i.e., to correct market failure); (2) to reduce costs through economies of size and coordination; (3) to provide markets, supplies, and services that are missing or in danger of being lost; (4) to pool risk; (5) to capture profits from another level; and (6) to benefit from increased market power"

(p.12)

Farmers can pool their products through marketing cooperatives. Economies of size can be gained through pooling, since the total costs of the operation can be spread over a larger quantity of product. Thus, total average cost decreases with pooling. When no additional economies of size are available, the cooperative has effectively minimized long-run average costs (LRAC). As long as total average costs are decreasing as quantity increases, the farmers can benefit from working together.

Producers also increase their own power in the market via cooperatives.

"Farmers organize to displace firms that earn above-normal profits as a result of their market power. In such a case, the entry of a cooperative tends to decrease the market power of other businesses in the commodity system involved"

(Cobia,p.131)

Increasing market power enables farmers to more effectively bargain for higher prices and to extend their control over factors which influence their businesses.

Dairy marketing cooperatives may perform four different functions: bargaining, processing, marketing, and providing services. Most combine bargaining with various processing and marketing functions. Some offer field services as well. Dairy marketing cooperatives bargain with processors and handlers for better prices and terms of trade. Bargaining-only dairy cooperatives do not take possession of raw milk. Some cooperatives receive raw milk and manufacture it into cheese, butter, whey, and powdered milk. Specific marketing functions include assembling milk in central locations, processing raw milk into either fluid milk or manufactured products, packaging and labeling the final product, providing a brand name for the product, storing and distributing the product, promoting and advertising the product, and retailing. Most dairy cooperatives are not involved with retailing, although a few operate dairy stores that sell dairy products, deli items, prepared meals, and other food products.

Regardless of what services are offered, dairy marketing cooperatives cannot exist without members, and the changing structure of the dairy industry limits the number of possible members. As shown previously in Table 2, the number of dairy cooperative members and the number of dairy farms have both declined steadily since 1959. A

research project which supported these figures was performed in 1984. A study of New England Dairy Herd Improvement Association (DHIA) members showed a negative correlation between farm size and cooperative membership (Bravo-Ureta and Lee). In other words, smaller New England farms were more likely to be cooperative members than were larger farms. Yet, recent trends in the dairy industry indicate a continuing decrease in the number of small farms. In the 38 years from 1950-88, the percentage of United States dairy farms with fewer than 50 milking cows dropped from 99.5 percent to 67.4 percent (Jacobson, pp.1-2). Given that smaller dairy farms are more likely to be cooperative members and that the number of dairy farms is diminishing with a lower proportion of small farms, then the total number of dairy cooperative members should also be decreasing. Bravo-Ureta and Lee also found that "large farmers tend to have fewer extension contacts and that fewer extension contacts reduce the probability of being a cooperative member" (p.24). For dairy cooperatives to survive, they must retain members. To do this, cooperatives must understand why producers select their milk buyers, what factors influence the producers' marketing decisions, and the subsequent behavior of individuals and groups.

GROUP & GAME THEORY

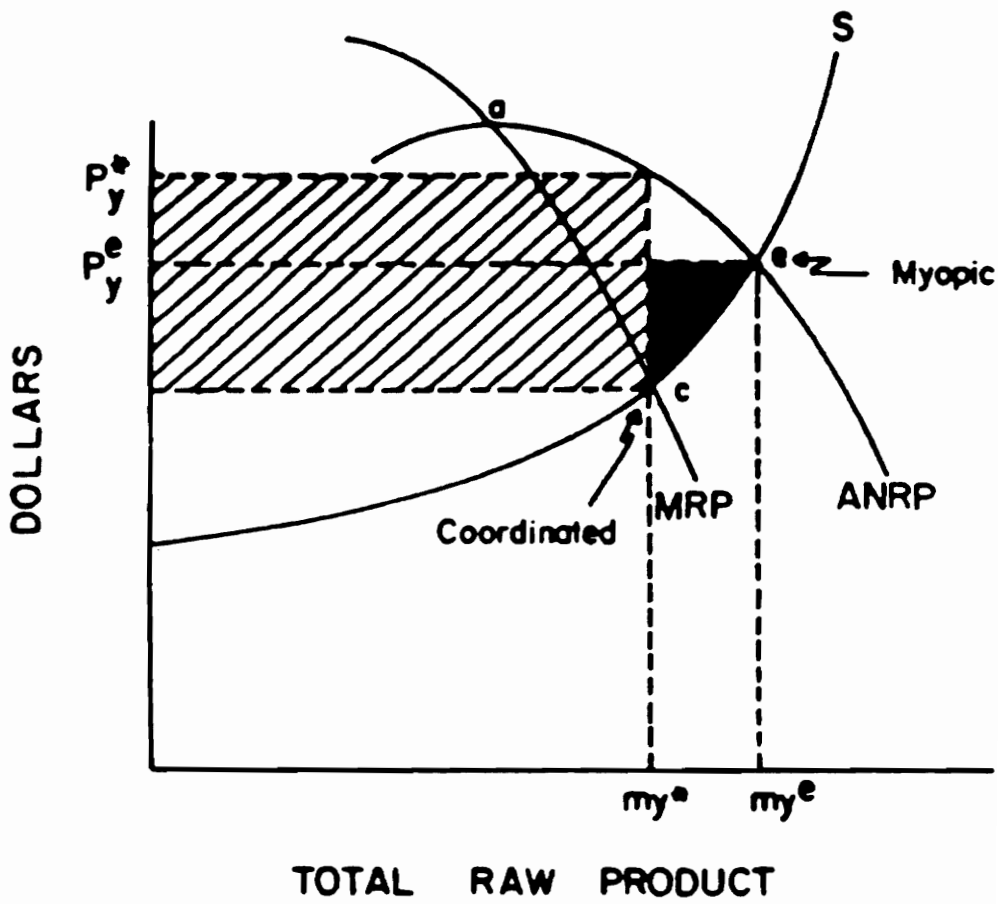
In perfectly competitive markets, firms can do no better than to maximize profits independently. Any action taken by these firms has little or no impact on either the market or other firms within the market. In practice, however, markets are not perfectly competitive, sometimes indicating a need for an alliance between firms. When competition occurs between buyers and sellers to obtain the "upper hand" in a bargaining situation, the presence of allies becomes important. Here, allies refers to those firms on the same marketing level facing identical problems and holding a common interest. Allies provide a supportive framework, on which can be built a powerful bargaining position. Unfortunately, all potential allies do not follow through in building the supportive framework, thus leaving gaps in the infrastructure. This scenario has taken place in the dairy industry due, in part, to the appearance of free riders. The free rider problem, with respect to dairy and other agricultural cooperatives, is best addressed by group and game theories.

Group theory analyzes the behavior of both groups and individuals within groups. Olson stated that a group's actions are determined by the actions of the members of that group, and that the members base their individual decisions on the benefits derived from each possible alternative. In effect, how the dairy industry is able to respond to the dilemmas of the dairy farmers depends primarily on where the individual dairymen place their alliance -- with other dairymen through cooperatives or with IOF handlers.

According to a study by Lopez and Spreen, individual, independent actions within a group result in myopic equilibrium. Their basic assumption is that cooperative members attempt to maximize their net returns. However, an individual's maximum net returns does not equal the group's maximum net returns.

"Each firm finds it to its advantage to increase output to the point where marginal cost equals price and to ignore the effects of its extra output on the position of the industry. It is true that the net result is that all firms are worse off, but this does not mean that every firm has not maximized its profits."
(Olson, pp.9-10)

Lopez and Spreen's graphical depiction of the difference between a myopic equilibrium point and a coordinated equilibrium point is shown in Figure 1. The myopic equilibrium point occurs where the members' supply curve intersects the cooperative's average net revenue product function (ANRP). Average revenue (AR) minus average total costs (ATC) minus the average price paid to the members equals average net revenue product (ANRP). In other words, the average net revenue product is the amount of money available for distribution to cooperative members, after subtracting total costs from the cooperative's total revenues, divided by the volume of milk marketed (Cobia). The coordinated equilibrium point occurs where the members' supply curve intersects the cooperative's marginal revenue product curve (MRP), or where marginal cost equals marginal revenue. The cross-hatched area minus the fully shaded area in Figure 1 illustrates the difference in total profits when shifting from a myopic equilibrium to a coordinated equilibrium, thus indicating an increase in benefits if members of a group would work together through cooperatives.



Source: Lopez and Spreen, p.388

Figure 1: Myopic and Co-ordinated Equilibriums

Dairy cooperatives are confronted with a major predicament regarding membership. The size of their targeted group, the dairy farmers within their market, is usually too large. Individuals are more likely to "disappear" in a large group, becoming less important and losing personal power over decisionmaking. "The larger the group, the larger the number of people who share in the decision, and there is a corresponding loss in the decision power of individuals" (J.Bennett,p.39). Olson gives three reasons why large groups will not act in their own common interest.

1. The larger the group, "the smaller the fraction of the total group benefit any person acting in the group interest receives"
2. The larger the group, "the less the likelihood that any small subset of the group . . . will gain enough from getting the collective good to bear the burden of providing even a small amount of it"
3. The larger the group, "the greater the organization costs"
(p.48)

Disagreement among dairy farmers, organizational difficulties, and farmers maximizing individual income have all facilitated the existence of free riders in the dairy industry.

Game theory helps to explain the actions of different individuals within groups, wherein group members are in disagreement. Game theory, as it pertains to cooperatives, examines strategic moves and rational decisions made by group members. Game theory is divided into two segments -- cooperative games, where players (group members) communicate and enter into binding commitments, and noncooperative games, in which players maximize their own best interests. A common noncooperative game is the "prisoner's dilemma." In a prisoner's dilemma, each player acts independently of

the others, even though cooperation among the group would lead to greater benefits for all (Staatz,1989). The prisoner's dilemma provides an economic basis for the free rider problem, hence the application of game theory to the membership troublespots of retention and enlargement.

In a basic prisoner's dilemma, each player possesses two possible strategies. With respect to the free rider problem, these strategies are marketing through a cooperative or marketing through an IOF. A two-person game is used here as an example for ease of understanding. Nonetheless, the insights provided by the two-person prisoner's dilemma game can be extended to a game involving many decision makers. A 2x2 payoff matrix, or four possible outcomes, appears with a two-person, two-strategy game.

For example, four outcomes are:

1. Farmer Jones joins a cooperative, and Farmer Smith joins a cooperative.
2. Farmer Jones joins a cooperative, and Farmer Smith sells to an IOF.
3. Farmer Jones sells to an IOF, and Farmer Smith joins a cooperative.
4. Farmer Jones sells to an IOF, and Farmer Smith sells to an IOF.

A payoff matrix, as shown below, is designed to show the returns received by each player, given the strategies chosen by each player. For instance, if Jones becomes a cooperative member and Smith sells to an IOF (the decision pair indicated by the asterisk), then Jones nets, say, \$3, while Smith nets \$9. The payoffs can signify services, money, level of risk, etc. This payoff matrix can be regarded as returns in

terms of relative utility, or what each decision pair yields relative to the other three possibilities.

Farmer Jones	Farmer Smith	
	Cooperative	IOF
Cooperative	(7,7)	(3,9)*
IOF	(9,3)	(4,5)

After establishing the payoff matrix, each player chooses the strategy that furnishes the best outcome for that player given the choice made by the other player. This decision is made without collaboration between the players. Utilizing the same payoff matrix, Farmer Jones examines her two strategies based on what Farmer Smith's alternatives. If Smith joins a cooperative, Jones receives a higher return from selling to an IOF (\$9 vs. \$7). If Smith sells to an IOF, Jones also receives a higher return from selling to an IOF (\$4 vs. \$3). Therefore, regardless of Smith's decision, Jones will select an IOF buyer. Farmer Smith conducts the same analysis. If Jones becomes a cooperative member, Smith receives a higher return from selling to an IOF (\$9 vs. \$7). If Jones sells to an IOF, Smith also receives a higher return from selling to an IOF (\$5 vs. \$3). Therefore, regardless of Jones' decision, Smith will select an IOF buyer. These strategy selections result in \$4 for Jones and \$5 for Smith, less than what they could have achieved through cooperating with each other. The lack of both trust and communication

between the players reduces the gains received by both players.

Another feature of a prisoner's dilemma is repetition. In a single-period game, reputations as "good" or "bad" playing partners and/or adversaries are irrelevant. However, if the game continues, players may become concerned with reputations and, therefore, develop cooperative behavior (Staatz,1987). Realistically, farmers play this cooperative/IOF "game" on a regular basis, so reputations become important.

Regarding the free rider issue, game theory helps explain why farmers behave and make decisions the way they do. Not everyone chooses to free ride, because not all payoff matrices are as idealistically simple as presented above. Payoff matrices may even be unknown. Game theory also informs cooperative management of how they contribute to free riding. Management usually concerns itself with the welfare of the overall organization, while overlooking the effects on individual producers.

"The game-theoretic approach . . . stresses that farmer cooperatives cannot always singlemindedly pursue the simple objectives . . . such as maximization of total member profits . . . because doing so may result in a distribution of member benefits that creates incentives for certain members to leave the organization. For a similar reason, a cooperative may not be able to serve everyone . . . Rules such as 'equal treatment for all' may in certain circumstances result in no service for anyone as they precipitate the disintegration of the organization."

(Staatz,1987,pp.139-140)

A heterogeneous group of members may require differentiated services to preserve cooperative loyalty.

If game theory accurately explains reality, then the free rider problem can be reduced by changing the payoffs received by the players. Changing the payoffs demands a

knowledge of values that members place on various qualities and services. For instance, Farmer Jones may place greater emphasis on, and subsequently receive a higher utility from, having an assured market. This higher payoff for Farmer Jones could significantly alter the payoff matrix and, therefore, the strategic decisionmaking. This payoff modification and corresponding change in strategy has also been compared to cooperative loyalty, which varies under different circumstances. A theoretical analysis by Staatz proposes four variables which influence cooperative loyalty.

1. "Cooperative loyalty is greater among those who will be farming for an indefinite period compared to those who are close to leaving farming"
2. "Cooperative loyalty increases as the penalties for disloyalty are increased"
3. "A farmer's cooperative loyalty decreases as he or she becomes more leveraged"
4. "Cooperative loyalty is greater in small cooperatives than in large ones"

(1987,p.131)

Cooperative loyalty and other factors that motivate strategy changes have been the topics of prior research. In 1955, Folkman discovered that most American farmers joined cooperatives for the economic services provided and that they knew very little about the theoretical configuration underlying cooperatives. In a late 1970s study, the reasons for leaving dairy cooperatives were very similar to Folkman's findings. Sixty-eight percent of the farmers who switched from cooperatives to IOFs said the cooperatives' special assessments were too high. Twenty-eight percent of the dairy

farmers leaving cooperatives for IOFs reported that cooperative deductions were too high (Wilkins and Stafford). Independents gave two main reasons for selling to IOFs: better price (36 percent) and tradition (44 percent). Fifty-four percent of the independents cited other reasons apparently not specified in the interviews. Deiter, Dahlgran, and Passe examined member awareness of services provided by dairy cooperatives, under the assumption that a higher level of awareness would lead to increased member support. They found six factors that had a significant, positive effect on member awareness: length of time with the cooperative, herd size, level of importance placed on cooperative services, member's effort and sincerity when rating a service, cooperative's member education program, and cooperative size.

Group theory, game theory, and prior research indicate that dairy cooperatives cannot assume that what is best for the cooperative is best for the individual members. Members, as well as independents, are concerned with their own best interests, so cooperatives must consider individual payoffs when setting cooperative policy, marketing plans, pricing schedules, etc. Dairy cooperatives may not be able to serve adequately all dairy farmers. Management may alienate some members while pleasing others, by assuming that what larger farms need is equivalent to what smaller farms need. Therefore, to increase and maintain membership, dairy marketing cooperatives must be able to associate valued services with specific groups of dairy farmers.

CHAPTER III

DATA & METHODOLOGY

Associating values and services with specific target groups requires the categorization of individuals into these target groups. On the basis of buyer selection, this study divides dairy farmers into dairy marketing cooperative members and independents. Then, the producer responses to survey questions are analyzed within the target groups. This chapter examines the survey design, a description of the dairy farmers and their responses, and the ways in which the responses will be analyzed.

