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A CRITICAL ANALYSIS OF THE COOPORATIVES
WORKING TOGETHER PROGRAM

by

Spencer N. Parkinson

A thesis submitted in partial fulfillment
of the requirements for the degree

of

MASTER OF BUSINESS ADMINISTRATION

in

International Food and Agribusiness

Awarded by the Royal Agricultural College
in cooperation with Utah State University

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I declare that the dissertation embodies the results of my own research or advanced studies and that it has been composed by me. Where appropriate, I have made acknowledgement to the work of others.

Signed,

A handwritten signature in black ink, appearing to read "Spencer N. Parkinson". The signature is fluid and cursive, with a large initial 'S'.

Spencer N. Parkinson
May 1, 2006

ABSTRACT

A Critical Analysis of the Cooperatives

Working Together Program

by

Spencer N. Parkinson, Master of Business Administration

Utah State University, 2006

Major Professor: Dr. E. Bruce Godfrey
Department: Economics

This study analyzes the effectiveness of the Cooperatives Working Together (CWT) program. This program is believed to have improved the farm-level price of milk since it began in July 2003. To date, no publicly available analysis addressing this question has been conducted. Total milk removed by the program was determined and expressed as a percentage of total milk produced nationally during the same time frame. Elasticity measures from prior studies were adapted to determine the impact of the program. This analysis suggests the program has had a significantly positive effect on the price of milk. Issues dealing with future action were identified and discussed.

In addition to analyzing the effectiveness of the CWT program, a survey was conducted among Utah dairy producers who had recently exited. It was determined that the majority of these producers were older and did not exit through the CWT program. The primary reasons for their exit were their older age, low milk prices, and lack of family interest in continuing to operate the dairy.

(68 pages)

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Spencer N. Parkinson

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CHAPTER 1

INTRODUCTION

During 2002 and 2003, dairy operators in the United States received prices for their milk that were well below the long-term average. Prompted by these record lows, a program known as Cooperatives Working Together (CWT) was developed in the summer of 2003. This program, developed by the National Milk Producers Federation (NMPF), has the primary goal of strengthening and stabilizing farm-level milk prices. Programs such as CWT have the potential for far-reaching effects that begin and end at opposite ends of the food chain. When a program has the potential to affect a large number of stakeholders, it deserves an effort to judge its effectiveness. Doing so enables those involved to keep the program the way it is, make improvements, or discard it.

A common perception among industry publications, dairy operators, other interested parties, and especially the people at CWT, is that this program has had a positive effect on the price of milk (Edmiston, 2005). Even though most people would like to believe their assessment has provided a modest return, there has not been an independent study performed to determine the validity of this claim. Determining the validity of this claim is the primary issue addressed in this study. Specifically, the hypothesis that CWT has not increased the farm-gate price of milk will be tested. Although this analysis is not meant to be exhaustive, several key issues surrounding this relatively new program will be identified and the implications that result from CWT will be explored.

CHAPTER 2

REVIEW OF LITERATURE

The intent of this chapter is to address issues closely related to the CWT programs and provide additional information about CWT. Related issues include past programs similar in nature and composition to CWT. Examples used for contrast and comparison are the Dairy Termination Program and the Federal Milk Marketing Order program. An understanding of these programs will provide additional insight needed to evaluate the CWT program. In addition to discussing similar programs, other studies and academic works with findings relevant to this analysis will be identified. The importance of these other studies will become apparent as they are discussed. Because there are no formally published studies regarding the CWT program since it began, only the author's observations and knowledge related to the program will be included.

Cooperatives Working Together Programs

The CWT program is unique when compared to traditional commodity programs with similar characteristics because NMPF officials: (1) claim to have no government involvement and (2) they rely solely on voluntary assessments paid by participating dairy operators. A statement promoting CWT describes the program as:

...a program designed by dairy farmers for the benefit of dairy farmers. It is a multi-dimensional, voluntary, producer-funded national program developed by the National Milk Producers Federation (NMPF), and is intended to strengthen and stabilize milk prices by better aligning milk supply with demand. There is no government involvement in CWT at any level and all dairy farmers share equally in the financial rewards of the program. (CWT, 2005c).

To participate in the CWT program, an interested dairy operator needs to be a member of CWT “...either through their membership in a participating cooperative or as an independent member of CWT” (CWT, 2006b). When a producer becomes a member of CWT, they contribute the current assessment, which is currently set at \$0.05 for every hundred pounds of milk sold. As noted above, CWT claims to be a private program with no government involvement. Therefore, the program is not encumbered by time-consuming political and legislative stumbling blocks. In addition, because CWT is privately owned, it is not subject to World Trade Organization (WTO) regulations. These factors should allow the program to be more flexible and better able to adapt to the changing circumstances surrounding the dairy industry.

Since CWT’s inception, three programs have been utilized to accomplish its mission of strengthening and stabilizing the price of milk. Like many agricultural programs aimed at improving farm-level prices, these particular programs focus on either reducing supply or stimulating demand. CWT’s programs include the herd retirement, export assistance, and reduced production marketing (RPM) programs. Each of these programs has been utilized in varying degrees since its beginning. However, since the contract between CWT and participating producers was renewed in the summer of 2004, little interest has been shown in the RPM program and, therefore, has not been utilized since its first use.¹ According to a CWT (2006b) news release (June 15, 2005), the CWT committee agreed that “both the herd retirement program and the export assistance

¹ The RPM program, used only once near the beginning of the CWT program, attempted to reduce national milk supplies by accepting bids from producers who agreed to temporarily reduce their output by an agreed upon amount.

program should be maintained, with CWT's funds primarily devoted to the retirement program.”

Theoretically, when national herd numbers, milk, non-fat dry milk, cheese, or butter supplies reach an undesirable level, CWT will devote resources to retire herds or provide export assistance. According to an article in *Hoard's West Dairyman* (2005), CWT has removed approximately 2.7 billion pounds of milk through three herd retirement programs. This was accomplished by removing about 149,000 cows from the nation's dairy herd. In addition to the milk removed through herd retirement, additional milk has been removed through the two other CWT programs (see table 1).

The export assistance program has been used since January 2004. Under this program, fully participating cooperatives can receive assistance removing excess cheese and butter from the United States market in an effort to improve prices of such products. According to CWT, “the export assistance activity generated by CWT is independent of and a complement to the United States government's operation of the Dairy Export Incentive Program (DEIP)” (CWT, 2006a). CWT uses this program when United States

Table 1. Millions Pounds of Milk Removed by CWT Program, July 2003-December 2005

Export Assistance (milk equivalent)	106
Reduced Production Marketing	88
Herd Retirement	
Round 1 (2003)	609
Round 2 (2004)	908
Round 3 (2005)	1,200
Total Herd Retirement	2,717
Total Milk Removed	2,911

Sources: *Hoard's West Dairyman* (2005) and personal communication - Walt Wosje.

prices for cheddar cheese and butter fall below certain levels. Current price floors, based on the Chicago Mercantile Exchange (CME), for cheddar cheese and butter are \$1.30 per pound for both products. The purpose of this program is to make United States dairy products more competitive in the world market.

To encourage use of the export assistance program, CWT officials have significantly relaxed most of the original restrictions that were thought to be inhibiting the success of the export program (i.e., export destinations, types of cheese, and package sizes eligible for export). A potential short-term benefit enjoyed by producers belonging to a cooperative that receives export assistance from CWT is that they receive the initial added revenue to share amongst themselves. They would continue to enjoy this benefit until the market accounted for the recently exported products. Once this realization has taken place, all producers would presumably enjoy the benefit of higher prices for the exported products.

Of the three CWT programs, the herd retirement program receives the most publicity and is credited with removing the most milk from the market during the life of CWT. Since the beginning of the CWT program, there has been a herd retirement round each year. The third and most recent round was announced on August 10, 2005 and was completed by November 30, 2005. This round attempted to retire 70,000 cows, resulting in the removal of an estimated 1.9 billion pounds of milk from the nation's supply. It was reported that 1.2 billion pounds of milk from 65,644 cows was actually removed by the most recent round (*Hoard's West Dairyman*, 2005).

Whenever CWT officials determine the national dairy herd numbers have increased to a point that they believe threatens an oversupply of milk, they announce that

a round of retirement will take place and bids will be accepted for a specified period of time. Once a retirement round has been announced, producers who have not previously participated can place a bid based on a year's worth of production. At the conclusion of open bidding, bids are examined and either accepted or rejected based on CWT objectives. Primary objectives include preventing too much milk in a particular region from being removed and minimizing the cost of the program (CWT, 2005b). Once accepted, auditors are sent to the successful applicant's dairy to verify information regarding the bid proposal and milk production records. At the close of a successful audit, an identifying mark is placed on animals owned by the producer signifying they are only suitable for slaughter. After slaughter has taken place, CWT honors their commitment. Producers can do as they please with the bid proceeds.

There are several issues surrounding the CWT program that have implications for the nation's dairy producers. The first of these, which relates to the voluntary nature of the CWT program, is the "free rider" effect. When a program is initiated that affects an entire group, regardless of whether or not they participate, the potential arises for an uneven distribution of benefits. In essence, non-participants are subsidized by those who are contributing. According to a *Hoard's Dairyman* article (2005c), approximately 74% of the nation's producers are currently contributing on a voluntary basis. Although all producers may share equally in the benefits of the program, the burden of supporting the program is not equally distributed. If the CWT program has had a positive effect on the milk price, the net return to participants is diminished by the fact that not all producers are contributing. Therefore, in order to allow contributing producers to at least break even on their assessment, the price would need to be raised above what would be

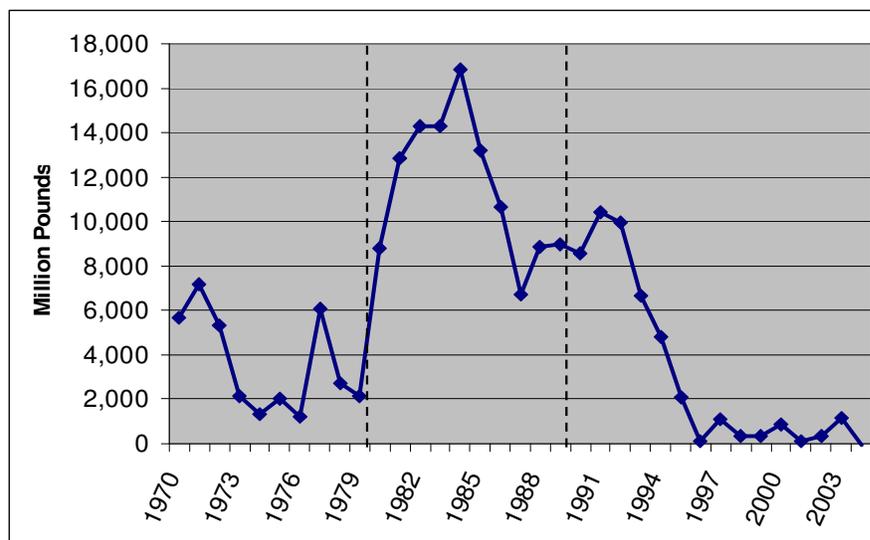
necessary under a fully participating program. If participation were mandatory, like most government programs, then the likelihood of everyone sharing equally in the burden would be higher.

Another issue with interesting implications deals with the effectiveness of the CWT program in removing those producers who desired to exit the industry when herd retirement rounds were conducted. Perhaps a method of judging the program's success, in social terms, would be to determine whether the herd retirement rounds have enabled producers wishing to exit the industry to do so. People desiring to exit the industry could potentially want to exit for a number of reasons that are not financial in nature. An example would be an operator approaching retirement with no family members interested in perpetuating the family business. If this particular operator were to submit a bid that was later rejected, he may resort to a less desirable exit strategy. To gain additional insight about the various reasons and circumstances for which dairy operators decide to leave the industry, the author conducted a survey amongst Utah producers who have recently exited.