SOURCE OF DATA

The data utilized in this research was obtained via a survey of Southern dairy farmers. The survey was formulated by the Southern Dairy Marketing Research Committee, a regional research project entitled "Economic and Technical Forces Shaping the Southern Dairy Industry." The research committee consisted of Southern land-grant university faculty members, Agriculture Experiment Station staff, and Federal agency personnel. The committee developed the survey (See Appendix A) to acquire information about the dairy farmers, the dairy farms, and the dairy handlers in twelve Southern states: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and Virginia.

The Southern Dairy Marketing Research Committee designed the survey instrument to find out about the milk marketing options available to Southern dairy farmers. The survey asked for information about cooperative buyers and IOF buyers and the services they offered. For comparison, the survey also asked for demographic information about the individual farmers. Attitudinal questions pertaining to why the farmers made their marketing decision were also included.

The committee randomly selected 5,660 dairy farmers, representing approximately 57 percent of the Grade A milk producers in the twelve-state area. The surveys were then mailed to these dairy farmers in February 1989. The survey asked for information as of December 1988. Forty-five percent of the surveys were returned, resulting in

2,538 respondents. These respondents accounted for almost 25 percent of the Grade A dairy farmers in the region. The experiment stations collected the data for their respective states and sent the edited data to Auburn University. The various data sets were then combined into a regional data set, which was employed in this study. The overall project was partially funded by the USDA's Agricultural Cooperative Service.

A PROFILE OF THE RESPONDENTS

This section includes four classes of information acquired from the S-217 Survey of Southern Dairy Farmers: characteristics of the individual farmer, characteristics of their farms, a description of their marketing options (including why the option was selected), and dairy cooperative members' attitudes about their cooperative. Here, the responses were not divided into members and independents. Rather, an overview of all respondents is given. This data description should not be used as a basis for analysis but as a ruler on which to measure both cooperative members and independents. All regional values were reported in a descriptive publication by Liebrand, Carley, and Ling.

Individual Characteristics. Characteristics of the individual dairy farmers describe the study population. For example, the average survey respondent was 47 years old with

22 years of dairy farming experience (Table 4). These values ranged from 18-82 years of age and from 0.3-54 years of experience. Thirteen percent of the dairymen believed they would remain in dairying for less than five years, and 39 percent of them were unsure about their future in dairy farming (Table 5). Over 50 percent of the farmers surveyed could disappear from the Southern dairy industry if their uncertainty leads them out of business in the next five years. Even a smaller reduction in dairy farmers could result in a deficit market in the South, causing serious supply, transportation, and distribution problems.

Farm Characteristics. Farm characteristics depict attributes of the dairy operations associated with the dairy farmers described above. In the South, individual proprietors owned almost 60 percent of the dairy farms, compared to 25 percent which were listed as a type of partnership (Table 6). However, large differences existed between states. For instance, 78 percent of Arkansas dairy farmers were individual proprietors, compared to only 39 percent of Florida dairy farmers. This wide variation was readily explained by the prevalence (34 percent) of family corporations in Florida.

Southern farms averaged 377 acres (Table 7), with values between five acres and 15,000 acres. Florida claimed the largest farms, in terms of both acreage and herd size (averaging 731 acres and 597 cows). Kentucky possessed the smallest farms, averaging 251 acres and 49 cows. Overall, the region's farms averaged 126 milking cows, with an annual production of nearly 14,600 pounds of milk per cow. The highest herd

Table 4: Southern Dairy Farmers' Average Age (in years) and Years of Experience, by State, 1988

State	Age	Experience
Alabama	47.3	20.5
Arkansas	44.4	15.7
Florida	47.0	22.2
Georgia	46.2	21.6
Kentucky	46.97	22.4
Louisiana	46.3	20.6
Mississippi	47.99	21.7
North Carolina	51.3	27.9
South Carolina	50.2	24.4
Tennessee	47.6	22.2
Texas	45.7	19.0
Virginia	47.5	23.7
Region	47.3	21.96

Source: S-217 Survey of Southern Dairy Farmers, Questions 16 and 17

Table 5: How Long Southern Dairy Farmers Expect to Remain in Dairy Farming, by State, 1988

State	Percentage of Farmers Expecting to Remain:			
	≤ 5 years	6 - 10 years	> 10 years	Not Sure
Alabama	8.4	15.1	40.3	36.1
Arkansas	15.8	10.4	40.3	33.5
Florida	8.7	10.1	48.3	32.9
Georgia	9.9	10.6	43.7	35.9
Kentucky	13.5	8.9	30.0	47.6
Louisiana	12.1	9.7	38.7	39.5
Mississippi	14.8	12.0	38.0	35.2
North Carolina	14.8	13.7	30.4	41.1
South Carolina	15.2	9.8	36.6	38.4
Tennessee	11.2	13.5	32.7	42.7
Texas	12.4	11.1	44.7	31.8
Virginia	12.3	10.8	37.5	39.4
Region	12.7	11.2	37.3	38.8

Source: S-217 Survey of Southern Dairy Farmers, Question 22

Table 6: Ownership Arrangement of Southern Dairy Farms, by State, 1988

State	Percentage of Farms in Ownership Arrangement:				
	Individual	Father/ Son	Other Partner	Family Corp.	Other
Alabama	53.4	17.8	15.3	12.7	0.8
Arkansas	77.8	10.4	4.1	6.8	0.9
Florida	38.9	10.7	10.7	34.2	5.4
Georgia	57.7	14.8	17.6	5.6	4.2
Kentucky	56.5	19.6	12.5	8.0	3.4
Louisiana	69.9	12.9	5.6	11.2	0.4
Mississippi	73.9	14.8	7.7	3.5	---
North Carolina	50.0	20.1	13.3	15.5	1.1
South Carolina	48.2	17.5	14.9	11.4	7.9
Tennessee	60.2	18.8	11.1	7.3	2.7
Texas	66.4	12.9	6.9	9.2	4.6
Virginia	54.3	16.9	15.1	11.9	1.8
Region	59.5	16.0	11.0	11.0	2.6

Source: S-217 Survey of Southern Dairy Farmers, Question 18

Table 7: Southern Dairy Farm Size and Production, by State, 1988

State	Farm Size		Production per Cow (lbs.)
	Acreage	Herd Size	
Alabama	432.7	120.7	14,555
Arkansas	293.7	63.99	14,006
Florida	731.3	597.3	15,132
Georgia	384.9	130.3	14,839
Kentucky	250.5	48.5	13,158
Louisiana	308.6	101.2	13,097
Mississippi	351.6	96.9	13,628
North Carolina	397.6	100.5	15,656
South Carolina	524.3	132.8	15,239
Tennessee	316.1	72.1	14,641
Texas	428.8	190.7	15,048
Virginia	395.9	84.0	16,230
Region	376.7	126.2	14,578

Source: S-217 Survey of Southern Dairy Farmers, Questions 11A, 13, and 15F

average occurred in Virginia, where cows produced 16,230 pounds annually (per cow). Louisiana showed the lowest production average per cow at just over 13,000 pounds of milk.

When computing average production per cow, 45 percent of Southern farmers used Dairy Herd Improvement Association (DHIA) records, while another 36 percent merely estimated the figure (Table 8). The percentage of farmers who estimated production per cow was highest in Arkansas (56.5 percent) and lowest in South Carolina (18.5 percent). On the other hand, South Carolina dairy farmers highly favored DHIA (71.3 percent). Kentucky reported the smallest percentage of DHIA members for the region (25.5 percent).

Most of the farmers surveyed (65 percent) were considered to be full-time milk producers, with 90-100 percent of their total income stemming from the dairy operation (Table 9). Florida had the most full-time dairy farmers, with over 86 percent. Kentucky's producers, however, were evenly distributed throughout the 70-100 percent income ranges.

The respondents were also asked what amount they would expect to receive if they sold the dairy operation and paid off all debts (Table 10). Florida reported the lowest percentage of farmers in the 100 percent -- debt free category (9.2 percent) but had the highest percentage of farmers in the 50-99 percent asset ranges (57.8 percent). North Carolina noted that only 2.7 percent of their dairy farmers would receive none of the farm's sale value. North Carolina also showed the smallest percentage of farmers in the

Table 8: How Southern Dairy Farmers Determine Herd Average, by State, 1988

State	Percentage of Farmers who Use:			
	DHIA	Another Records System	Estimate	Other
Alabama	59.8	7.5	28.0	4.7
Arkansas	28.0	14.5	56.5	1.0
Florida	51.5	18.5	21.5	8.5
Georgia	53.1	9.2	33.1	4.6
Kentucky	25.5	12.8	44.3	17.4
Louisiana	40.6	7.4	35.5	16.6
Mississippi	34.9	11.9	43.7	9.5
North Carolina	60.3	4.9	23.9	10.9
South Carolina	71.3	1.9	18.5	8.3
Tennessee	42.4	13.4	41.1	3.0
Texas	36.1	12.4	47.4	4.1
Virginia	63.6	6.1	25.3	5.0
Region	45.5	10.1	36.1	8.3

Source: S-217 Survey of Southern Dairy Farmers, Question 14

Table 9: Percent of Farm Income Received from Southern Dairy Sales, by State, 1988

State	Percentage of Dairy Farmers in Each Income Category:					
	1-24%	25-49%	50-69%	70-79%	80-89%	90-100%
Alabama	1.7	5.2	7.8	5.2	11.2	69.0
Arkansas	0.9	4.1	5.5	9.2	15.1	65.1
Florida	3.4	2.8	1.4	2.1	4.1	86.2
Georgia	2.1	1.4	5.6	7.0	13.4	70.4
Kentucky	4.3	4.3	15.4	23.5	26.7	25.8
Louisiana	1.6	2.0	4.1	2.8	10.2	79.3
Mississippi	2.1	1.4	5.0	4.3	9.3	77.9
North Carolina	2.3	1.9	2.3	5.7	11.4	76.4
South Carolina	0.9	2.7	5.3	8.0	13.3	69.9
Tennessee	1.1	2.7	4.9	11.8	23.2	56.3
Texas	2.3	0.9	6.0	6.5	12.0	72.4
Virginia	0.4	3.6	3.3	7.6	18.2	66.9
Region	2.0	2.8	6.0	9.0	15.4	64.8

Source: S-217 Survey of Southern Dairy Farmers, Question 19

Table 10: Value of Southern Dairy Farm Assets After Repayment of All Debts, by State, 1988

State	Percentage of Dairy Farmers in Each Asset Category:					
	None	1-24%	25-49%	50-74%	75-99%	100%
Alabama	3.4	13.8	14.7	20.7	30.2	17.2
Arkansas	6.5	14.4	20.4	27.3	18.1	13.4
Florida	7.0	8.5	17.6	31.7	26.1	9.2
Georgia	3.7	17.8	14.8	28.9	16.3	18.5
Kentucky	8.5	13.7	15.2	19.8	16.5	26.2
Louisiana	8.6	14.8	14.8	19.8	23.0	18.9
Mississippi	11.5	10.8	15.8	25.2	21.6	15.1
North Carolina	2.7	5.1	12.5	24.1	28.0	27.6
South Carolina	5.5	14.7	13.8	23.9	18.3	23.9
Tennessee	6.4	10.8	12.4	18.0	28.4	24.0
Texas	3.3	10.9	22.3	28.0	23.7	11.8
Virginia	4.1	9.3	15.2	19.6	28.5	23.3
Region	6.0	11.7	15.7	23.2	23.2	20.1

Source: S-217 Survey of Southern Dairy Farmers, Question 21

1-49 percent asset ranges (17.6 percent) and, as could be expected, the most farmers in the debt free category (27.6 percent). Mississippi recorded a high, 11.5 percent of dairy farmers with debts exceeding assets. Regionally, almost one-half of the respondents placed in the 50-99 percent asset ranges, with another 20 percent in the debt free class.

Marketing Characteristics. Marketing characteristics identify the marketing options available to Southern dairy farmers and the current status of those options. Eighty-three percent of the Southern dairy farmers surveyed belonged to a dairy marketing cooperative (Table 3). Cooperative membership ranged from 49.2 percent in Alabama to 100 percent in Florida. Based on earlier descriptions, Florida's 100 percent membership figure indicates that large, full-time farms, with 50-99 percent asset values and owned by family corporations were cooperative members in Florida. The Southern producers also sold milk to their current buyers, either cooperative or IOF, for an average of 12 years (Table 11). Virginia producers averaged 17 years with their buyers. Thus, considerable loyalty, or at least stability in marketing affiliations, was evident. Regionally, 79 percent of the respondents had written contracts with their buyers.

Southern cooperatives and IOFs put forth equivalent recruiting efforts in 1988. Seventeen percent of the region's dairy farmers were contacted by at least one cooperative and/or IOF representative (Table 12). The average number of representatives reported throughout the region were 1.4 cooperative representatives and 1.5 IOF representatives. In North Carolina, farmers were visited by an average of two

Table 11: Length of Time with Current, Southern Milk Buyer (in years) and Existence of Written Contracts with Current, Southern Milk Buyer, by State, 1988

State	Time with Current Buyer	Percentage of Dairy Farmers with Written Contracts
Alabama	7.1	69.2
Arkansas	11.5	75.9
Florida	10.9	95.3
Georgia	12.4	84.1
Kentucky	12.4	69.5
Louisiana	9.9	92.8
Mississippi	12.1	88.4
North Carolina	10.5	76.3
South Carolina	9.4	63.4
Tennessee	11.8	64.8
Texas	12.7	93.5
Virginia	17.0	77.9
Region	11.9	78.8

Source: S-217 Survey of Southern Dairy Farmers, Questions 2 and 3

Table 12: Average Number of Marketing Representatives and the Southern Dairy Farmers They Contacted, by State, 1988

State	Average Number of Representatives		Percentage of Dairy Farmers Contacted by at least One Representative	
	Cooperative	IOF	Cooperative	IOF
Alabama	1.1	1.3	26.7	34.2
Arkansas	1.3	1.0	1.8	1.8
Florida	1.3	1.0	6.6	2.0
Georgia	1.3	1.4	32.2	30.1
Kentucky	1.5	1.3	18.7	24.6
Louisiana	1.3	1.4	15.8	9.5
Mississippi	1.4	1.2	36.6	20.4
North Carolina	2.0	1.4	15.6	8.9
South Carolina	1.5	3.7	14.5	16.2
Tennessee	1.3	1.5	18.9	38.9
Texas	1.5	1.6	13.8	6.4
Virginia	1.4	1.7	13.1	11.7
Region	1.4	1.5	16.8	16.7

Source: S-217 Survey of Southern Dairy Farmers, Questions 6A and 6B

cooperative representatives, the highest cooperative average in the region. IOFs recruited most heavily in South Carolina, with an average of 3.7 representatives. However, these representatives in the Carolinas only reached about 16 percent of the dairy farmer populations in those states. Cooperatives contacted 37 percent of Mississippi dairy farmers, and IOFs contacted 39 percent of Tennessee dairy farmers. On the other hand, neither business type contacted more than two percent of the dairy farmer population in Arkansas. Perhaps this lack of personal contact in Arkansas was due to their high percentage of cooperative membership (93 percent, Table 3). If those cooperatives did not feel threatened about losing their Arkansas membership, then they may have placed Arkansas lower on their priority lists.

Most Southern dairy farmers (89 percent) were either satisfied or very satisfied with their milk buyers (Table 13). Florida had the most farmers who were very satisfied (44 percent). Regionally, only 11 percent of the respondents were unhappy with their current buyers. South Carolina had the highest proportion of the very unsatisfied producers (22 percent), whereas Georgia reported no producers in the very unsatisfied category. Three reasons for the initial selection of these buyers were cited most often: assured market and payment (51 percent), pays the highest price (33 percent), and services offered are better (32 percent) (Table 14). Alabama producers chose their buyers because of the higher prices paid, whereas almost 70 percent of Texas producers made the decision based on an assured market. Twenty-one percent of Mississippi producers selected low deductions. In Arkansas, more than one-half of the farmers did not have a choice

Table 13: Southern Dairy Farmers' Satisfaction Level with Milk Buyers, by State, 1988

State	Percentage of Farmers who Reported Being:			
	Very Satisfied	Satisfied	Unsatisfied	Very Unsatisfied
Alabama	30.5	66.1	1.7	1.7
Arkansas	31.1	57.5	10.0	1.4
Florida	44.1	46.7	6.6	2.6
Georgia	28.2	61.3	10.6	---
Kentucky	29.1	58.9	9.7	2.3
Louisiana	33.2	53.0	10.3	3.6
Mississippi	35.0	55.0	8.6	1.4
North Carolina	24.8	63.9	8.6	2.6
South Carolina	24.6	53.3	16.7	5.3
Tennessee	30.0	57.4	9.5	3.0
Texas	37.7	56.7	4.2	1.4
Virginia	42.2	49.1	6.1	2.5
Region	32.6	56.6	8.5	2.4

Source: S-217 Survey of Southern Dairy Farmers, Question 4

Table 14: Southern Dairy Farmers' Reasons for Selecting Current Milk Buyers, by State, 1988

State	Percentage of Farmers who Said:							
	Highest Price	Better Services	Only Choice	Friendly Personnel	Other Farmers	Low Deductions	Assured Market	Other
Alabama	48.3	29.2	8.3	31.7	24.2	13.3	45.8	14.2
Arkansas	20.5	25.4	50.9	20.5	12.5	4.5	41.5	4.0
Florida	27.6	35.5	15.8	21.1	20.4	7.2	67.8	11.2
Georgia	37.8	32.9	9.1	22.4	21.7	8.4	59.4	16.8
Kentucky	31.4	34.6	9.6	28.9	17.6	8.5	52.1	11.9
Louisiana	46.6	40.7	9.1	26.9	24.1	17.8	46.2	12.6
Mississippi	39.4	37.3	8.5	28.9	20.4	21.1	54.2	7.0
North Carolina	32.3	23.8	18.6	24.9	19.0	8.2	41.3	18.6
South Carolina	38.5	16.2	20.5	19.7	15.4	8.5	41.0	16.2
Tennessee	38.9	31.7	9.4	30.6	17.4	7.5	49.4	11.7
Texas	22.0	40.8	12.8	20.6	18.8	8.7	69.3	10.1
Virginia	24.5	28.4	14.2	31.6	23.4	10.6	52.8	21.6
Region	33.0	31.8	15.6	26.2	19.4	10.0	51.4	13.2

Source: S-217 Survey of Southern Dairy Farmers, Questions 5A - 5H

between buyers -- only one was available to them. This further explains why heavy recruitment did not occur in Arkansas during the survey year.

To obtain the above-mentioned, high satisfaction level, 18 percent of the milk producers switched to another marketing alternative during the period from 1983-1988 (Table 15). Moving from one cooperative to another was the most common form of change (39 percent), but leaving a cooperative for an IOF placed a relatively close second at 29 percent. The highest percentage of changes occurred in Alabama, with 62 percent of the changes going from cooperatives to IOFs. Tennessee producers also switched from cooperatives to IOFs, while most of the changes in Texas and Virginia were exactly the opposite -- IOFs to cooperatives. Low prices and high deductions were cited most often as reasons for changing buyers (47 percent and 26 percent, respectively) (Table 16). However, 25 percent were forced to find another buyer, since their former buyer had gone out of business. This scenario was very common in Arkansas, where 78 percent switched buyers for this reason. In Mississippi, 11 percent were dropped by their former buyers, and recruiting played a large role in Alabama (21 percent of farmers who switched buyers).

For those dairymen who elected to remain with their buyer, four elements stood above the rest: assured market (63 percent), stable and secure operation (62 percent), a tradition of marketing through that buyer (49 percent), and capable and friendly personnel (44 percent) (Table 17). These four reasons were listed as having a strong influence on the farmer's decision to stay with the current buyer. An assured market

Table 15: Southern Dairy Farmers who Changed Buyers and the Types of Changes, by State, 1983-1988

State	Percentage of Farmers who Changed Buyers	Percentage of Farmers who Changed from:			
		Co-op to Co-op	Co-op to IOF	IOF to Co-op	IOF to IOF
Alabama	32.5	10.3	61.5	5.1	23.1
Arkansas	4.0	44.4	22.2	33.3	---
Florida	19.1	91.7	---	8.3	---
Georgia	16.1	54.5	13.6	31.8	---
Kentucky	18.7	17.5	34.9	6.3	41.3
Louisiana	23.7	84.5	3.4	10.3	1.7
Mississippi	19.0	42.9	32.1	21.4	3.6
North Carolina	19.3	42.6	29.6	24.1	3.7
South Carolina	24.8	46.9	18.8	21.9	12.5
Tennessee	24.5	7.7	53.8	9.2	29.2
Texas	7.3	35.3	11.8	41.2	11.8
Virginia	11.3	33.3	21.2	45.5	---
Region	17.6	39.2	28.8	17.6	14.4

Source: S-217 Survey of Southern Dairy Farmers, Questions 7A and 8

Table 16: Southern Dairy Farmers' Reasons for Changing Milk Buyers, by State, 1983-1988

State	Percentage of Farmers who Chose Following Reasons:									
	Buyer out of business	Prices too low	Deductions too high	High hauling charges	Poor on-farm services	Incorrect butterfat testing	Personal reasons	Dropped by former buyer	Actively recruited	Other
Alabama	7.7	61.5	35.9	7.7	12.8	5.1	17.9	5.1	20.5	---
Arkansas	77.8	---	---	---	---	11.1	11.1	---	---	---
Florida	51.7	6.9	---	13.8	10.3	---	3.4	---	---	---
Georgia	8.7	60.9	13.0	4.3	8.7	13.0	8.7	4.3	13.0	---
Kentucky	22.7	42.4	31.8	12.1	12.1	6.1	19.7	3.0	10.6	---
Louisiana	38.3	35.0	30.0	23.3	16.7	5.0	5.0	---	1.7	---
Mississippi	22.2	55.6	33.3	22.2	7.4	7.4	14.8	11.1	18.5	7.4
North Carolina	32.7	59.6	21.2	17.3	7.7	7.7	13.5	---	5.8	19.2
South Carolina	31.0	51.7	37.9	24.1	3.4	13.8	24.1	3.4	3.4	27.6
Tennessee	12.3	47.7	20.0	4.6	6.2	4.6	20.0	1.5	6.2	---
Texas	18.8	56.3	25.0	18.8	18.8	12.5	12.5	6.3	---	---
Virginia	9.4	65.6	34.4	21.9	15.6	12.5	21.9	---	6.3	31.3
Region	24.8	47.2	25.7	14.5	10.5	7.2	15.0	2.5	7.6	6.7

Source: S-217 Survey of Southern Dairy Farmers, Questions 9A - 9J

Table 17: Southern Dairy Farmers' Reasons for Remaining with the Same Milk Buyer, by State, 1983-1988

State	Percentage of Farmers who Chose Following Reasons:										
	Better price	Low deductions	Stable operation	Tradition	Field services	Low hauling charges	Friendly personnel	Assured market	Loyalty	Selling breed milk	Other
Alabama	29.5	19.2	59.0	33.3	25.6	25.6	44.9	56.4	24.4	7.7	---
Arkansas	27.4	10.1	57.2	48.1	25.0	20.2	32.7	56.3	25.5	8.7	15.4
Florida	38.8	22.4	75.0	52.6	29.3	37.1	42.2	76.7	37.1	7.8	---
Georgia	33.0	11.3	60.9	45.2	28.7	27.0	44.3	66.1	35.7	2.6	---
Kentucky	24.1	13.1	55.5	51.5	42.0	29.2	46.4	58.8	28.8	5.1	---
Louisiana	46.4	21.3	64.5	44.8	44.3	42.6	49.7	60.7	37.7	10.9	---
Mississippi	30.7	15.8	58.8	51.8	36.8	43.0	48.2	65.8	27.2	7.0	4.4
North Carolina	27.6	10.8	58.6	42.9	24.1	31.5	45.8	54.7	33.0	7.4	7.9
South Carolina	34.6	12.8	56.4	44.9	25.6	32.1	34.6	55.1	20.5	14.1	3.8
Tennessee	29.0	17.1	64.8	43.0	44.6	35.2	48.2	64.2	34.2	10.4	---
Texas	28.8	15.2	71.7	50.0	40.4	28.3	43.4	70.2	31.3	8.6	---
Virginia	25.1	16.9	65.8	60.1	39.1	36.6	45.3	66.7	39.1	7.0	7.4
Region	30.3	15.2	62.4	48.5	35.3	32.2	44.2	62.5	32.0	7.9	3.7

Source: S-217 Survey of Southern Dairy Farmers, Questions 10A - 10K

and a stable operation convinced Florida and Texas producers to sell to the same buyers. Tradition was a strong influence for 60 percent of Virginia's producers, more so than for any other state. Louisiana had the highest percentage of farmers who stayed due to a better price (46 percent).

Although the price farmers received stood out as an important factor for one-third of the region's producers in choice of marketing affiliation, 29 percent of the farmers mentioned that their prices were the same as their neighbors, and 26 percent said that they did not know how their prices compared to those received by their neighbors (Table 18). Forty-one percent of Virginia's dairy farmers were not sure of the price comparison, while one-half of the farmers in Arkansas and Florida believed prices to be the same. Gross dollar sales for the Southern region in December 1988 averaged just slightly less than \$19,400 (Table 19). Total average deductions amounted to approximately \$1,700. Most producers reported having received a butterfat differential (77 percent) (Table 20). On the other hand, some supplemental payments were not standard practice. Less than 25 percent of the study population pocketed income from the following sources: protein-nonfat solids premiums, volume price incentives, quality premiums, and seasonal incentives. More Florida producers received a butterfat differential and Class I and blend prices above the Federal Order price than producers in any other state. In Georgia, dairy farmers collected more seasonal and volume incentives. Protein-nonfat solids premiums, rare throughout most of the region, were most prevalent in Kentucky.

Table 18: Comparison of Milk Prices Received by Southern Dairy Farmers, by State, 1988

State	Percentage of Farmers who Reported:				
	Mine higher	Same	Mine lower	Some high, some low	Don't know
Alabama	19.3	37.7	2.6	13.2	27.2
Arkansas	6.3	50.0	1.9	8.3	33.5
Florida	11.6	53.4	2.1	12.3	20.5
Georgia	22.2	23.7	10.4	22.2	21.5
Kentucky	14.7	24.3	20.1	14.1	26.9
Louisiana	28.6	18.6	16.5	19.5	16.9
Mississippi	23.7	21.4	22.9	15.3	16.8
North Carolina	20.4	18.8	12.5	22.4	25.9
South Carolina	23.6	21.8	5.5	31.8	17.3
Tennessee	18.7	22.4	22.4	17.1	19.5
Texas	8.4	47.3	4.4	10.8	29.1
Virginia	10.7	23.7	11.5	13.4	40.8
Region	16.7	29.2	12.3	16.1	25.7

Source: S-217 Survey of Southern Dairy Farmers, Question 32

Table 19: Average Gross Income and Deductions of Southern Dairy Farms, by State, December 1988

State	Gross income	Deductions (in dollars):						
		Hauling	National Dairy Promotion	State Milk Commission	Marketing services	Cooperative capital retains	Federal gov't. assessment	Other ^a
Alabama	25,155	1,164	264	54	252	132	64	94
Arkansas	11,960	486	115	4	20	113	19	74
Florida	N/A ^b	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Georgia	29,977	1,258	288	124	130	173	48	115
Kentucky	8,053	381	92	28	46	66	17	277
Louisiana	16,458	601	173	51	133	118	28	311
Mississippi	16,466	575	174	---	106	110	29	176
North Carolina	22,108	815	143	29	351	226	37	380
South Carolina	29,073	1,205	142	21	146	160	48	483
Tennessee	16,959	715	158	104	181	110	37	532
Texas	36,792	1,597	424	---	150	428	70	361
Virginia	17,925	878	190	49	166	134	31	50
Region	19,400	816	185	37	154	166	36	286

^a Other cooperative or plant deductions plus any other deductions (Questions 28F & 28H)

^b Data for Florida not available, due to market competition.

Source: S-217 Survey of Southern Dairy Farmers, Questions 27D and 28A - 28H

Table 20: Supplemental Payments Received by Southern Dairy Farmers, by State, 1988

State	Percentage of Farmers who Received:							
	Butterfat differential	Class I price above Order price	Blend price above Order price	Quality premium	Seasonal incentive	Volume incentive	Protein-nonfat solids premium	Other
Alabama	83.8	55.5	46.7	14.0	30.1	26.4	1.0	6.8
Arkansas	68.1	36.3	31.3	1.5	3.1	5.2	—	8.0
Florida	93.7	79.4	78.0	6.6	5.8	7.3	1.4	6.6
Georgia	87.0	66.2	58.9	17.4	43.0	30.1	0.8	2.4
Kentucky	70.2	39.1	37.5	30.9	26.6	20.2	7.5	3.2
Louisiana	70.7	45.5	32.5	37.0	25.9	21.3	0.5	4.2
Mississippi	73.8	37.2	34.7	42.9	30.2	26.2	4.2	3.4
North Carolina	78.7	28.3	22.9	20.8	21.4	16.3	0.9	0.9
South Carolina	86.2	48.6	21.9	9.5	27.5	16.7	0.9	2.9
Tennessee	75.4	43.2	43.3	5.7	33.2	25.0	—	1.4
Texas	74.3	46.9	40.8	2.1	4.7	5.2	1.0	6.3
Virginia	78.1	37.7	35.7	38.8	33.6	26.8	1.2	5.7
Region	76.8	44.6	39.1	20.3	23.7	18.8	1.8	4.2

Source: S-217 Survey of Southern Dairy Farmers, Questions 31A - 31H

METHODS OF ANALYSIS

Comparing characteristics of cooperative members and independents provides information about the dairy farmers and their needs. To facilitate this comparison, the regional data set is divided into two segments: responses from cooperative members and responses from noncooperative members (independents). In an attempt to determine statistical differences between the two groups, one of two statistical tests is used. The type of test depends on the type of response. If a question elicits a continuous reply, such as the length of time marketing through the current buyer or the age of the farmer, then a t-test is employed. On the other hand, if a response is categorical (multiple choice), then a chi-square analysis is performed.

The t-test is used when comparing the mean values of two sample groups. Specifically, this test examines the mean values of continuous variables by contrasting cooperative responses and independent responses. In general, the null hypothesis is

$$H_0: \begin{array}{l} \text{mean value for} \\ \text{cooperative} \\ \text{members} \end{array} = \begin{array}{l} \text{mean value for} \\ \text{independents} \end{array}$$

or

$$\mu_c = \mu_i$$

This null hypothesis states that both means values are equivalent, also stating that any numeric difference between the means occurred strictly by chance. The null hypothesis is rejected when the calculated t value from the t statistic is greater than the critical t

value for the chosen confidence interval. For the purposes of this research, the 95 percent confidence interval was selected. The t statistic and degrees of freedom formulas are

$$t = \frac{\mu_c - \mu_i}{s_p \sqrt{(1/n_c) + (1/n_i)}}$$

$$df = n_c + n_i - 2$$

where:

s_p = standard deviation for population

n_c = sample size of cooperative members

n_i = sample size of independents

The t-test is based on three underlying assumptions. First, the two samples must be independent of each other. In other words, the constituents of one sample cannot be related to the constituents of the other sample. Second, the samples must be taken from normally-distributed populations. The distributions for the sample means are considered normal when the Central Limit Theorem holds (Ott). In this case, the Central Limit Theorem applies due to the large, combined sample size ($n_c + n_i$, or $2109 + 429 = 2538$).

The third assumption is that the variances must be equal. If the variances are not equal, then different t statistic and degrees of freedom formulas are used. The test which

compares the variances, known as the F-test, utilizes this null hypothesis:

$$H_0: \quad s_c^2 \quad = \quad s_i^2$$

or

$$\text{cooperative variance} \quad = \quad \text{independent variance}$$

If the calculated F value is greater than the critical F value for the 95 percent confidence interval, then the null hypothesis is rejected. A rejection of the null hypothesis, in this research, indicates different responses from cooperative members and independents. Unless otherwise noted, the t-tests are conducted assuming unequal variances, since the sample sizes are so different. When the sample sizes are equal, the two t-statistic equations are also equal. When the sample sizes are almost equivalent, the t-statistics will also be nearly the same. However, dissimilar sample sizes require the unequal variances t-statistic. The adjusted t statistic and degrees of freedom formulas for unequal variances are

$$t = \frac{\mu_c - \mu_i}{\sqrt{(s_c^2/n_c) + (s_i^2/n_i)}}$$

$$df = \frac{(n_c - 1)(n_i - 1)}{(n_i - 1)z^2 + (1 - z)^2(n_c - 1)}$$

where:

$$z = \frac{(s_c^2/n_c)}{(s_c^2/n_c) + (s_i^2/n_i)}$$

The survey's qualitative questions are examined by a chi-square test of independence. Each variable is compared to the question: Are you a cooperative member? Yes or No (Question 1). This bivariate analysis constructs two-way, or contingency, tables. In the form of a matrix, the tables are composed of rows, columns, and cells. The cells contain the values associated with the corresponding rows and columns.