The author is not proposing that CWT's primary focus should be to enable producers wishing to exit to do so, but is simply identifying the potential for secondary, perhaps significant, effects from bid-accepting decisions. Because the bidding process is competitive in nature, it is assumed that the CWT program will remove a certain level of milk for the lowest price. In fact, it is arguably in the best interest of CWT participants to approach it this way because funds saved as a result can be used in future price-enhancing efforts.

Dairy Termination Program

The 1980s were a tumultuous time for the dairy industry. The Commodity Credit Corporation (CCC) was purchasing large amounts of excess manufactured dairy products because dairy operators were significantly expanding production to take advantage of the incentive offered by high milk price supports (see figure 1). According to Bailey (1997), the reason the support price was set so high was because of its relationship with the parity index. The purpose of the parity index was to ensure dairy owners a comparable level of purchasing power with a particular period when the price-cost relationship was in their favor. Realizing the cause of the large amounts of CCC purchases, Congress disengaged the support level from the parity index and froze the support price at \$13.10 per hundredweight on October 1, 1980. After the tie between the parity index and support price was severed, the support price was related to the size of CCC purchases.



Source: USDA/ERS, 2006a.

Figure 1. Dairy products removed annually by the Commodity Credit Corporation: 1970-2004

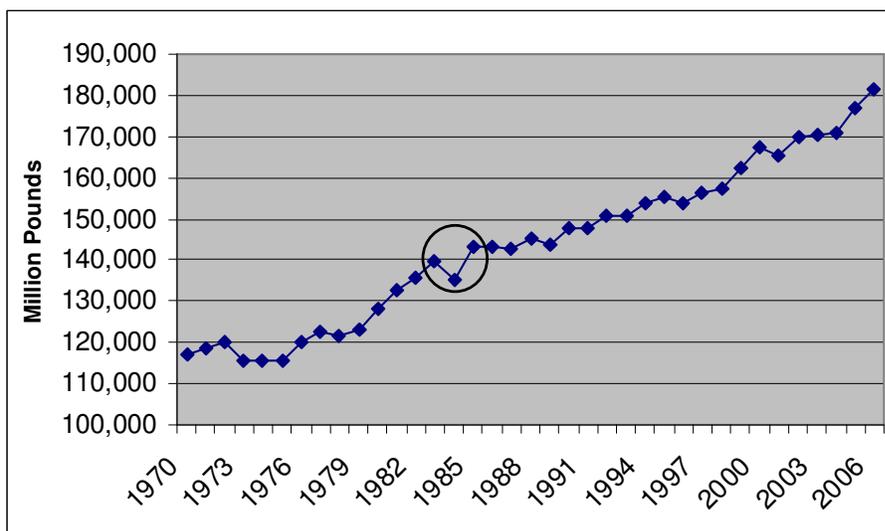
For periods in which the purchase of excess products exceeded certain thresholds, the support price could be lowered. Conversely, if purchases fell to a specific level, the support price could increase (Bailey, 1997).

Through the course of about five years and several legislative acts, the support price was eventually reduced to \$11.60/cwt on July 1, 1985. However, this was not enough to slow the increasing supply of milk. A temporary program, known as the Milk Diversion Program (MDP), was utilized between January 1984 and March 1985 in an effort to entice dairy owners to reduce their marketing of milk. However, because the program was temporary, so were the results (Bailey, 1997). After this effort to slow the supply of milk, another temporary program, known as the Dairy Termination Program (DTP), was utilized. The DTP is very similar in its goals and objectives to the herd retirement program employed by CWT.

The Food Security Act of 1985 authorized the USDA to purchase 10% of the nation's dairy herd as part of the DTP. The main goal of the DTP was to raise the farm-level milk price by reducing national supply. To accomplish this goal, the DTP used financial incentives to encourage dairy operators to cease production. Part of the funds paid to successful participants was from producer assessments while the remaining amount came from tax revenue. Producers voluntarily submitted bids to terminate milk production for a period of five years. If a bid was successful, the producers agreed to slaughter or export all female dairy cattle over the age of eighteen months. This liquidation took place between April 1, 1986 and August 31, 1987. Another stipulation of the program required a successful bidder to idle the facility for a period of five years. Once announced, producers nationwide submitted bids to the program. In total, \$1.8

billion was paid to successful bidders, resulting in an 11.3 billion pound reduction in the milk supply (Dixon and Susanto, 1991). Figure 2 shows historical and projected national milk production. Note in particular the large drop in production between 1985 and 1987. This is the period of time when the DTP was operated.

As a result of the DTP, some positive and negative effects were experienced by both the dairy and beef industries. As expected, there were short-term benefits enjoyed by the dairy industry from implementing this program. These benefits included reduced milk production, fewer purchases under the price support program, reduced government inventories, and higher prices paid to producers (Collins, 2000). A disputable negative effect of the program was flooding of the beef market. Although the USDA was authorized to purchase up to 400 million pounds of beef, it is argued that there was an adverse effect on the price of beef during this termination of dairy cattle (Bailey, 1997).



Source: USDA/NASS, 2006b.

^a 2006 is an estimate from USDA/ERS, 2006f.

Figure 2. Historical and projected United States milk production (1970-2006)^a

This is one example of the possible, perhaps unintended, negative impacts that can be a part of a program such as this.

Although there were several short-term benefits to the DTP, the longer term effects soon became apparent. As the supply of milk was reduced and the price rose, the remaining producers responded by increasing production, causing the nation's overall supply to rise and a subsequent decrease in the milk price. After the program's completion, several studies were conducted to determine its effectiveness in raising the price of milk. Dixon and Susanto (1991) explored the impact the MDP and DTP had on the dairy industry. To make this determination, they evaluated the effects of both programs at both an aggregate and state-by-state level. In regard to the benefits of the DTP, Dixon and Susanto report "... the five-year ban on production by producers exiting under the DTP appears to have little, if any effect. Herd size began increasing immediately after the last exit month to pre-DTP levels" (page 5).