To test the values in the cell, the expected number of responses per cell must be determined.

$$E_{ij} = \frac{(\text{row } i \text{ total})(\text{column } j \text{ total})}{N}$$

where:

$$N = \text{total observations}$$

If the observed values equal the expected values, then the categorical variable and Question 1 are independent. Chi-square tests whether Question 1 and the other question are independent of each other or dependent upon each other. Hence, the null hypothesis is

$$H_o: E_{ij} = n_{ij}$$

where:

n_{ij} = the number of observations for row i and column j

The test statistic and degrees of freedom formulas are

$$X^2 = \sum_{ij} \left[\frac{(n_{ij} - E_{ij})^2}{E_{ij}} \right]$$

$$df = (r - 1)(c - 1)$$

where:

r = number of rows in the table

c = number of columns in the table

The null hypothesis is rejected when the calculated X^2 value exceeds the critical X^2 value for the selected confidence interval and the appropriate degrees of freedom (Ott). Once again, the 95 percent confidence interval was chosen for this study.

The ultimate objective of this research is to develop membership recommendations for cooperatives, and the steps to reach these recommendations must be identified. Cooperatives will want to either retain current members and/or recruit new members, so these two groups should be defined. Their corresponding needs should also be

recognized. As stated by Olson, a group's individual members will make their decisions based on the benefits received by those individuals. A dairy farmer will choose the benefits important to him/her when selecting a milk buyer. Therefore, the dairy cooperatives need to know what areas are important to which farmers to attract them as members.

The way to define these two groups is to ask identical questions of both groups and then statistically compare the answers. The questions were asked in the survey, with this study comparing the answers on a member-nonmember basis. Statistically different answers (rejecting the null hypothesis) characterize individuals. The individuals can then be categorized into smaller, target groups. To recall a theory segment from Chapter II, individuals can "disappear", or become less important, in large groups. So, targeting smaller groups indicates to the farmers that the cooperative is interested in serving their needs, rather than just increasing its own milk supply. Similar answers (accepting the null hypothesis) will not differentiate individuals but may emphasize items significant to all farmers. The farmers' responses to the survey questions, along with their associated comparisons, can be found in Chapter IV.

CHAPTER IV

RESULTS & ANALYSIS

Once the surveys were received from the Southern dairy farmers, the responses were divided into two categories based on the farmer's marketing affiliation (cooperative member or independent). A statistical comparison between the two groups' responses was then made, using t-tests (See Appendices B and C.) and chi-square analyses (See Appendix D.). The results of the comparison are shown in this chapter, along with their implications for cooperative membership and their relationship to group and game theory. The comparisons were also subdivided according to the specific items they characterized:

the individual dairy farmer, the dairy operation, the farmer's marketing choice (including a section on cooperative members' opinions about their cooperative), and the income and expenses related to the dairy operation.

INDIVIDUAL CHARACTERISTICS

Southern dairy farmers, regardless of market affiliation, were very similar. Only three survey questions pertained to the individual farmer, and cooperative members and independents had similar responses to two of them. The only characteristic which showed a statistical difference was the age of the farmer. Dairy cooperative members in the South were older than their independent counterparts by 1.4 years (Table 21). Both groups averaged 22 years of dairying experience, which contradicts the repetition theory of the prisoner's dilemma game. Theory suggests that players will become concerned about their reputations and will develop cooperative behavior the longer they must play the game. Theory would then expect cooperative members to have played the game longer than independents. Yet, this was not the case.

How long Southern dairy farmers expected to remain in the dairy business also relates to their reputations. If a farmer expects to be farming in ten years, then reputations become important to the farmer, leading to the development of cooperative

Table 21: Southern Dairy Farmers' Average Age (in years) and Years of Experience, Comparison of Cooperative Members and Independents, 1988

	Mean Value for:		Calc. t	df
	Cooperative Members	Independents		
Age*	47.55 (0.273) ^a N=2042	46.15 (0.556) N=415	2.25	630.7
Experience	22.08 (0.282) N=2044	21.43 (0.626) N=418	0.96 ^b	2460.0

^a Standard errors shown in parentheses.

^b The variances of the two groups are equal.

* Indicates means are different from each other at the .05 level of significance.

Note: Refer to Appendices B and C for t-test statistics.

Source: S-217 Survey of Southern Dairy Farmers, Questions 16 and 17

behavior. However, cooperative members maintained the same time expectations as independents. Almost 40 percent of both groups expected to still be dairying in ten years (Table 22). Another 40 percent were unsure of their futures as dairy farmers. The remaining 20 percent anticipated leaving the dairy industry in less than ten years.

FARM CHARACTERISTICS

Compared to their independent counterparts, dairy cooperative members milked significantly larger herds in the South (Table 23). Subsequently, they sold a greater quantity of milk, since annual production per cow was equivalent for both producer groups. This herd size - membership relationship contradicts Bravo-Ureta and Lee's 1984 finding in New England. In their study, small farms were cooperative members. Yet, the Southern results support Deiter, Dahlgran, and Passe's study. They found a positive correlation between herd size and member awareness/support in the upper mid-West. Herd size, then, appears to have differing impacts on cooperative membership in different regions.

One other farm characteristic resulted in a significant difference between cooperative members' farms and independents' farms (Table 24). Eighty-two percent of dairy cooperative members were full-time dairy farmers, receiving 80-100 percent of their total

Table 22: How Long Southern Dairy Farmers Expect to Remain in Dairy Farming, Comparison of Cooperative Members and Independents, 1988

Years Remaining in Dairying	Percentage of:	
	Cooperative Members	Independents
Five years or less	12.70	12.50
Six-ten years	10.86	12.74
More than ten years	37.47	36.56
Not sure	38.97	38.21

Note: Refer to Appendix D.28 for chi-square statistics.

Source: S-217 Survey of Southern Dairy Farmers, Question 22

Table 23: Southern Dairy Farm Size and Production, Comparison of Cooperative Members and Independents, 1988

	Mean Value for:		Calc. t	df
	Cooperative Members	Independents		
Herd size*	131.85 (7.40)* N=2030	98.63 (5.35) N=412	3.64	2002.9
Milk sold (lbs.), 1988*	2,184,928 (173,478.87) N=1885	1,552,642 (96,792.85) N=370	3.18	2167.2
Production per cow (lbs.)	14,579 (65.90) N=1887	14,577 (149.30) N=373	0.01 ^b	2258.0
Total acreage	378 (12.67) N=2030	370 (18.99) N=410	0.34	821.4

^a Standard errors shown in parentheses.

^b The variances of the two groups are equal.

* Indicates means are different from each other at the .05 level of significance.

Note: Refer to Appendices B and C for t-test statistics.

Source: S-217 Survey of Southern Dairy Farmers, Questions 11A, 12, 13, and 15F

Table 24: Percent of Farm Income Received from Southern Dairy Sales, Comparison of Cooperative Members and Independents, 1988

Percentage of Income from Dairy*	Percentage of:	
	Cooperative Members	Independents
90-100 percent	65.78	60.10
80-89 percent	15.78	13.78
70-79 percent	8.35	12.11
50-69 percent	5.63	7.60
25-49 percent	2.52	4.28
1-24 percent	1.94	2.14

* Indicates means are different from each other at the .05 level of significance.

Note: Refer to Appendix D.25 for chi-square statistics.

Source: S-217 Survey of Southern Dairy Farmers, Question 19

income from the dairy operation. Seventy-four percent of the independents classified as full-time farmers.

The remaining farm characteristics showed no statistical differences between the two groups' responses. Southern dairy farmers were individual proprietors (Table 25), who owned their milking facilities (Table 26) and were DHIA members (Table 27). Most of them would receive at least 50 percent of the farm's sale value after paying all debts (Table 28). For example, if a farmer who owes \$90,000 to various creditors sells his/her farm for \$150,000, then the farmer would pocket \$60,000, or 40 percent of the farm's sale value ($60,000 \div 150,000 = .40$). This attribute differs from *a priori* expectations. Staatz suggested that cooperative loyalty decreases as a farmer becomes more leveraged. In this instance, one would presume to find a greater percentage of independents in the less than 50 percent categories. However, this percentage of independent producers equaled the percentage of cooperative producers.

Overall, the dairy operations of cooperative members were basically the same as the independents' dairy operations. Beginning with this similar, decisionmaking foundation, the producers should also have similar business goals and needs. Thus, according to group theory, the possibility exists to assemble similar people with similar goals and strive toward these common goals through cooperation.

Table 25: Ownership Arrangement of Southern Dairy Farms, Comparison of Cooperative Members and Independents, 1988

Type of Operation	Percentage of:	
	Cooperative Members	Independents
Individual proprietorship	59.97	57.31
Father-son partnership	15.76	16.98
Family corporation	11.15	10.38
Other partnership	10.62	12.74
Other	2.50	2.59

Note: Refer to Appendix D.24 for chi-square statistics.

Source: S-217 Survey of Southern Dairy Farmers, Question 18

Table 26: Ownership of Southern Dairy Farms, Comparison of Cooperative Members and Independents, 1988

	Percentage of:	
	Cooperative Members	Independents
Own	85.35	88.03
Rent	12.43	9.62
Other	2.22	2.35

Note: Refer to Appendix D.26 for chi-square statistics.

Source: S-217 Survey of Southern Dairy Farmers, Question 20

Table 27: How Southern Dairy Farmers Determine Herd Average, Comparison of Cooperative Members and Independents, 1988

Systems	Percentage of:	
	Cooperative Members	Independents
DHIA records	44.88	48.51
Estimated	35.92	36.86
Another system	10.34	8.94
Other	8.86	5.69

Note: Refer to Appendix D.23 for chi-square statistics.

Source: S-217 Survey of Southern Dairy Farmers, Question 14

Table 28: Value of Southern Dairy Farm Assets After Repayment of All Debts, Comparison of Cooperative Members and Independents, 1988

Percentage of Asset Value	Percentage of:	
	Cooperative Members	Independents
100 percent	20.10	20.00
75-99 percent	23.08	24.44
50-74 percent	23.28	22.78
25-49 percent	15.67	16.05
1-24 percent	11.84	11.11
None	6.02	5.68

Note: Refer to Appendix D.27 for chi-square statistics.

Source: S-217 Survey of Southern Dairy Farmers, Question 21

MARKETING CHARACTERISTICS

For dairy cooperatives attempting to build membership, it is important to note the recruiting efforts that existed in the field (Table 29). In 1988, both IOFs and cooperatives targeted their efforts toward independent producers. While not excluding cooperative members, a greater number of representatives from milk buyers were aimed at independents. An average of 1.2 representatives contacted independents. This statistic shows that dairy cooperatives recognized the important role of recruiting non-members. They also continued to maintain good relations with cooperative members by sending an average of 0.8 representatives to contact cooperative members.

Interestingly, IOFs also centered their recruiting efforts on independents. Apparently, IOFs perceived a greater opportunity with independents, whereas members might not have been such an easy target. If cooperative members were less likely to be approached by IOFs, then IOFs must have perceived a greater difficulty in tearing members away from their cooperatives. The figures indicate that IOF representatives believed cooperative loyalty to be a difficult bond to break. Yet, a producer's loyalty to another IOF buyer did not appear to concern the IOF recruiters.

Southern dairy cooperative members sold milk to their current buyers for a significantly longer period of time (a total of almost 13 years) (Table 30). Independent producers fell short in this category by remaining with current buyers for only seven years. This supports Deiter, Dahlgran, and Passe's work, which showed an increase in

Table 29: Average Number of Milk Marketing Representatives who Contacted Southern Dairy Farmers, Comparison of Cooperative Members and Independents, 1988

Marketing Representatives	Mean Value for:		Calc. t	df
	Cooperative Members	Independents		
IOFs*	0.79 (0.05)* N=551	1.20 (0.10) N=169	-3.73	245.3
Cooperatives*	0.78 (0.04) N=530	1.24 (0.11) N=160	-3.94	192.0

* Standard errors shown in parentheses.

* Indicates means are different from each other at the .05 level of significance.

Note: Refer to Appendices B and C for t-test statistics.

Source: S-217 Survey of Southern Dairy Farmers, Questions 6A and 6B

Table 30: Length of Time with Current Milk Buyer (in years), Comparison of Cooperative Members and Independents, 1988

	Mean Value for:		Calc. t	df
	Cooperative Members	Independents		
Years with current buyer*	12.86 (0.22) ^a N=2042	7.01 (0.36) N=405	13.92	757.6

^a Standard errors shown in parentheses.

* Indicates means are different from each other at the .05 level of significance.

Note: Refer to Appendices B and C for t-test statistics.

Source: S-217 Survey of Southern Dairy Farmers, Question 2

cooperative loyalty as time with the cooperative increased. The farmer's time invested in the cooperative provides the opportunity to witness firsthand the benefits of being a cooperative member and gives the cooperative an opportunity to educate the member on the benefits not easily seen or associated with the cooperative. Together, firsthand knowledge and additional education should increase the probability of further cooperative support from the farmer. For instance, only 13 percent of 1989's dairy cooperative members sold to other milk buyers from 1983-1988, compared to 43 percent of 1989's independent producers (Table 31). Dairy cooperatives secured 87 percent of their 1989 membership for at least that five year period, perhaps longer.

One avenue for securing members, as well as granting security to the members, is through a written contract. As evidenced in the results of this study, cooperative members possessed contracts more often than independents. In the South, 89 percent of the dairy cooperative members had written contracts, a significant difference from the 29 percent of independents who had contracts with their IOF buyers (Table 32). If independents were able to procure a higher milk price from IOF firms, as is traditionally believed, then a risk/return trade-off existed for them. In other words, to receive a higher price, 71 percent of the independents were forced to assume the major risk of not securing a market for their milk through written contracts. This implies a risk-taking persona, willing to operate *sans* contract to obtain the short-run return of a higher price.

The higher price received signifies a payoff similar to those defined by a prisoner's dilemma game. The payoffs associated with each strategy represent the utility each

Table 31: Sales to Other Milk Buyers, Comparison of Cooperative Members and Independents, 1983-1988

Sales to Other Buyers*	Percentage of:	
	Cooperative Members	Independents
Yes	13.17	43.24
No	86.83	56.76

* Indicates means are different from each other at the .05 level of significance.

Note: Refer to Appendix D.3 for chi-square statistics.

Source: S-217 Survey of Southern Dairy Farmers, Question 7A

Table 32: Existence of Written Contracts with Current Milk Buyer, Comparison of Cooperative Members and Independents, 1988

Written Contracts*	Percentage of:	
	Cooperative Members	Independents
Yes	88.95	29.19
No	11.05	70.81

* Indicates means are different from each other at the .05 level of significance.

Note: Refer to Appendix D.1 for chi-square statistics.

Source: S-217 Survey of Southern Dairy Farmers, Question 3

player receives from that strategy relative to the utility from the other possible strategies. The relative utility can also be described as the level of satisfaction a player derives from a particular strategy. A player attempts to maximize satisfaction through selecting the optimal strategy. Yet, game theory shows that the payoffs are less than optimal, due to the strategy chosen by the other player. Therefore, everyone's satisfaction is decreased. Instead of being extremely satisfied with their choices, the players are more likely to be satisfied, at best, and perhaps even dissatisfied. In this study, 47 percent of the independents reported being very satisfied with their IOF buyer (Table 33), an amount significantly higher than 30 percent of the cooperative members. Fifty-eight percent of the members noted being satisfied with their cooperative. The members also voiced dissatisfaction with their cooperative buyers. Twelve percent of the cooperative members expressed dissatisfaction (both unsatisfied and very unsatisfied) with their cooperative, compared to only four percent of the independent producers. Since more members were dissatisfied, and they were not as strongly satisfied, cooperatives may be facing some membership problems. Further analysis could assist in identifying the root of this dissatisfaction.

Some Southern dairy farmers chose to find another milk buyer when dissatisfied. (Refer to Tables 15 and 31.) From 1983-1988, 18 percent of the region's dairy farmers changed buyers, with more members switching to IOFs than independents becoming members. The reasons for changing milk buyers revealed both similarities and differences between cooperative members and independent producers (Table 34).