Bausell and Belsley (1992) conducted a study that evaluated the effectiveness of the various 1980s dairy programs. The three major programs analyzed were the MDP, the DTP, and the milk price support scheme.² Through the course of their study, they found that each of the programs "temporarily reversed the upward trend in production and support costs" and that of the three, "the policy of reduced support prices provided the most cost-effective, long-term solution, resulting in savings to government and consumers, and reduced transfers to producers" (page 611). At the time of their study, the full effects of the DTP had not been realized, but the authors stated that "...the effects of the DTP may ultimately prove transitory" (page 607). They also suggested that the DTP

² The primary milk pricing scheme in the United States is the Federal Milk Marketing Order system.

had more potential to have a longer lasting effect than the MDP because it reduced productive capacity by requiring herd retirees to dispose of their cows. Because participants in the MDP were not required to slaughter or export their cows, a geographical shift in production was more likely than a reduction. These authors found that the DTP also achieved substantial reductions in dairy production, nearly equivalent to the lower-support-price program, but net savings to government and consumers appear relatively small. Although the DTP reduced the supply of milk, it was done with significant government outlays. The general consensus concerning the DTP is that it did help the situation in the short run, but there may have been a more cost effective way to obtain the desired results.

The DTP program is very similar to the CWT herd retirement program in its goals and objectives in that both programs attempt to improve the farm-level price of milk through a reduction of supply. Although the desired results are the same, the means for arriving to this end are quite different. There are a few differences between the CWT herd retirement program and the DTP that should be noted. First, the CWT herd retirement program can and has been repeated. In contrast to the DTP, this attribute would presumably enable the effects of prior efforts to be sustained. However, if an operator places a successful bid, they are forbidden from submitting another bid in subsequent rounds of CWT herd retirement.

The way funds used for supply-influencing measures are obtained is the second difference between the programs. Rather than being only partially funded by producers, the CWT program relies solely on the assessment of voluntarily participating producers. Although the assessment can change whenever the contract between CWT and

participating producers is renewed (normally annually), the assessment has remained at the nickel per hundredweight level since the program began.³

A third difference revolves around what can be done with the cows associated with a successful bid. Unlike the DTP, which allowed dairy operators to export their cows, successful CWT bidders are required to take their entire milking herd to slaughter. To ensure cattle destined for slaughter arrive at the packing plant, auditors visit dairies and place an identifiable mark on the cattle signifying they are not for export or sale as milk cows. This is done to prevent the milk produced from those cows earmarked for slaughter from entering the domestic supply.

A fourth difference between the DTP and CWT is that successful bidders in CWT only have to dispose of their milking and dry herds rather than all female cattle over the age of 18 months. Any animals that have not calved at the time of disposition can be retained and, if desired, milked when they calve.

A fifth difference between the programs is that a producer who retires their herd through CWT faces no restrictions on the use of milking facilities after doing so. This is in contrast to a five-year idling period required of participants in the DTP program. Because producers who participate in CWT are allowed to resume milking, it is likely that some will choose to begin milking again. In fact, according to a survey of successful Round 2 bidders conducted by CWT, approximately 17.3% of those who placed a successful bid have resumed milking. Among those who had not resumed operation at the time the results of the survey were posted, 10.3% had plans to resume and 8.2% had not yet decided (CWT, 2005a).

³ Beginning July 1, 2006, the assessment will be raised to \$0.10/cwt.

It is possible that the CWT program has not had a noticeable impact directly traceable to their actions over the last few years. Rather, the program could have caused optimistic speculation and increased people's expectations. In general, expectations are expressed in terms of future prices. Thus it is possible CWT has had a positive indirect influence on milk price. Although the percentage of non-participating producers is shrinking (at a decreasing rate) with time, there are some who are reluctant to become a part of the program. An article in the *Hoard's Dairyman* (2005a) presents many of the arguments people have against the program. These arguments range from saying the successful bidders were going to exit anyway to concerns that the program would remove too much milk in certain areas. One of the most insightful arguments presented in a later issue of *Hoard's Dairyman* (2005b) compares the CWT program to other national programs aimed at increasing prices for certain industries. The person who submitted the comment said that when cotton farmers were paid to destroy their crops, consumers switched to cheaper wool products. Another example this person used was the Conservation Reserve Program, which he believes allowed Brazil to become a powerful competitor in soybeans and other crops (*Hoard's Dairyman*, 2005b). Although some arguments are easily dispelled, others can offer CWT an opportunity to better refine its actions.

Federal Milk Marketing Orders

In 2005, 65% of the nation's milk was marketed and priced through the federal milk marketing order system (USDA/AMS, 2006b). If California's separate state

marketing order is included, the percentage increases to 86%⁴ (California Department of Food and Agriculture, 2006). Because these marketing orders have such a ubiquitous presence, there are several implications related to both the dairy industry as a whole and to CWT in particular that can be discussed.

The primary objectives of the Federal Milk Marketing Order (FMMO) are to: (1) assist farmers in developing steady, dependable markets by providing prices for their milk that are reasonable in relation to economic conditions; and (2) assure consumers at all times of adequate supplies of pure, wholesome milk at reasonable prices (USDA/AMS, 1996). The FMMO program is basic in its principles and objectives but quite complex in the methods used to accomplish them. The program came about as a result of collapsed milk prices caused primarily by the Great Depression. The first authority given to set minimum milk prices was included as part of the Agricultural Adjustment Act of 1933. This authority was later formalized and spelled out in more detail in the Marketing Agreement Act of 1937. Although the 1937 agreement has since been amended, the federal orders in effect today continue to be founded on this act.