Table 33: Southern Dairy Farmers' Satisfaction Level with Milk Buyers, Comparison of Cooperative Members and Independents, 1988

Satisfaction Level*	Percentage of:	
	Cooperative Members	Independents
Very Satisfied	29.70	46.60
Satisfied	57.90	49.88
Unsatisfied	9.66	3.04
Very Unsatisfied	2.74	0.47

* Indicates means are different from each other at the .05 level of significance.

Note: Refer to Appendix D.2 for chi-square statistics.

Source: S-217 Survey of Southern Dairy Farmers, Question 4

Table 34: Southern Dairy Farmers' Reasons for Changing Milk Buyers, Comparison of 1989 Cooperative Members and 1989 Independents, 1983-1988

Reason	Rank	Strong/Moderate Influence ---percent---		Rank	Weak/No Influence ---percent---	
		Cooperative Members	Independents		Cooperative Members	Independents
Low milk prices*	1	82.17	91.24	1	17.83	8.76
High assessments/deductions	2	63.08	74.79	2	36.93	25.21
Excessive hauling charges*	3	55.38	40.74	4	44.62	59.25
Poor on-farm services	4	41.80	29.70	7	58.19	70.30
Personal reasons	5	40.51	44.23	3	59.48	55.77
Buyer went out of business*	6	31.93	11.17	8	---	---
Incorrect butterfat testing	7	28.69	34.00	6	71.30	66.00
Actively recruited by fieldman	8	26.47	39.05	5	73.53	60.96
Dropped by former buyer	9	8.74	4.17	9	91.26	95.83

* Indicates means are different from each other at the .05 level of significance.

Note: Refer to Appendix D.4-D.12 for chi-square statistics.

Source: S-217 Survey of Southern Dairy Farmers, Questions 9A-9I

For instance, low milk prices were top-ranked in both camps, yet the prices were important to a greater number of independents (91 percent, compared to 82 percent of members). These figures reflect the percentage of dairy farmers who changed buyers and said low milk prices had a strong or moderate influence on why they changed buyers. Both groups agreed on their second most influential reason -- high assessments and/or deductions. Here, the members' responses statistically equaled the independents' responses. This finding supports Wilkins and Stafford's study. Northeastern dairy farmers said their top reason for changing buyers was due to special assessments, regardless of the type of change (cooperative-to-cooperative or cooperative-to-IOF). These reasons represent the farmers' utility, or what brings satisfaction to the farmers. Specifically, low milk prices did not satisfy most of the dairy farmers who changed milk buyers.

At this point, the reasons for finding another buyer diverged into two, separate paths. The 1989 cooperative members gave their third-highest ranking to excessive hauling charges. The 1989 independents rated personal reasons as third. However, the percentages for this reason were equivalent for both groups. Another similar reason was incorrect butterfat testing. Even though this reason ranked quite low on both lists, a high percentage of dairy farmers felt this to be an important issue (29 percent of members and 34 percent of independents). The entire dairy industry should be alerted to the existence of such bad business practices.

An involuntary reason for changing buyers showed a significant difference between

1989 member and independent responses. Thirty-two percent of the 1989 members were forced to switch when their buyers went out of business. Eleven percent of the 1989 independents were faced with the same problem. Although cooperatives are generally formed to add stability to a market, they are just as susceptible to mergers, acquisitions, bankruptcies, etc. as are other forms of business. Table 35 shows that 69 percent of the 1989 members originated from other cooperatives. Sixty-seven percent of the 1989 independents also originated from cooperatives. Through logical progression, it appears that most of the dairy farmers who were forced to change buyers formerly sold to cooperatives. Yet, over half of the initial cooperative members continued to sell to a cooperative (Table 36). Fifty-eight percent who were initially cooperative members remained cooperative members. Fifty-five percent who were initially independents switched to a cooperative buyer. So, even though most of the dairy farmers were forced to switch because a cooperative went out of business, dairy cooperatives still maintained a majority of those farmers who switched, regardless of origin.

Just as important as the reasons for changing milk buyers are the reasons for staying with the same milk buyer. Ten potential reasons for remaining with the same buyer were specified in the survey. Ninety-six percent of the cooperative members listed an assured market as the primary reason for remaining with their buyer (Table 37). Ninety-one percent of the independents made the same claim, but they only ranked it third. A stable and secure buying operation placed second for both groups.

A tradition of always selling to a particular buyer proved to be equally important to

Table 35: 1989 Cooperative Members and Independents who Originated from Cooperatives and IOFs, 1983-1988

	Point of Origin			
	Cooperative		IOF	
	Frequency	Percent	Frequency	Percent
1989 Members	174	69.0	78	31.0
1989 Independents	128	66.7	64	33.3

Source: S-217 Survey of Southern Dairy Farmers, Question 8

Table 36: Original Cooperative Members and Independents who Became 1989 Cooperative Members and 1989 Independents, 1983-1988

Point of Origin	1989 Marketing Affiliation			
	Cooperative Members		Independents	
	Frequency	Percent	Frequency	Percent
Co-op	174	57.6	128	42.4
IOF	78	54.9	64	45.1

Source: S-217 Survey of Southern Dairy Farmers, Question 8

Table 37: Southern Dairy Farmers' Reasons for Remaining with the Same Milk Buyer, Comparison of 1989 Cooperative Members and 1989 Independents, 1983-1988

Reason	Rank	Strong/Moderate Influence ---percent---		Rank	Weak/No Influence ---percent---	
		Cooperative Members	Independents		Cooperative Members	Independents
Assured market*	1	95.71	90.95	3	4.28	9.05
Stable operation	2	95.17	94.12	2	4.83	5.88
Friendly personnel	3	87.04	90.41	4	12.96	9.60
Tradition	4	80.51	75.70	6	19.49	24.29
Low hauling charges	5	79.30	75.90	5	20.70	24.10
Field services*	6	77.28	65.05	9	22.72	34.95
Better price*	7	77.05	94.76	1	22.95	5.24
Loyalty	8	74.78	72.53	8	25.22	27.48
Low deductions*	9	63.62	74.33	7	36.38	25.67
Selling breed milk*	10	27.13	39.87	10	72.86	60.13

* Indicates means are different from each other at the .05 level of significance.

Note: Refer to Appendix D.13-D.22 for chi-square statistics.

Source: S-217 Survey of Southern Dairy Farmers, Questions 10A - 10J

both members and independents. Although receiving different rankings compared to other reasons, equivalent percentages of members and independents said tradition had either a strong or a moderate influence on why they remained with a milk buyer. This supports Wilkins and Stafford's finding pertaining to independents. In their study, 44 percent of the independents, the highest percentage, stayed with their IOF buyer out of tradition. Loyalty influenced both groups in a similar manner, reported by a high percentage from both circles but showed no statistical difference between responses.

Basing buyer selection on field services offered occurred more frequently with cooperative members. Field services are defined as when the milk buyer assists the farmer with production and quality problems/issues. Independents did not place this reason very high on their priority list, yet sixty-five percent felt that field services were, indeed, important. Surprisingly, 40 percent of the independents said that selling breed milk, milk produced by a specific breed of dairy cattle, was also an important quality. This result may reflect the Jersey herd population, since Jersey producers can carve out a specific market niche for themselves due to the high butterfat content of the milk.

Southern dairy farmers showed the largest difference in responses at the monetary level. Ninety-five percent of the independents, compared to 77 percent of the cooperative members, were strongly/moderately influenced by better milk prices. These figures resulted in a top ranking by independents and a seventh-place ranking by members. Regardless of the statistical difference, a majority of cooperative members placed emphasis on the economic benefits of joining a marketing cooperative, a result

similar to that of Folkman's in 1955. This finding also supports Wilkins and Stafford's results, which noted higher milk prices being important to independent producers. Low deductions also showed a statistical difference with a much smaller spread, 74 percent of independents and 64 percent of members. Independents stayed with a milk buyer because of high milk prices, and independents changed buyers because of low milk prices (Table 34). Thus, independents apparently stressed short-run economic returns (immediate prices received) over long-term gains (risk-reduction through an assured market and cooperative action).

INCOME & EXPENSES

As identified previously, independents emphasized monetary over non-monetary factors in their marketing decisions. Cooperative members also emphasized monetary issues, just not to the same extent. Group theory states that members of a group base their decisions on the benefits, or the perceived benefits, from each possible alternative. Thus, Southern dairy farmers were questioned about their perceptions of local milk prices. When asked to compare the price they received relative to those received by neighboring dairy farmers, more cooperative members (14 percent) thought their prices were lower, compared to only three percent of the independents (Table 38). As with a

Table 38: Comparison of Prices Received by Southern Cooperative Members and Independents, 1988

Relative Comparison*	Cooperative Members ---percent---	Independents ---percent---
Mine lower	14.08	3.47
Same	29.67	26.73
Some higher, some lower	16.16	16.09
Mine higher	13.26	33.66
Do not know	26.83	20.05

* Indicates means are different from each other at the .05 level of significance.

Note: Refer to Appendix D.37 for chi-square statistics.

Source: S-217 Survey of Southern Dairy Farmers, Question 32

payoff matrix in a prisoner's dilemma game, if these cooperative members receive a greater utility from higher prices, then they can be expected to leave the cooperative for an IOF. However, they may receive greater utility from other marketing attributes. In that case, a knowledge of higher IOF prices would have little or no effect on their marketing decisions. Thirty-four percent of the independents believed they received higher prices than their neighbors did. Only 13 percent of the members held the same belief. These figures signify that independent producers thought IOFs paid a higher price per hundredweight than cooperatives did. On average, this was, indeed, true.

Liebrand and Ling analyzed the S-217 data set and compared the prices received by members and independents. The study encompassed 11 states, as price data were not collected from Florida producers. Liebrand and Ling only utilized information from those cooperative members with an IOF operating in their area. They then calculated three different prices: gross price, adjusted for 3.5 percent butterfat content; mailbox price, the price received after all deductions; and mailbox price without subtracting capital retains. Table 39 shows the results of this comparison.

Liebrand and Ling's research showed that Southern IOFs paid 29 cents more per hundredweight than their cooperative competitors. This amount jumped to 37 cents when the mailbox price was calculated. Cooperatives required higher deductions for both hauling and capital retains, but the cost of IOF marketing services exceeded cooperative marketing services by three cents per hundredweight. Cooperatives should remember at this point that the main reason for changing buyers, for both members and independents,

Table 39: Difference Between IOF Prices/Deductions and Cooperative Prices/Deductions, Southern United States, 1988

Prices/Deductions	Difference in Value^a ---\$/cwt.---
Gross price	.29 ^b
Mailbox price plus capital retains^c	.28 ^b
Mailbox price	.37 ^b
Hauling deductions	-.02 ^d
Marketing service deductions	.03 ^b
Capital retains deductions	-.09 ^b

^a The alternative IOF handler with the highest mailbox price less cooperative price/deduction.

^b The difference is statistically significant with 99.9 percent confidence.

^c Mailbox price without capital retains deducted.

^d The difference is statistically significant with 95 percent confidence.

N = 493

Source: Liebrand and Ling, p.3.

was due to low milk prices. As evidenced by Liebrand and Ling's study, the discrepancy in the milk prices received was not a result of greater deductions being subtracted from cooperative members' milkchecks. Rather, the cooperative members received 29 cents less per hundredweight before deductions. The price disadvantage accumulated to a reduction in total sales revenue of more than \$6,000 in 1988.⁷ Once again, depending on what attributes provide greater utility to the farmers, this gross price discrepancy may lead more farmers to an IOF.

In addition to the basic price of the milk, buyers may also offer supplemental payments. For instance, the most common form of payment in the South was a butterfat differential, received by approximately 76 percent of all dairy farmers (Table 40). The more payments received equals increased benefits for the farmer. According to group theory, the farmer then bases decisions on these benefits, thereby affecting the way in which other dairy farmers behave. Therefore, the disbursement of supplemental payments could strengthen a dairy cooperative's position with producers. The results indicated that dairy cooperatives offered a variety of payments, which they should emphasize for membership purposes. Seasonal price incentives, received by 26 percent of members and ten percent of independents, facilitate the cooperative's role of supply and demand balancing. Quality milk premiums, received by 22 percent of members and

⁷ Pounds of milk sold in 1988, from Table 23, equaled 2,184,928. Converted to hundredweight, total average production for cooperative members was 21,849 cwt. Multiplied by 29 cents per hundredweight resulted in \$6,336.21, the estimated difference in annual gross pay received by members and independents.

Table 40: Supplemental Payments Received by Southern Dairy Farmers, Comparison of Cooperative Members and Independents, 1988

Supplemental Payments	Percentage of:	
	Cooperative Members	Independents
Butterfat differential	77.11	75.26
Class I price above Federal or State Order Class I price	45.04	42.47
Blend price premium above Federal or State Order blend price*	38.69	40.86
Seasonal price incentive*	26.25	10.11
Quality milk premium*	22.41	9.19
Volume price incentive*	21.57	4.23
Other supplementary payment	4.30	3.46
Protein-nonfat solids premium	2.11	0.28

* Indicates means are different from each other at the .05 level of significance.

Note: Refer to Appendix D.29-D.36 for chi-square statistics.

Source: S-217 Survey of Southern Dairy Farmers, Questions 31A - 31H

nine percent of independents, reward producers for a high quality product. Volume price incentives, received by 22 percent of members and only four percent of independents, pass along the savings accrued through economies of size. The only premium paid more often by IOFs was a blend price premium above the marketing order's blend price. Otherwise, dairy cooperatives furnished the largest percentage of supplemental payments.

COOPERATIVE MEMBERS' ATTITUDINAL CHARACTERISTICS

To gain insight regarding how members feel about their cooperatives, the survey asked dairy marketing cooperative members questions pertaining to member participation, cooperative services offered, cooperative performance, and future business policies. This information can be used, along with the previous research findings, in developing membership recommendations.

Members participated in cooperative affairs to a relatively high degree, suggesting that channels for keeping members informed were well-established. Eighty-one percent read cooperative magazines, and sixty percent attended meetings at various levels (Table 41). Other activities included voting in an election (59 percent) and maintaining contact with fieldmen (56 percent). Less participation appeared in leadership positions, as could be expected, because of the limited number of such positions. Very few members served

Table 41: Southern Dairy Cooperative Member Participation, 1988

Activity	---Percent---
Read cooperative magazines and publications	81.1
Attended district, division, or annual meetings	59.7
Voted in election of delegates or board members	59.0
Maintained close contact with cooperative fieldmen and management	55.6
Personally contacted cooperative management about problems and concerns	49.3
Served on cooperative committee	12.2
Served as director at some level	10.3
Served as a delegate to annual meeting	6.9

Source: S-217 Survey of Southern Dairy Farmers, Questions 26A - 26H

as a delegate (seven percent), a director (10 percent), or a committee member (12 percent).

The members were asked to give the services offered by their cooperative a rating of either excellent, average, or poor. Members could also choose "Not Offered", where applicable. Sixty-nine percent of the members gave their cooperative an excellent rating for their provision of an assured market (Table 42). Milk hauling also rated an excellent from 57 percent of the members. Ten percent felt their cooperative did a poor job of performing field services, such as assisting in production and quality problems. One-fourth of the members said their cooperative did not sell milking supplies and equipment, and, therefore, they could not provide a rating.

Question 23 listed seven statements, and the members were asked to indicate if they agreed or disagreed with the statement and to what extent. The largest percentage of members (83 percent) agreed that their cooperative kept them well-informed about various business operations and issues (Table 43). Most members also believed that management did a good job, overall. Seventy-six percent said they received better services from their cooperative than they could from other buyers, while 64 percent thought they received a better price from their cooperative. This contradicts the earlier finding where, in Table 38, only 13 percent of the cooperative members thought they received a higher price than their neighbors.