Since federal orders were first initiated, the number of orders has decreased significantly. Recently, the Federal Agriculture Improvement and Reform Act of 1996 required that “the number of Federal milk marketing orders be reduced from the thirty-three then in existence to no less than ten nor more than fourteen...” (Manchester and Blayney, 2001). As a result, the number was reduced to 11. Later, on April 1, 2004, the Western order (135) was terminated. This order included Utah and parts of Idaho, Nevada, Oregon, and Wyoming. A map of the remaining 10 orders is shown in figure 3.

⁴ The percentages reported are computed by dividing the milk produced under both federal and California orders by the total amount produced in the United States (USDA/NASS, 2006a).

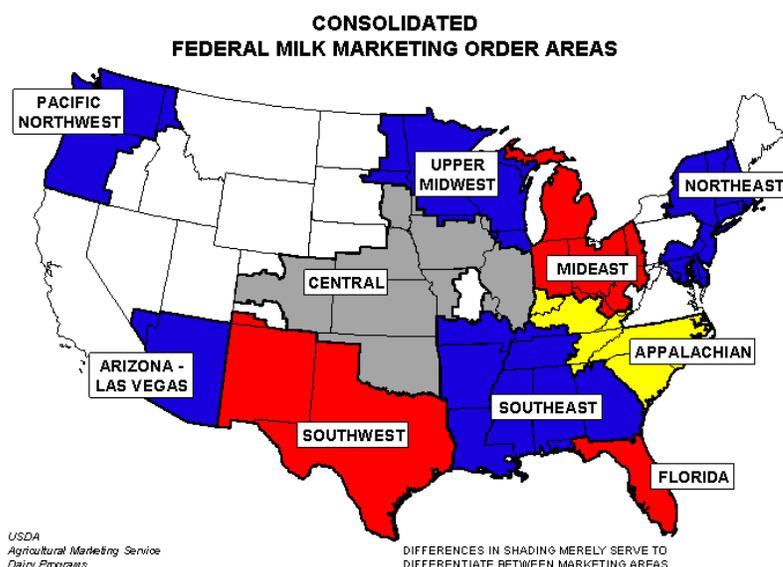


Figure 3. Current federal milk marketing orders

The basis for needing a program to set minimum prices stems from the perishable nature of milk and the inability of producers to provide a consistent supply of milk throughout the year. The supply of milk is seasonal, with a major peak occurring in the spring and early summer months because of good weather and freshening cows. During this peak time, the demand for dairy products is lower than at other times of the year, primarily because public schools, a large consumer of dairy products, are out of session.

Because producers have difficulty providing a constant level of milk, much of the unneeded fluid milk is processed into storable manufactured products such as butter, cheese, and nonfat dry milk (Bailey, 1997). At times, excess production forces prices down. Producers typically respond to lower prices by decreasing production, which eventually causes prices to increase as excess product is removed. But producers have difficulty responding quickly to changes in price. This lag causes prices to swing wildly in an unregulated environment.

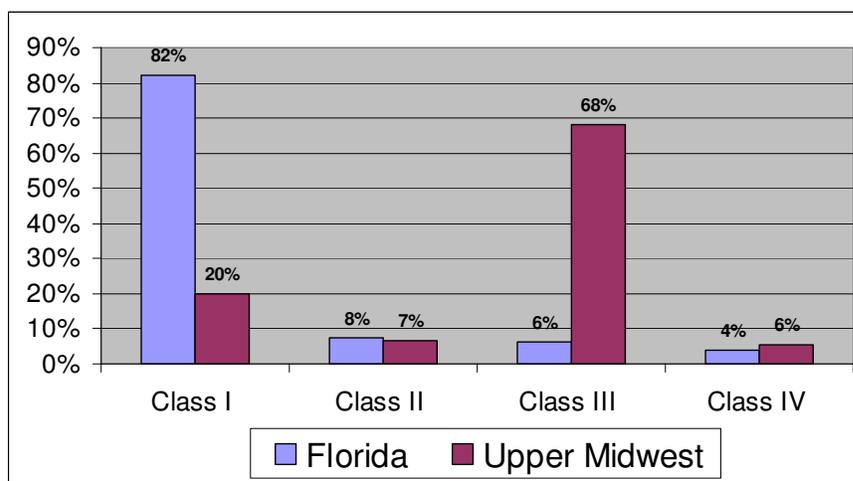
The two key elements used to accomplish the objectives of the FMMO system are classified pricing and pooling. Under the current FMMO system, there are four classes of milk. Class I is milk used for fluid (primarily beverage) milk; Class II milk is used for ice cream and packaged cream; Class III is milk used for cheeses; and Class IV is used for butter and nonfat dry milk.

On a monthly basis, statistics are gathered concerning the quantities of milk used in the various classes for each order. Prices for each class of milk are then calculated based on other dairy product prices and several components such as butterfat, dry whey, and protein. For a detailed illustration of the calculations used to set minimum prices in the FMMO system, see Appendix A. Once class prices are determined, a blended price is derived from a weighted average based on the quantity of each class of milk pooled by producers in the same order. Once the order-wide monthly price is determined, adjustments are made on an individual producer level to reflect the differing quality of milk.

Because fluid milk is assumed to have a higher value, a larger percentage of Class I utilization will result in a higher blend price for a particular order. The Florida order, for example, enjoys a higher percentage of Class I utilization and therefore tends to have a higher blended price than an order where cheese or other products in a lower valued class comprise a greater percentage of total milk use. Shown below in figure 4 is a comparison between the Florida and the Upper Midwest order, an area known for its production of cheese.⁵ The difference in quantities of milk devoted to the various classes of milk is even more noticeable when all three manufacturing classes of milk (II, III, and

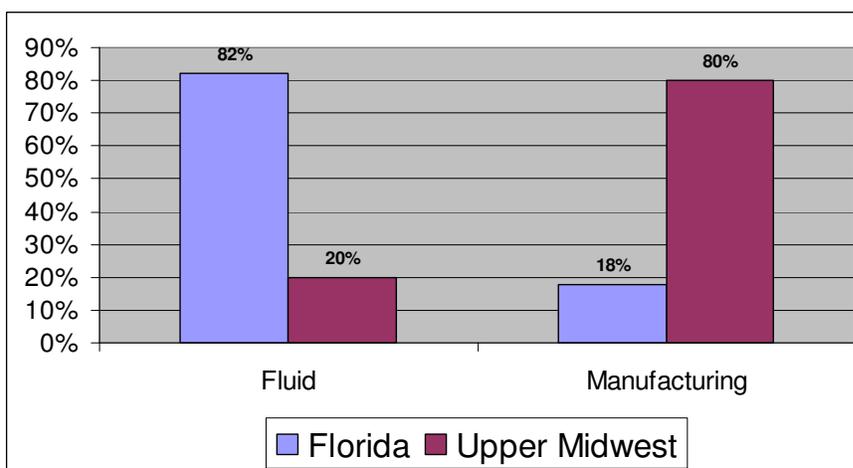
⁵ For a map of the Upper Midwest order, refer to figure 3.

IV) are combined for each order as is done in figure 5. Not only does the differing use of each class of milk impact prices received, but it also has implications regarding the amount of milk removal necessary to return the producers' assessment. This will be discussed in more detail in Chapters 4 and 5.



Source: USDA/AMS, 2006c.

Figure 4. Class utilization of milk in the Florida and Upper Midwest orders, 2005



Source: USDA/AMS, 2006c.

Figure 5. Manufacturing and fluid milk utilization, Florida and Upper Midwest orders, 2005

Review of Elasticities

When determining the price impact of a lower supply of fluid milk or products derived from milk, two sensitivity measures must be estimated. These are price elasticity of demand and price flexibility. Ultimately, price flexibility will be the measure that will enable a conclusion to be made regarding CWT's effectiveness, but it cannot be estimated without having an approximation of price elasticity of demand. Therefore, discussion will first be devoted to price elasticity.

Price elasticity of demand (elasticity) expresses the percentage change in quantity demanded associated with a given percentage change in price (Tomek and Robinson, 1990):

$$E_p \approx \frac{\left(\frac{\Delta Q}{Q}\right)}{\left(\frac{\Delta P}{P}\right)} = \left(\frac{\Delta Q}{\Delta P}\right)\left(\frac{P}{Q}\right)$$

For the purpose of this study, the interest in elasticity at the farm level is emphasized. The concern is with the impact on the amount of milk demanded by processors in the event of higher prices caused by either lower supply or increased demand (i.e., CWT's actions). Because of the downward-sloping nature of a demand curve, the elasticity is expected to have a negative sign. A typical question when estimating the effect of higher prices would be, "If the all-milk price were to increase by 1%, what percentage⁶ decrease might be expected in the quantity demanded by processors?" If the resulting elasticity is greater than one in absolute terms, the

⁶ Measuring in percentages allows all units of measure to be accurately compared, thus enabling better decision-making.

percentage decrease in quantity demanded would be more than the percentage increase in price. The inverse statement for elasticities less than one is also true. For example, if the elasticity for fluid milk were -0.2 , a 1% increase in the price of fluid milk would be expected to result in a 0.2% decrease in quantity demanded.

All studies that were reviewed indicate that the farm-level elasticity for milk is relatively inelastic. That is, a 1% change in the price of milk used is expected to cause less than a 1% change in the quantity demanded. Several reasons can be given for the inelastic demand for milk. The primary reason is that for the industry as a whole, there are few options available as a substitute for fluid milk.

Because producers of milk sell an undifferentiated commodity, processors could force the price down through their more powerful bargaining position. To overcome this, groups of producers band together as cooperatives and market the group's milk as one seller. This serves to effectively reduce the elasticity of demand for their product and increase their bargaining power. As a result, any given fluctuation in price has a lesser impact on the quantity demanded than if each producer marketed his/her own milk.

Milk used for manufacturing purposes tends to be more elastic than fluid milk because milk that was at one point very perishable has been processed into a form that can be stored and transported. As a result, the market for manufactured dairy products can easily extend beyond regional or national boundaries. Therefore, many direct substitutes exist for these products both domestically and internationally. Because of the more elastic nature of manufactured dairy products, a given change in price can be expected to have a larger impact on the quantity demanded for that product when compared to fluid milk.

Estimating the farm-level elasticity of demand is beyond the scope of this study. As a result, there are two options available, each with limitations. The first option is to review what other authors have estimated and used in their respective studies. Using this approach has one limitation dealing with the applicability of the figures to this study. Most of the studies that report appropriate elasticities did not adequately disclose the sources and methods used for acquiring the data used in their estimates. The methods other authors used to obtain data are important because, ideally, when data are gathered for this particular study it should be done in the same manner. Collecting the data in the same method is important because of the differing elasticities associated with fluid and manufacturing milk products.

James Miller (2005), an economist who is responsible for many of the statistical tables available from the Economic Research Service, said he could think of three fully legitimate ways of splitting the use between fluid and manufacturing that give much different shares. In order to ensure that elasticity measures reported in other studies are correctly applied, it is important to know how data for the elasticities were derived so similar methods can be applied in this study. As shown in Chapter 3, using consistent data is important when applying the elasticities to each class of milk. Unless more information can be obtained, this can threaten the accuracy of the results.

The second option would be to use a derived demand estimate as explained by Tomek and Robinson (1990). In order to derive a farm-level elasticity figure, it would be necessary to estimate a primary demand curve for a known stage of the supply chain. Ideally, information regarding processors' reaction to price changes would suit this study best, but processors are unlikely to volunteer such sensitive data. Because there is ample

data at the retail level, the focus would likely turn to this stage of the supply chain.

Applying the derived demand method to milk would require either the estimation of a demand curve for each dairy product or a single curve that aggregates all products. For simplicity's sake, all products would be aggregated. Once this curve is estimated, the average marketing margin would need to be determined. This could be expressed as either a fixed amount, a percentage of the retail price, or a combination of the two.