Forty-one percent perceived that the cooperative provided benefits to independents, showing support for the free rider concept. The members could also respond with "No

Table 42: Rating of Southern Dairy Cooperative's Services by their Members, 1988

Services	Members per Rating ---percent---			
	Excellent	Average	Poor	Not offered
Providing an assured market	68.8	28.6	1.9	0.6
Milk hauling (operating routes or arrangements)	57.2	37.4	3.4	1.9
Providing marketing information	47.2	42.8	8.2	1.9
Providing leadership in policymaking matters	46.0	41.6	8.0	4.5
Checking milk weights and tests	42.9	42.7	6.7	7.7
Performing field services (assisting in production and quality problems)	42.7	43.1	10.4	3.7
Selling milking supplies and equipment, etc.	35.0	32.4	7.8	24.8

Source: S-217 Survey of Southern Dairy Farmers, Questions 24A - 24G

Table 43: Performance of Southern Dairy Cooperatives, According to their Members, 1988

Statements	Members ---percent---		
	Agree ^a	Disagree ^b	No Opinion
My cooperative keeps me well-informed of changes in the cooperative's operations, financial conditions, and marketing problems	82.6	13.8	3.6
My cooperative's management is doing a good job	78.2	16.4	5.4
My cooperative treats all its members equitably (fairly)	77.1	15.9	6.9
My cooperative provides better services than I could get from other buyers	75.9	12.5	11.5
My cooperative does a good job in holding down operating and marketing costs	71.1	20.4	8.6
My cooperative provides me a better price for my milk than I could get from other buyers	64.0	26.1	9.9
My cooperative provides significant benefits to nonmembers	40.6	19.1	40.3

^a "Agree" responses and "Tend to Agree" responses combined.

^b "Disagree" responses and "Tend to Disagree" responses combined.

Source: S-217 Survey of Southern Dairy Farmers, Questions 23A - 23G

Opinion." The largest "No Opinion" response (40 percent) also referred to this nonmember benefits category, possibly indicating a lack of knowledge of the public goods supplied by their cooperative.

For the dairy cooperatives to remain competitive, the majority of members (58 percent) agreed that cooperatives should increase the profitability of, or the gains received from, milk sold, by processing or manufacturing more of their members' milk (Table 44). A few (17 percent) wanted the cooperatives to just market the milk. Yet, many farmers either disagreed with, or were undecided about, suggestions of how to increase profitability and do more than just meet the basic marketing needs of the members. For instance, 43 percent of cooperative members were undecided about increasing the amount of money required as a cooperative investment from the members, and 37 percent disagreed with the idea entirely. Likewise, 43 percent disagreed with merging hauling operations with other cooperatives, and 59 percent were against merging all operations with other cooperatives. Both moves could potentially lead to greater economies of size and could, subsequently, increase profitability.

Table 44: Necessary Changes to Maintain Dairy Cooperatives' Future Competitiveness, According to Dairy Cooperative Members, 1988

Statements	Members ---percent---		
	Agree	Disagree	Undecided
Increase profitability of milk sold through cooperatives by processing or manufacturing more of their members' milk	58.3	12.7	29.0
Merge hauling operations with other cooperatives	22.6	43.1	34.3
Engage in plant ownership with other cooperatives	20.0	42.6	37.3
Increase member investment requirements as needed for profitable marketing programs	19.9	37.3	42.8
Just market milk; do not haul or process milk	16.5	58.9	24.6
Merge all operations with other cooperatives	12.2	58.8	29.0
Engage in plant ownership with non-cooperative corporations	11.1	52.6	36.2

Source: S-217 Survey of Southern Dairy Farmers, Questions 25A - 25G

SUMMARY

The results of this research show a basic similarity of dairy farms and dairy farmers, regardless of marketing orientation. Both cooperative members and independents had 22 years of dairying experience, a production average of almost 14,600 pounds of milk, 370 acres of land, and comparable asset values. Based on this information, group theory asserts that the farmers could join together to benefit from cooperative action.

However, the differences between the groups indicate different goals. The amount of time dealing with the same buyer, the reasons for selecting a buyer, the reasons for changing buyers, and the farmer's satisfaction level with the buyer all produced different responses from cooperative members and independents. The farmer's age, the number of milking cows, and the percentage of total income derived from the dairy operation also delivered differing results. These distinct qualities, and therefore distinct goals, signify obstacles along the path toward cooperation. Individuals with different, individual goals are difficult to assemble into a group working toward a common goal. Thus, rather than forcing all dairy farmers into one group with the same goal, dairy marketing cooperatives should develop, within their membership, smaller sub-groups with different goals. This study can assist dairy cooperatives in identifying these target groups, in turn helping to reduce the incidence of free riders.

CHAPTER V

CONCLUSIONS & RECOMMENDATIONS

This study began with a definition of free riders and their impact on the dairy industry. Free riders can present a very real threat to cooperative operations through supply reduction and decreased cooperative morale. However, the ability to maintain and/or increase membership limits the effect of free riders. This study attempts to produce cooperative membership recommendations to assist in reducing the incidence of free riders.

Group theory suggests that group behavior depends on the behavior of individuals

within the group. These individuals base their decisions on the benefits derived from each possible decision. Yet, the benefits may be different for different individuals. To ascertain the benefits important to various, individual dairy farmers, a survey was developed and distributed throughout the twelve-state region. The survey responses were then compared, based on the farmers' marketing affiliations (cooperative member or independent producer). This research utilized chi-square tests and t-tests to determine any statistical differences between the two groups' responses. The analysis resulted in both similarities and differences between the groups, thereby defining distinct target groups. Dairy cooperatives can use this information to pursue specific farmers, depending on the cooperative's membership goals. To maintain membership levels, cooperatives need to know which members are less likely to remain with the cooperative and what marketing qualities these members deem important. To increase membership, cooperatives need to know what marketing qualities independents emphasize when selecting a buyer. This chapter first examines the conclusions reached through this analysis and then the recommendations which stem from the conclusions. The chapter ends with study limitations and future research suggestions.

CONCLUSIONS

The response comparison produced information about dairy farmer characteristics, reasons for making certain marketing decisions, satisfaction levels, prices received for raw milk, and general recruiting practices. For instance, dairy cooperatives and IOFs both targeted independents in their recruiting efforts. Buyer representatives who visited independents exceeded the number of representatives who visited cooperative members by a three-to-two margin. The description of who the buyers contacted follows.

According to the analysis, Southern dairy cooperative members were characterized as farmers who received 80-100 percent of their farm income from the dairy operation. They milked larger herds and, therefore, sold more milk.⁸ They also remained with their milk buyer for a greater length of time. Conversely, independent producers on average were part-time dairy farmers (with 1-79 percent of their farm income derived from the dairy operation). They milked smaller herds and, subsequently, sold less milk. They were also affiliated with their IOF buyers for a shorter period of time than the cooperative members.

The results showed that independent producers emphasized short-run economic benefits. Independents changed buyers due to low prices and high deductions; they stayed with buyers due to high prices and low deductions. Cooperative members

⁸ The production average per cow was equivalent for both cooperative members and independents.

changed buyers for similar reasons; they were more likely to switch due to excessive hauling charges. However, members differed from independents in their reasons for remaining with a milk buyer. Members said they stayed with their cooperative because of the assured market for their milk and the field services offered by the cooperative.⁹ Both groups stressed the importance of friendly personnel and low hauling charges in keeping the farmers' business.

Another related conclusion pertained to the dairy farmer's level of satisfaction with the buyer. A greater percentage of independent producers reported being very satisfied. On the other hand, more members revealed dissatisfaction with their cooperative buyer. In fact, members outnumbered independents in the very unsatisfied category by three-to-one.

The independents' high level of satisfaction related back to their top motive for marketing decisions -- short-run economic benefits. Liebrand and Ling discovered that IOFs paid \$.29 more per hundredweight than cooperatives did. IOFs also deducted less money for hauling expenses, although they did charge more for marketing services. However, the comparative analysis indicated substantially more supplemental payments paid by cooperatives. Seasonal incentives, quality premiums, and volume incentives were all potential additions to a cooperative member's paycheck.

⁹ The field services were not specifically defined.

RECOMMENDATIONS

The previous conclusions suggest recommendations which can be utilized by dairy marketing cooperatives. Cooperatives must first examine their overall recruiting efforts. Even if the cooperative wishes to attract independents, the cooperative should not neglect its current members. Treating recruiting and member relations as a trade-off will only result in alienating, and eventually losing, current members. One possible member relations strategy is for cooperatives to include local members in their member relations and recruiting programs. Involving local members in recruiting independent producers adds credibility to the cooperative's membership campaign; the information originates from another dairy farmer, rather than sounding like a sales pitch from an official cooperative representative. Local members can also assist in maintaining contact with less-involved members in their area. Both of these ideas keep travel costs down, even after compensating the local members for their mileage. They also provide another way to increase member participation in the activities of the cooperative, thus emphasizing to the participating locals how important each member is to the cooperative's survival. However, cooperatives should not use local members as replacements for cooperative staff. Dairy farmers should feel that they have access to staff members and management.

With limited time and resources, which dairy farmers should be contacted? The data indicate that cooperatives should begin by targeting farmers according to its membership goals. If the cooperative is concerned about losing current membership, it must target

those members who are less likely to remain with the cooperative. This study showed that dairy farmers changed milk buyers due to low milk prices and high assessments/deductions. If the cooperative wishes to attract independent producers, it must target part-time dairy farmers, with smaller milking herds, who have sold to their IOF buyer for a relatively short period of time. Targeting these two audiences compels the cooperative to combine its membership efforts with strong, economic reasons for selling to a cooperative buyer, or else the independents will continue to change buyers to achieve a better economic position. Cooperatives should also recognize the regional impact on the herd size - cooperative membership relationship. This research, performed in the Southern United States, supports Deiter, Dahlgran, and Passe's work from the upper Midwest. However, it contradicts Bravo-Ureta and Lee's efforts in the Northeast. Each dairy cooperative should examine the herd size of its target market based on geographic location.

After defining who should be targeted, the question is how can a cooperative attract their target group? To draw the attention of independents, cooperatives need to increase short-run returns, either through increasing price or through decreasing deductions, or both. Rather than a cooperative offering a specific set of services, it should offer a variety of services from which an individual farmer can select. For instance, if a dairy cooperative offers a total of five services, and the dairy farmer is only interested in three of those services, then the farmer will not want to pay for all five. Cooperatives can itemize their services and charge each farmer for only those services that the farmer

chooses to receive.

The conclusions also indicate a strong emphasis on economic issues by members. High milk prices are important to members, but they are just as concerned with low deductions. The members' emphasis on financial issues should encourage cooperatives to increase the bottom line received by producers. One way is to limit deductions for unwanted services. Once again, charging only for selected services allows members to develop their own, individualized marketing plans based on their needs, wants, and wallets.

The weight placed on economic issues by both members and independents says that cooperatives should underscore supplemental payments in recruiting and member education programs. More cooperative members received seasonal incentives, quality premiums, and volume incentives than independents did. This is a topic which will be of great interest to all dairy farmers.

Southern cooperative members highlight an assured market for their milk and field services offered as the two, main reasons for staying with a cooperative. Friendly and capable personnel was also emphasized by members, as well as independents. Cooperatives should require public relations training for its staff, specifically those employees who have the most contact with members. These non-economic benefits can be stressed by the cooperative in its member education programs. Some of the members may not be aware of all the opportunities and services available to them through their cooperative.

What services do dairy farmers want? Where must improvements be made in the provision of these services? The data indicate that milking supplies are not available through some cooperatives, yet selling supplies may be a needed service. Many members gave only average ratings to the provision of marketing information and leadership in policymaking matters. Perhaps these are several areas where improvement is needed. The best way to determine what the members want is through open communication.

The conclusions suggest a lower level of satisfaction from cooperative members compared to independents. To correct this problem, the cooperative needs to know why the members are not satisfied. Here again, opening the lines of communication is imperative. Cooperative management must encourage both positive and negative feedback from the members. All members need to know that their opinions are important and that their businesses are crucial to the cooperative. Through personal contacts, open-question sessions at meetings, and continued encouragement in regular publications, cooperatives can keep information flowing between those who manage the cooperative and those who own the cooperative.

One final issue is raised by the conclusions of the study. Independent producers earn more income per hundredweight than cooperative members. Yet, cooperative members appear to be willing to accept trade-offs, accepting less income for valued services. One way to illustrate what a cooperative can do for dairy farmers is to present the information where farmers are sure to look, on their milkcheck. In conjunction with charging only

for selected services, cooperatives could itemize the deductions for the services provided to each individual on each individual's milkcheck. This policy would show where the deductions are allocated and what specific services are provided by the cooperative. Members are not just suppliers of the cooperative but are owners of the cooperative, and this itemization exhibits accountability to the member/owners.

For dairy cooperatives faced with the free rider problem, the above recommendations provide ways of maintaining and/or increasing membership to help reduce the incidence of free riders. Providing selected services requested by farmers, itemizing costs, informing the membership of services offered, and emphasizing the importance of the individual farmer can have an impact on the farmers' perceptions of the benefits of cooperative membership. When these perceptions change in a positive direction, cooperative support grows, cooperative membership expands, and the tendency toward free riders diminishes.

LIMITATIONS & FUTURE RESEARCH IDEAS

When utilizing the information from this research, cooperative managers must keep in mind four limitations inherent in the study. First, the results of this analysis are based on an entire region, which encompasses a wide variety of climates, dairying practices,

and dairying capabilities. However, this research can serve as a foundation for future state-level case studies. Second, this study incorporated point-in-time analysis, rather than trend analysis. In other words, the economy has changed since the surveys were completed in December, 1988. Again, this study can serve as a foundation for either future point-in-time analyses or future trend analyses. Third, to assist cooperatives in their membership programs, further information regarding farmer satisfaction is necessary. Fourth, an individual's attitudes are not always equivalent to that individual's behaviors. What someone reports in a survey may not accurately reflect how that person will behave in an actual situation. However, this analysis is based on the assumption that people do behave in accordance with their attitudes. A future study might examine historical data and compare it with prior attitudes and beliefs to show the relationship between attitudes and behaviors.

REFERENCES

- Bennett, John W. "Agricultural Cooperatives in the Development Process: Perspectives from Social Science," Studies in Comparative International Development. Vol.18, 1983, pp.3-68.
- Bennett, Peter D. Marketing. McGraw-Hill Book Company, New York, McGraw-Hill series in marketing, 1988.
- Bravo-Ureta, Boris E. and Tsoung-Chao Lee. "Socioeconomic and Technical Characteristics of New England Dairy Cooperative Members and Nonmembers," Journal of Agricultural Cooperation. Vol.3, 1988, p.12-27.
- Brooks, Karen. Dairying and Dairy Policy in the 1980s. American Enterprise Institute for Public Policy Research, Washington,D.C., Nov. 1984.
- Capper-Volstead Committee. The Question of Undue Price Enhancement by Milk Cooperatives. USDA, Dec. 1976.
- 1987 Census of Agriculture. U.S. Department of Commerce, Bureau of the Census, Vol.1, Part 51, p.7.
- Cobia, David, ed. Cooperatives in Agriculture. Prentice-Hall,Inc., 1989.
- Cooperative Historical Statistics. USDA, ACS, Cooperative Information Report 1, Section 26, Oct. 1987.
- Deiter, Ronald E., Roger A. Dahlgran, and David M. Passe. "Member Awareness of Dairy Cooperative Services in the North Central Region," North Central Journal of Agricultural Economics. Vol.4, No.2, July 1982, pp.31-44.
- Farmer Cooperative Statistics, 1988. USDA, ACS, Service Report No. 26, Dec. 1989.
- Farmer Cooperative Statistics, 1989. USDA, Agricultural Cooperative Service, Service Report Number 29, December 1990.
- Farmer Cooperative Statistics, 1990. USDA, ACS, Service Report No. 31, Dec. 1991.
- Folkman, William S. Membership Relations in Farmers' Purchasing Cooperatives. University of Arkansas, Agricultural Experiment Station, Bulletin 556, 1955.

- Jacobson, Robert E. "The Structure of the Dairy Farm Sector in the United States." Leaflet Series, "Dairy Policy Issues and Options for the 1990 Farm Bill." The Ohio State University.
- Liebrand, Carolyn, Dale M. Carley, and K. Charles Ling. Southern Dairy Farmers' Evaluation of Milk Handlers. USDA, ACS, Research Report Number 97, September 1991.
- Liebrand, Carolyn Betts and K. Charles Ling. Value of Cooperative Benefits to Southern Dairy Farmers. USDA, ACS, Research Report No. 99, October 1991.
- Longo, Louis P. "Building and Sustaining Member Commitment: A Director Speaks," American Cooperation 1985. AIC Yearbook, p.48-51.
- Lopez, Rigoberto A. and Thomas H. Spreen. "Co-ordination Strategies and Non-members' Trade in Processing Co-operatives," Journal of Agricultural Economics. Vol.36, No.3, September 1985, pp.385-396.
- Manchester, Alden C. The Public Role in the Dairy Economy. Westview Special Studies in Agriculture Science and Policy, Westview Press, Boulder CO, 1983.
- Martin, George A. "Numbers drop, but co-ops still significant in dairy industry," Hoard's Dairyman. Vol.135, No.7, April 10, 1990, p.339.
- McDowell, Howard, Ann M. Fleming, and Richard F. Fallert. Federal Milk Marketing Orders: An Analysis of Alternative Policies. Commodity Economics Division, Economic Research Service, USDA. Agricultural Economic Report Number 598. September 1988.
- Mengel, John R. Assessing Milk Handler Benefits. USDA, ACS Service Report Number 20, Sept. 1988.
- Olson, Mancur. The Logic of Collective Action. Public Goods and the Theory of Groups. Schocken Books, New York NY, 1965.
- Ott, Lyman. An Introduction to Statistical Methods and Data Analysis. Second Edition. Duxbury Press, PWS Publishers, Boston MA, 1984.
- Staatz, John M. "A Game-Theoretic Analysis of Decisionmaking in Farmer Cooperatives," Cooperative Theory: New Approaches. Jeffrey S. Royer, editor. USDA, ACS Service Report Number 18, Washington DC, July 1987, pp.117-147.

Staatz, John M. Farmer Cooperative Theory: Recent Developments. USDA, ACS Research Report No. 84, June 1989.

Tucker, Ray Moss. "Let's talk dollars and sense," Dairymen News. Volume 22, Number 7, July 1990, pp.3&6.

Wilkins, Paul C. and Thomas H. Stafford. Dairy Farmers' Evaluation of Northeastern Dairy Cooperatives. USDA, ACS Research Report No.19, April 1982.

Appendix A: S-217 Survey of Southern Dairy Farmers

MILK MARKETING SURVEY: SOUTHERN DAIRY FARMERS

FARM LOCATION: County or Parish _____

**FIRST, WE WOULD LIKE TO OBTAIN INFORMATION
REGARDING THE SALE OF YOUR MILK**

1. Currently, do you sell your milk through a milk marketing cooperative?

1. YES 2. NO

IF YES, please list the name of the cooperative

IF NO, please list the name and location of the milk plant to whom you sell your milk.

2. How long have you been marketing (selling) your milk through the organization identified in question 1 above?

_____ Years.

3. Do you have a written contract with the cooperative or milk plant for the sale of your milk?

1. YES 2. NO

4. How satisfied are you with your current cooperative or milk plant (buyer)? (CIRCLE ONE)

- | | |
|-------------------|---------------------|
| 1. Very satisfied | 3. Unsatisfied |
| 2. Satisfied | 4. Very unsatisfied |

5. Why did you choose to sell your milk through your current cooperative or milk plant? (CIRCLE ALL THAT APPLY).

- | | |
|----------------------------------|---------------------------------|
| A 1. Pays the highest price | E. 5. Other farmers recommended |
| B 2. Services offered are better | F 6. Lowest deductions |
| C 3. Only choice I have | G 7. Assured market and payment |
| D 4. Friendly personnel | H 8. Other (list) _____ |

6. In the last 12 months, how many proprietary milk plant or milk marketing cooperative representatives have contacted you about buying your milk?

 A NUMBER of proprietary milk plant representatives.

 B NUMBER of milk marketing cooperative representatives.

7. During the last five (5) years, have you sold your milk to buyers other than your current buyer?

1. YES 2. NO IF NO, please go to QUESTION 10.

IF YES, please list the milk plant(s) or milk cooperative(s) that you have sold milk to other than your current buyer, then go to QUESTION 8.

8. Since you changed milk buyers, please CIRCLE below the most recent type of change, then go to QUESTION 9.

1. Changed from one cooperative to another cooperative.
2. Changed from a cooperative to a proprietary (noncooperative) plant (buyer).
3. Changed from a proprietary (noncooperative) plant (buyer) to a cooperative.
4. Changed from one proprietary (noncooperative) plant to another proprietary plant (buyer).

9. Did you change to another buyer because your previous buyer went out of business or closed a plant? (CIRCLE)

- A 1. YES 2. NO IF YES, go to QUESTION 11.

IF NO, to what extent did each of the following reasons influence your decision to change? Please CIRCLE ONE NUMBER for each reason.

<u>Reasons for changing milk buyer</u>	<u>DEGREE OF INFLUENCE</u>			
	<u>Strong</u>	<u>Moderate</u>	<u>Weak</u>	<u>None</u>
B Milk prices received were too low	1	2	3	4
C Special assessments and deductions charged were too high	1	2	3	4
D Hauling charges were excessive	1	2	3	4
E Poor on-farm services offered	1	2	3	4
F Incorrect butterfat testing	1	2	3	4
G Personal reasons	1	2	3	4
H Dropped by former buyer	1	2	3	4
I Actively recruited by fieldman	1	2	3	4
J Other (list) _____				

Now, go to QUESTION 11.

10. NEVER CHANGED BUYER: Since you have never changed milk buyers in the last five (5) years, to what extent has each of the following reasons influenced your decision to stay with the same buyer? Please CIRCLE ONE NUMBER for each reason:

Reasons for not changing buyer	DEGREE OF INFLUENCE			
	Strong	Moderate	Weak	None
A Better price	1	2	3	4
B No or low deductions and/or assessments	1	2	3	4
C Stable and secure operation	1	2	3	4
D Always have sold to this buyer	1	2	3	4
E Field services offered	1	2	3	4
F Favorable hauling charges	1	2	3	4
G Capable and friendly personnel	1	2	3	4
H Assured market	1	2	3	4
I My loyalty to this buyer	1	2	3	4
J Selling breed milk	1	2	3	4
K Other (list) _____				

**NOW, WE WOULD LIKE SOME INFORMATION
ABOUT YOU AND YOUR DAIRY FARM OPERATION**

11. What is the size of your dairy herd today?
- A NUMBER of cows and heifers that have freshened that you milked today.
- B NUMBER of dry cows today.
- C NUMBER of other female dairy calves and heifers.
12. What was the total pounds of milk sold from your farm in 1988?
- _____ POUNDS of milk sold.
13. What was the average yearly production per cow in your herd in 1988?
- _____ POUNDS of milk per cow per year (not daily average).
14. How was the answer to question 13 above determined? (CIRCLE ONLY ONE).
1. Rolling herd average from DHIA records.
 2. Herd average from another type record system.
 3. Estimated.
 4. Other (list) _____

15. How many acres of owned and rented land do you use in your dairy operation?

- A ACRES of cultivated cropland for the dairy herd.
 B ACRES of pasture for the dairy herd.
 C ACRES of land for hay.
 D ACRES of woodland.
 E ACRES for loafing area and buildings.
 F TOTAL ACRES for dairy operation.

16. What is the age of the principal operator of this dairy farm?

_____ YEARS.

17. How many years since age 18 has the principal operator been a dairy farmer?

_____ YEARS.

18. What is the ownership arrangement of this dairy operation? (CIRCLE ONLY ONE)

1. Individual owner 3. Partnership other than father-son
 2. Father-son partnership 4. Family corporation
 5. Other (list) _____

19. What percent of your total income from all farm sales in 1988 came from the sale of milk and dairy animals? (CIRCLE ONLY ONE).

1. 1 - 24% 3. 50 - 69% 5. 80 - 89%
 2. 25 - 49% 4. 70 - 79% 6. 90 - 100%

20. Do you own or rent your dairy milking, feeding and housing facilities? (CIRCLE ONLY ONE).

1. OWN 2. RENT 3. OTHER (Explain) _____

21. If you sold your entire farming operation including the dairy herd, what percent of the sales value would you be able to retain after all debts had been paid? (CIRCLE ONLY ONE)

1. None (0), debts exceed assets 4. 50 - 74%
 2. 1 - 24% 5. 75 - 99%
 3. 25 - 49% 6. 100% - currently debt free

22. How much longer do you expect to remain in the dairy business? (CIRCLE ONLY ONE).

1. 5 years or less 3. More than 10 years
 2. 6 - 10 years 4. Not sure

IF YOU ARE NOT A MEMBER OF A MILK MARKETING COOPERATIVE,
PLEASE GO TO QUESTION 27

IF YOU ARE A MEMBER OF A MILK MARKETING COOPERATIVE, WE WOULD
LIKE YOU TO ANSWER THE FOLLOWING QUESTIONS

23. Please give us your opinion about the performance of your cooperative.
(CIRCLE ONE OPINION FOR EACH STATEMENT).

	<u>Agree</u>	<u>Tend to agree</u>	<u>Tend to disagree</u>	<u>Disagree</u>	<u>No Opinion</u>
A My co-op provides me a better price for my milk than I could get from other buyers	1	2	3	4	5
B My co-op provides better services than I could get from other buyers	1	2	3	4	5
C My co-op keeps me well informed on changes in the co-op's operations, financial conditions, and marketing problems	1	2	3	4	5
D My co-op management is doing a good job	1	2	3	4	5
E My co-op treats all its members equitably (fairly)	1	2	3	4	5
F My co-op does a good job in holding down operating and marketing costs	1	2	3	4	5
G My co-op provides significant benefits to nonmembers	1	2	3	4	5

24. Please rate the services provided by your cooperative that best represents your opinion (CIRCLE ONE OPINION FOR EACH SERVICE LISTED).

	<u>Excellent</u>	<u>Average</u>	<u>Poor</u>	<u>Not offered</u>
A Milk hauling (operating routes or arrangements)	1	2	3	4
B Performing field services (assisting in production and quality problems)	1	2	3	4
C Checking milk weights and tests	1	2	3	4
D Providing an assured market	1	2	3	4
E Providing marketing information	1	2	3	4
F Selling milking supplies and equipment, etc.	1	2	3	4
G Providing leadership in policy making matters	1	2	3	4

25. What changes do you believe are needed in the future to ensure that cooperatives are competitive in selling members milk? (PLEASE CIRCLE WHETHER YOU AGREE OR NOT).

	<u>Agree</u>	<u>Undecided</u>	<u>Disagree</u>
A Increase profitability of milk sold through co-ops by processing or manufacturing more of their members' milk	1	2	3
B Increase member investment requirements as needed for profitable marketing programs	1	2	3
C Merge hauling operations with other cooperatives	1	2	3
D Merge all operations with other cooperatives	1	2	3
E Engage in plant ownership with other cooperatives	1	2	3
F Engage in plant ownership with non co-op corporations	1	2	3
G Just market milk, do not haul or process milk	1	2	3

26. As a member of a milk marketing cooperative, which of the following did you do during the last twelve months? (CHECK ALL THAT APPLY).

- A Attended district, division, or annual meetings
- B Voted in election of delegates or board members
- C Read co-op magazines and publications
- D Maintained close contact with cooperative fieldmen and management
- E Personally contacted cooperative management about problems and concerns
- F Served on co-op committee
- G Served as a delegate to annual meeting
- H Served as director at some level

NOW, WE WOULD LIKE TO OBTAIN INFORMATION FOR ONE MONTH
ON THE TOTAL DOLLARS THAT YOU RECEIVED FOR YOUR MILK
AND THE DOLLARS THAT WERE DEDUCTED FOR VARIOUS REASONS
ALL DATA WILL BE KEPT CONFIDENTIAL

27. Please get your DECEMBER 1988 milk receipt stub (FINAL PRODUCER STATEMENT OR TOTAL MONTH SETTLEMENT CHECK) that contains the information on milk sales, gross dollars and deductions.

IF YOU COULD ENCLOSE A COPY OF THE DECEMBER STUB, I will take from it the necessary information to complete this section. You now go to QUESTION 31.

IF YOU CANNOT SEND A COPY OF THE STUB TO ME, please use the information from it to complete the following:

- a. List the date of payment A.
- b. List total pounds of milk sold in December B
- c. List butterfat test for the milk sold C
- d. List the gross dollar amount before any deductions \$ D

28. Please list the TOTAL DOLLARS deducted for each item:

- a. Total dollars deducted for hauling milk \$ A
- b. Total dollars deducted for National Dairy Promotion \$ B
- c. Total dollars deducted for State Milk Commission \$ C
- d. Total dollars deducted for marketing services \$ D
- e. Deductions for milk cooperative capital retains \$ E
- f. Any other milk cooperative or milk plant deductions \$ F
- g. Federal government assessment \$ G
- h. Any other deductions, but not for supplies, assignments for loans, etc.
(LIST) H

29. Did you receive an "Advance Payment" for milk delivered during the month covered by the milk receipt above? (CIRCLE ONE)

A 1. YES 2. NO IF YES, what was the dollar amount? \$ B

30. Did you receive a patronage refund or cooperative capital retains in 1988?

A 1. YES 2. NO
IF YES, please list the amount of patronage refund \$ B
IF YES, please list the amount of cooperative capital retains \$ C

31. Have you received any of the following kinds of premiums, bonuses, supplementary payments, etc., in the last 12 months? CIRCLE YES OR NO OR NOT SURE FOR EACH ONE:
- A a. A butterfat differential.....YES, NO, NOT SURE
 - B b. Class I price above the Federal or State Order Class I Price.....YES, NO, NOT SURE
 - C c. A blend price premium or bonus over the Federal or State Order blend.....YES, NO, NOT SURE
 - D d. A quality milk premium (other than for butterfat)....YES, NO, NOT SURE
 - E e. Seasonal price incentive (other than base-excess price).....YES, NO, NOT SURE
 - F f. A milk volume price incentive.....YES, NO, NOT SURE
 - G g. A protein-nonfat solids premium.....YES, NO, NOT SURE
 - H h. Any other supplementary payment.....YES, NO, NOT SURE

Explain what kind _____

32. Over the last 12 months, how have the prices you received for your milk compared with the prices for milk received by other dairy farmers in your area? (CIRCLE ONE)
- 1. My prices were higher
 - 2. My prices were about the same
 - 3. My prices were lower
 - 4. My prices were higher than some and lower than others
 - 5. I don't know

33. Please list the names of all other cooperatives and milk plants that pick up milk in your area. (Do not include your buyer).

In this space please make additional comments that you have concerning milk marketing or milk policy issues.

PLEASE RETURN THE COMPLETED QUESTIONNAIRE IN THE ENCLOSED ADDRESSED POSTAGE-PAID ENVELOPE.

----- **THANK YOU** -----

Appendix B: F-test Values for Testing Equality of Variances for Continuous Variables

See Appendix C for corresponding t-test values.

	Calc. F	df	Prob. > F
Years with current buyer (Q2)	1.97	(2041,404)	0.0000
Number of IOF representatives (Q6A)	1.41	(168,550)	0.0040
Number of cooperative representatives (Q6B)	3.00	(159,529)	0.0000
Number of cows milked (Q11A)	9.43	(2029,411)	0.0000
Total pounds of milk sold, 1988 (Q12)	16.37	(1884,369)	0.0000
Annual production per cow (lbs.) (Q13)	1.01	(372,1886)	0.8425
Total acreage (Q15F)	2.20	(2029,409)	0.0000
Age of farmer (years) (Q16)	1.19	(2041,414)	0.0272
Years of experience (Q17)	1.01	(417,2043)	0.9012
Gross income (Q27D)	1.52	(359,1643)	0.0000
Total hauling charges (Q28A)	1.20	(1644,358)	0.0335
National Dairy Promotion deduction (Q28B)	1.22	(1570,344)	0.0223
Charges for marketing services (Q28D)	3.12	(487,230)	0.0000
Federal government assessment (Q28G)	2.45	(296,1571)	0.0000

Appendix C: T-test Values for Testing Equality of Means for Continuous Variables

	Calc. t	df	Prob. > t
Years with current buyer (Q2)	13.92	757.6	0.0001
Number of IOF representatives (Q6A)	-3.73	245.3	0.0002
Number of cooperative representatives (Q6B)	-3.94	192.0	0.0001
Number of cows milked (Q11A)	3.64	2002.9	0.0003
Total pounds of milk sold, 1988 (Q12)	3.18	2167.2	0.0015
Annual production per cow (lbs.) (Q13)	0.01	2258.0	0.9917
Total acreage (Q15F)	0.34	821.4	0.7340
Age of farmer (years) (Q16)	2.25	630.7	0.0246
Years of experience (Q17)	0.96	2460.0	0.3388
Gross income (Q27D)	-1.53	468.1	0.1259
Total hauling charges (Q28A)	-1.78	561.2	0.0763
National Dairy Promotion deduction (Q28B)	-1.20	544.3	0.2290
Charges for marketing services (Q28D)	1.47	695.0	0.1412
Federal government assessment (Q28G)	-1.63	343.1	0.1051

Appendix D: Chi-square Statistics for Categorical Questions

Key to reading appendix tables:

The cell frequency, row percentage, and column percentage are given in each cell, according to the corresponding cross-tabulation. Beneath each table, the appropriate degrees of freedom are shown in parentheses. The chi-square value ($X^2=742.561$) is shown, as well as the probability of the critical value being greater than the calculated value ($p=0.00$).