Regardless of the method employed, knowledge of the actual marketing margin would be necessary to yield a meaningful estimate. Because this option is vulnerable to error, the first option will be employed.

An extensive literature review was conducted which yielded fewer relevant results than initially anticipated. There were ample studies that discuss price elasticity for dairy products at the retail level. However, there were few concerned with the farm-level price elasticity, the stage in the supply chain relevant to this research. Those studies identified with price elasticities suitable for this research are summarized in table 2.

Ippolito and Masson (1990) explored the impact of government regulation on various players in the dairy industry. Specifically, they focused on the costs of price regulation rather than the price support system and did not discuss the potential benefits

Table 2. Farm-level Price Elasticities from Previous Studies

	Fluid	Manufacturing
Ippolito and Masson (1978)	-0.12 to -0.34	-0.20 to -0.26
	Average -0.23	Average -0.23
Dahlgran (1980)	-0.112	-0.352
Helmberger and Chen (1994)	-0.07	-0.35
Suzuki and Kaiser (1997)	-0.158	-0.217
Average	-0.14	-0.29
Maximum	-0.23	-0.35
Minimum	-0.07	-0.22

associated with the regulation of the dairy industry. In their analysis, they used a range of derived farm-level elasticities to show the impact of regulation. The ranges for fluid and manufacturing demand elasticities were -0.12 to -0.34 and -0.20 to -0.26, respectively.

In 1997, Suzuki and Kaiser questioned the assumption made by other researchers that the dairy industry exhibits perfect competition characteristics. To test the validity of this assumption, they used a generic advertising example. To determine the difference, they used a perfect competition and imperfect competition model and compared the results. The farm-level price elasticities of demand used in their study were -0.158 for fluid and -0.217 for manufacturing purposes.

The purpose of Dahlgran's (1980) paper was to "formulate a model and estimate the interregional transfers and welfare losses created by the current regulatory structure imposed on the United States dairy markets" (page 288). Specifically, he looked at the effects of milk pricing regulations used for fluid and manufacturing purposes. Dahlgran tested the hypothesis that regulation did have an effect on the allocation of milk between the two basic classifications of milk. For his analysis, he used a farm-level elasticity estimate for fluid milk of -0.112 and -0.352 for manufacturing.

Helmberger and Chen's study (1994) was concerned with the effects of terminating the milk marketing order and the milk price support programs. They simulated three different options; eliminating the milk order and price support programs in turn and then both of them together. The mean values used for farm-level demand elasticities were -0.07 and -0.35 for fluid and manufacturing milk, respectively.

Now that the discussion on elasticity has taken place, the concept must be taken a step further. Because CWT is attempting to influence the price of milk by reducing

supply, the elasticity figures will not give a meaningful interpretation relative to this study. Recall that price elasticity gives an approximate response of quantity demanded to a change in price. Taking the reciprocal of an elasticity figure gives a figure known as price flexibility. The resulting interpretation is “what percent change in price is expected given a one percent change in quantity?” Although an approximation, a great deal of insight can be drawn from its result.

A good explanation of price flexibility is given by Tomek and Robinson (1990). The authors illustrate price flexibility as it relates to agricultural products and why agricultural prices are unique when compared to other goods. Because crops have a level supply that cannot be altered once planted, prices adjust to a level that will clear the market. In their book, Tomek and Robinson speak mainly of actual crops growing in fields, but milk can also be considered a crop. The main difference being that it is harvested much more frequently. Milk shares many of the same limiting characteristics as other crops (i.e., its perishable nature and the difficulty of making short-term supply changes) and is therefore treated in the same manner as conventional crops. As Tomek states, “the situation is one of a fixed supply and a given level of demand for a specific time period” (page 49). Therefore, because milk cannot be stored indefinitely, the price adjusts to a level that will clear the market. This is why the author is interested in applying a price flexibility value to the CWT question. To illustrate, by taking the reciprocal of the average fluid milk elasticity from table 2 (-0.14), a price flexibility of -7.14 is calculated. Interpreted, this says that for every percentage decrease in the quantity supplied, an estimated 7.14% increase in the price of milk is expected.

CHAPTER 3

METHODOLOGY

The primary objective of this chapter is to discuss the methods and reasoning for testing the null hypothesis that CWT has not increased the farm-gate price of milk. To accomplish this objective, various alternatives for testing the hypothesis will be discussed and analyzed. After the alternatives have been critiqued, the best option will be identified and later applied in Chapter 4.

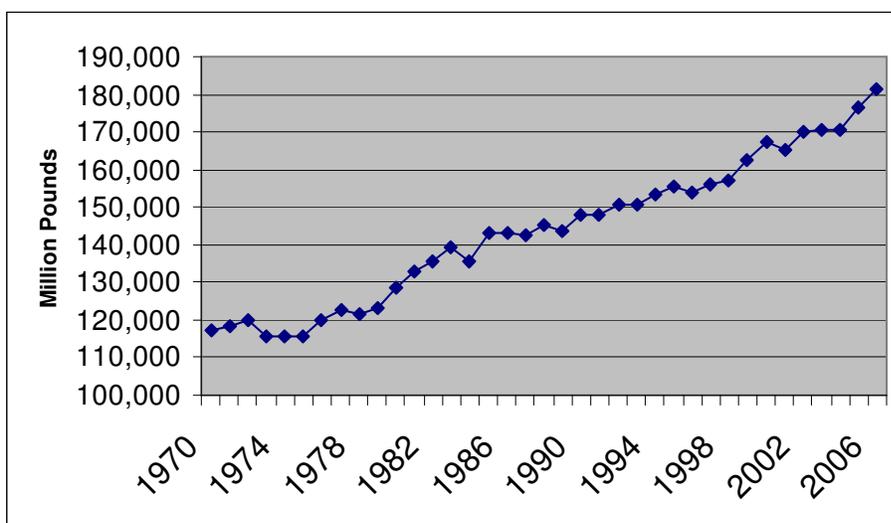
The first step in establishing a logical framework for testing the hypothesis is to determine the magnitude of CWT's actions. In other words, the percentage of total milk removed must be determined. To do this, the amount of milk removed by CWT needs to be compared to the total amount produced nationally during CWT's existence (July 2003 until December 2006).