D.1: Written contract with milk buyer

Cooperative Membership (Q1)	Written Contracts (Q3)	
	Yes	No
Yes	1820 88.95 93.72	226 11.05 43.30
No	122 29.19 6.28	296 70.81 56.70

$X^2=742.561$, $p=0.00$, ($df=1$)

D.2: Satisfaction level with current buyer

Cooperative Membership (Q1)	Satisfaction (Q4)			
	Very Satisfied	Satisfied	Unsatisfied	Very Unsatisfied
Yes	618 29.70 75.64	1205 57.90 84.98	201 9.66 93.93	57 2.74 96.61
No	199 46.60 24.36	213 49.88 15.02	13 3.04 6.07	2 0.47 3.39

$X^2=61.053$, $p=0.00$, ($df=3$)

D.3: Sales to other buyers from 1983-1988

Cooperative Membership (Q1)	Sales to Different Buyers (Q7A)	
	Yes	No
Yes	268 13.17 59.96	1767 86.83 88.26
No	179 43.24 40.04	235 56.76 11.74

$X^2=208.433$, $p=0.00$, (df=1)

D.4: Previous buyer went out of business

Cooperative Membership (Q1)	Buyer Went Out of Business (Q9A)	
	Yes	No
Yes	91 31.93 81.98	194 68.07 54.96
No	20 11.17 18.02	159 88.83 45.04

$X^2=26.027$, $p=0.00$, (df=1)

D.5: Changed buyers because prices received were too low

Cooperative Membership (Q1)	Low Milk Prices (Q9B)			
	Strong	Moderate	Weak	None
Yes	103	26	9	19
	65.61	16.56	5.73	12.10
	48.82	60.47	60.00	76.00
No	108	17	6	6
	78.83	12.41	4.38	4.38
	51.18	39.53	40.00	24.00

$X^2=8.039$, $p=0.045$, (df=3)

D.6: Changed buyers because assessments and deductions were too high

Cooperative Membership (Q1)	High Assessments and/or Deductions (Q9C)			
	Strong	Moderate	Weak	None
Yes	54	28	16	32
	41.54	21.54	12.31	24.62
	46.96	50.00	59.26	62.75
No	61	28	11	19
	51.26	23.53	9.24	15.97
	53.04	50.00	40.74	37.25

$X^2=4.188$, $p=0.242$, (df=3)

D.7: Changed buyers because hauling charges were excessive

Cooperative Membership (Q1)	Excessive Hauling Charges (Q9D)			
	Strong	Moderate	Weak	None
Yes	48 36.92 73.85	24 18.46 47.06	16 12.31 50.00	42 32.31 46.67
No	17 15.74 26.15	24 25.00 52.94	16 14.81 50.00	48 44.44 53.33

$X^2=13.442$, $p=0.004$, ($df=3$)

D.8: Changed buyers because of the poor on-farm services offered

Cooperative Membership (Q1)	Poor On-Farm Services (Q9E)			
	Strong	Moderate	Weak	None
Yes	30 24.59 63.83	21 17.21 61.76	16 13.11 57.14	55 45.08 48.25
No	17 16.83 36.17	13 12.87 38.24	12 11.88 42.86	59 58.42 51.75

$X^2=4.25$, $p=0.236$, ($df=3$)

D.9: Changed buyers due to incorrect butterfat testing

Cooperative Membership (Q1)	Incorrect Butterfat Testing (Q9F)			
	Strong	Moderate	Weak	None
Yes	18 15.65 56.25	15 13.04 42.86	12 10.43 44.44	70 60.87 57.85
No	14 14.00 43.75	20 20.00 57.14	15 15.00 55.56	51 51.00 42.15

$X^2=3.502$, $p=0.321$, (df=3)

D.10: Changed buyers due to personal reasons

Cooperative Membership (Q1)	Personal Reasons (Q9G)			
	Strong	Moderate	Weak	None
Yes	35 30.17 52.24	12 10.34 46.15	5 4.31 38.46	64 55.17 56.14
No	32 30.77 47.76	14 13.46 53.85	8 7.69 61.54	50 48.08 43.86

$X^2=2.051$, $p=0.562$, (df=3)

D.11: Changed buyers because they were dropped by their former buyer

Cooperative Membership (Q1)	Dropped by Former Buyer (Q9H)			
	Strong	Moderate	Weak	None
Yes	8 7.77 72.73	1 0.97 50.00	1 0.97 50.00	93 90.29 50.54
No	3 3.13 27.27	1 1.04 50.00	1 1.04 50.00	91 94.79 49.46

$X^2=2.051$, $p=0.562$, (df=3)

D.12: Changed buyers due to active recruitment

Cooperative Membership (Q1)	Actively Recruited by Fieldman (Q9I)			
	Strong	Moderate	Weak	None
Yes	12 11.76 35.29	15 14.71 44.12	10 9.80 58.82	65 63.73 53.28
No	22 20.95 64.71	19 18.10 55.88	7 6.67 41.18	57 54.29 46.72

$X^2=4.423$, $p=0.219$, (df=3)

D.13: Did not change buyers due to better prices

Cooperative Membership (Q1)	Better Price (Q10A)			
	Strong	Moderate	Weak	None
Yes	486	605	152	173
	34.32	42.73	10.73	12.22
	80.20	88.45	98.70	95.05
No	120	79	2	9
	57.14	37.62	0.95	4.29
	19.80	11.55	1.30	4.95

$X^2=55.444$, $p=0.00$, (df=3)

D.14: Did not change buyers because of low deductions and/or assessments

Cooperative Membership (Q1)	No or Low Deductions and/or Assessments (Q10B)			
	Strong	Moderate	Weak	None
Yes	231	612	238	244
	17.43	46.19	17.96	84.42
	75.99	90.27	90.49	91.39
No	73	66	25	23
	39.04	35.29	13.37	12.30
	24.01	9.73	9.51	8.61

$X^2=47.835$, $p=0.00$, (df=3)

D.15: Did not change buyers due to stable and secure operation

Cooperative Membership (Q1)	Stable and Secure Operation (Q10C)			
	Strong	Moderate	Weak	None
Yes	1102 72.88 88.30	337 22.29 87.99	33 2.18 84.62	40 2.65 86.96
No	146 71.57 11.70	46 22.55 12.01	6 2.94 15.38	6 2.94 13.04

$X^2=0.562$, $p=0.905$, (df=3)

D.16: Did not change buyers due to tradition

Cooperative Membership (Q1)	Have Always Sold to That Buyer (Q10D)			
	Strong	Moderate	Weak	None
Yes	876 60.96 90.22	281 19.55 87.81	107 7.45 89.92	173 12.04 84.80
No	95 53.67 9.78	39 22.03 12.19	12 6.78 10.08	31 17.51 15.20

$X^2=5.712$, $p=0.126$, (df=3)

D.17: Did not change buyers because of field services offered

Cooperative Membership (Q1)	Field Services Offered (Q10E)			
	Strong	Moderate	Weak	None
Yes	639	456	178	144
	45.10	32.18	12.56	10.16
	90.38	89.59	86.83	79.12
No	68	53	27	38
	36.56	28.49	14.52	20.43
	9.62	10.41	13.17	20.88

$X^2=19.178$, $p=0.00$, (df=3)

D.18: Did not change buyers due to favorable hauling charges

Cooperative Membership (Q1)	Favorable Hauling Charges (Q10F)			
	Strong	Moderate	Weak	None
Yes	565	573	168	129
	39.37	39.93	11.71	8.99
	87.60	89.39	85.28	87.76
No	80	68	29	18
	41.03	34.87	14.87	9.23
	12.40	10.61	14.72	12.24

$X^2=2.669$, $p=0.446$, (df=3)

D.19: Did not change buyers due to capable and friendly personnel

Cooperative Membership (Q1)	Capable and Friendly Personnel (Q10G)			
	Strong	Moderate	Weak	None
Yes	773	476	104	82
	53.87	33.17	7.25	5.71
	87.34	87.66	90.43	91.11
No	112	67	11	8
	56.57	33.84	5.56	4.04
	12.66	12.34	9.57	8.89

$X^2=1.849$, $p=0.604$, (df=3)

D.20: Did not change buyers due to an assured market

Cooperative Membership (Q1)	Assured Market (Q10H)			
	Strong	Moderate	Weak	None
Yes	1131	299	26	38
	75.70	20.01	1.74	2.54
	90.34	83.29	70.27	84.44
No	121	60	11	7
	60.80	30.15	5.53	3.52
	9.66	16.71	29.73	15.56

$X^2=25.934$, $p=0.00$, (df=3)

D.21: Did not change buyers out of loyalty

Cooperative Membership (Q1)	Loyalty (Q10I)			
	Strong	Moderate	Weak	None
Yes	572	448	151	193
	41.94	32.84	11.07	14.15
	89.24	87.67	86.78	87.73
No	69	63	23	27
	37.91	34.62	12.64	14.84
	10.76	12.33	13.22	12.27

$X^2=1.183$, $p=0.757$, ($df=3$)

D.22: Did not change buyers because of breed milk sales

Cooperative Membership (Q1)	Selling Breed Milk (Q10J)			
	Strong	Moderate	Weak	None
Yes	123	179	104	707
	11.05	16.08	9.34	63.52
	77.85	88.18	88.89	90.29
No	35	24	13	76
	23.65	16.22	8.78	51.35
	22.15	11.82	11.11	9.71

$X^2=19.707$, $p=0.00$, ($df=3$)

D.23: How production per cow is determined

Cooperative Membership (Q1)	How Production per Cow is Obtained (Q14)			
	DHIA	Another System	Estimate	Other
Yes	846	195	677	167
	44.88	10.34	35.92	8.86
	82.54	85.53	83.27	88.83
No	179	33	136	21
	48.51	8.94	36.86	5.69
	17.46	14.47	16.73	11.17

$X^2=5.283$, $p=0.152$, ($df=3$)

D.24: Ownership arrangement of dairy farms

Cooperative Membership (Q1)	Type of Operation (Q18)				
	Individual	Father/Son	Other Partner	Family Corp.	Other
Yes	248	328	221	232	52
	59.97	15.76	10.62	11.15	2.50
	83.70	82.00	80.36	84.06	82.54
No	243	72	54	44	11
	57.31	16.98	12.74	10.38	2.59
	16.30	18.00	19.64	15.94	17.46

$X^2=2.386$, $p=0.665$, ($df=4$)

D.25: Percentage of farm income received from dairy sales

Cooperative Membership (Q1)	Percentage of Income from Dairy (Q19)					
	1-24%	25-49%	50-69%	70-79%	80-89%	90-100%
Yes	40	52	116	172	325	1355
	1.94	2.52	5.63	8.35	15.78	65.78
	81.63	74.29	78.38	77.13	84.86	84.27
No	9	18	32	51	58	253
	2.14	4.28	7.60	12.11	13.78	60.10
	18.37	25.71	21.62	22.87	15.14	15.73

$X^2=14.3$, $p=0.014$, (df=5)

D.26: Ownership of dairy farms

Cooperative Membership (Q1)	Own or Rent Dairy Facilities (Q20)		
	Own	Rent	Other
Yes	1771	258	46
	85.35	12.43	2.22
	82.53	86.29	82.14
No	375	41	10
	88.03	9.62	2.35
	17.47	13.71	17.86

$X^2=2.656$, $p=0.265$, (df=2)

D.27: Value of dairy farm assets after repayment of debts

Cooperative Membership (Q1)	Income After All Debts are Paid (Q21)					
	None	1-24%	25-49%	50-74%	75-99%	100%
Yes	121	238	315	468	464	404
	6.02	11.84	15.65	23.28	23.08	20.10
	84.03	84.10	82.89	83.57	82.42	83.30
No	23	45	65	92	99	81
	5.68	11.11	16.05	22.72	24.44	20.00
	15.97	15.90	17.11	16.43	17.58	16.70

$X^2=0.565$, $p=0.99$, ($df=5$)

D.28: Years farmers expected to remain in dairying

Cooperative Membership (Q1)	Years Expected to Remain in Dairying (Q22)			
	5 years or less	6-10 years	More than 10	Not sure
Yes	263	225	776	807
	12.70	10.86	37.47	38.97
	83.23	80.65	83.35	83.28
No	53	54	155	162
	12.50	12.74	36.56	38.21
	16.77	19.35	16.65	16.72

$X^2=1.244$, $p=0.742$, ($df=3$)

D.29: Supplemental payment -- butterfat differential

Cooperative Membership (Q1)	Butterfat Differential (Q31A)		
	Yes	No	Not Sure
Yes	1486 77.11 83.58	337 17.49 82.80	104 5.40 80.00
No	292 75.26 16.42	70 18.04 17.20	26 6.70 20.00

$X^2=1.179$, $p=0.555$, (df=2)

D.30: Supplemental payment -- Class I price premium

Cooperative Membership (Q1)	Class I Price Above Federal or State Order Class I Price (Q31B)		
	Yes	No	Not Sure
Yes	836 45.04 84.36	405 21.82 80.20	615 33.14 84.83
No	155 42.47 15.64	100 27.40 19.80	110 30.14 15.17

$X^2=5.465$, $p=0.065$, (df=2)

D.31: Supplemental payment -- blend price premium

Cooperative Membership (Q1)	Blend Price Premium Above Federal or State Order Blend Price (Q31C)		
	Yes	No	Not Sure
Yes	710 38.69 82.37	477 25.99 80.98	648 35.31 85.71
No	152 40.86 17.63	112 30.11 19.02	108 29.03 14.29

$X^2=5.895$, $p=0.052$, ($df=2$)

D.32: Supplemental payment -- quality premium

Cooperative Membership (Q1)	Quality Milk Premiums (Q31D)		
	Yes	No	Not Sure
Yes	422 22.41 92.75	1308 69.46 81.60	152 8.07 83.06
No	33 9.19 7.25	295 82.17 18.40	31 8.64 16.94

$X^2=33.08$, $p=0.00$, ($df=2$)

D.33: Supplemental payment -- seasonal incentive

Cooperative Membership (Q1)	Seasonal Price Incentives (Q31E)		
	Yes	No	Not Sure
Yes	490 26.25 93.16	1119 59.94 80.33	258 13.82 84.87
No	36 10.11 6.84	274 76.97 19.67	46 12.92 15.13

$X^2=46.903$, $p=0.00$, (df=2)

D.34: Supplemental payment -- volume incentive

Cooperative Membership (Q1)	Volume Price Incentives (Q31F)		
	Yes	No	Not Sure
Yes	401 21.57 96.39	1265 68.05 80.37	193 10.38 86.16
No	15 4.23 3.61	309 87.04 19.63	31 8.73 13.84

$X^2=63.659$, $p=0.00$, (df=2)

D.35: Supplemental payment -- protein-nonfat solids premium

Cooperative Membership (Q1)	Protein-Nonfat Solids Premium (Q31G)		
	Yes	No	Not Sure
Yes	39 2.11 97.50	1637 88.63 83.73	171 9.26 84.24
No	1 0.28 2.50	318 90.60 16.27	32 9.12 15.76

$X^2=5.543$, $p=0.063$, (df=2)

D.36: Supplemental payment -- other

Cooperative Membership (Q1)	Other Supplementary Payment (Q31H)		
	Yes	No	Not Sure
Yes	77 4.30 86.52	1498 83.59 83.36	216 12.05 85.71
No	12 3.46 13.48	299 86.17 16.64	36 10.37 14.29

$X^2=1.61$, $p=0.657$, (df=2)

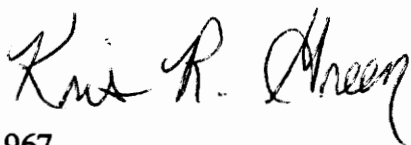
D.37: Comparison of dairy prices

Cooperative Membership (Q1)	Comparison of Prices (Q32)				
	Mine Higher	Same	Mine Lower	Some Higher, Some Lower	Do Not Know
Yes	261 13.26 65.74	584 29.67 84.39	277 14.08 95.19	318 16.16 83.03	528 26.83 86.70
No	136 33.66 34.26	108 26.73 15.61	14 3.47 4.81	65 16.09 16.97	81 20.05 13.30

$X^2=121.107$, $p=0.00$, (df=4)

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