There are two sources of data on total United States milk production: the National Agricultural Statistics Service (NASS) and the Economic Research Service (ERS). While it would be most appropriate to base this analysis on the NASS data series, doing so would preclude examination of most of the time during which CWT has been in effect. This is because final data from NASS are not immediately available following a given period of time. Therefore, two alternatives were considered for extending the length of data series used for analysis. The ERS issues monthly reports based on historical NASS data that provide national milk production forecasts (USDA/ERS, 2006f). Forecasts from these reports could be used for years in which data are not available. This approach

would create a data set based on milk production matched with the correct year but suffers from inclusion of the preliminary and potentially incorrect ERS estimates.

An alternative approach would be to use prior year observations from the NASS data set as proxies for missing observations. For example, 2005 data could be used in place of unpublished 2006 data. The disadvantage to using prior year's data is that it would not fully reflect interannual changes in milk production. Because production exhibits an upward trend (see figure 6), using prior year data as proxies for missing observations would understate production. Consequently, the ERS forecast data will be used to augment the NASS observations.

After the total amount of milk produced in the nation has been determined, the amount removed by CWT must be estimated. NMPF officials estimated that CWT has removed 2.9 billion pounds primarily through herd retirements (see table 1). Because the amount of milk produced nationally during CWT's existence will be calculated, any other



Source: USDA/NASS, 2006a

a) 2006 is an estimate from USDA/NASS, 2006b

Figure 6. The increasing trend in national milk production^a

efforts scheduled to take place up until the end of 2006 must be included in the calculation. The goal for CWT's export assistance program for this year is to remove manufactured products representing approximately 1 billion pounds of milk (CWT, 2006a). Adding this to the amount that has already been removed will give a better picture of how much of an impact the program has had.

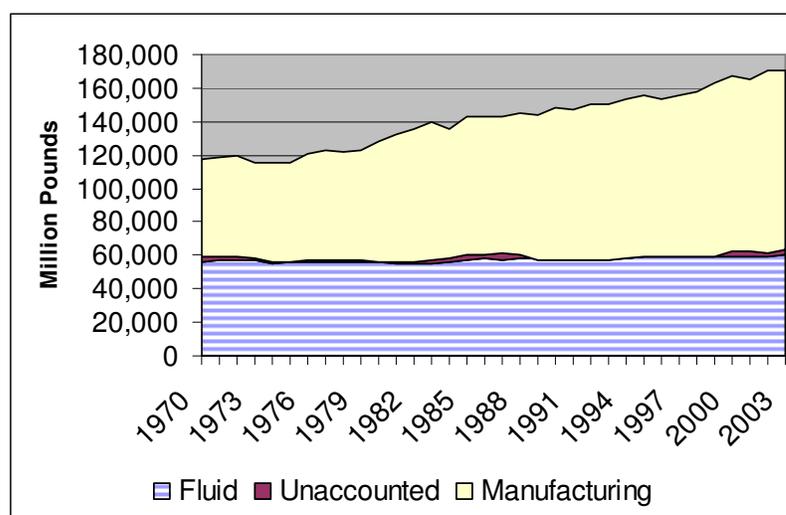
Once the percentage of milk removed by CWT has been determined, the price elasticity measures identified from prior studies will be converted to price flexibilities to estimate the impact on the price received by producers. This will give an indication as to whether CWT has had a positive impact on the price of milk.

Because the demand for manufactured products is more elastic than the demand for fluid milk, an equal percentage increase in the price both goods will cause a larger percentage decline in demand for manufactured products than in the demand for fluid milk. Therefore, more manufactured products (milk equivalent) than fluid milk would need to be removed to yield a comparable impact on price. In other words, the ratio (utilization ratio) of manufacturing to fluid milk utilization has an impact on the effectiveness of the removal of milk from the marketplace.

In order to apply the elasticity measures in a consistent way, the data used in this study should be comparable to data used in previous studies. Unfortunately, it is unclear how authors of previous studies derived their data. When discussing this problem with James Miller (2005) of the Economic Research Service he said, "Suffice it to say that any farm-level demand elasticity of all milk at farm-level between -0.1 and -0.4 is unlikely to be challenged, with the consensus about -0.15 or -0.2." The data in table 2 suggest that

the average elasticity of both classes of milk fall within the range Jim Miller said is unlikely to be challenged.

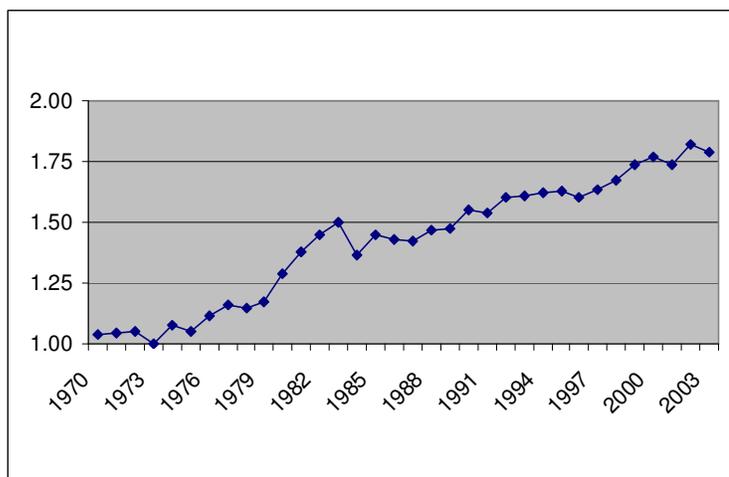
Because the herd retirement program essentially removes fluid milk from the market, it might be tempting to use fluid milk elasticities to estimate the impact of the CWT program. However, doing so would not acknowledge that the milk produced by the exiting cows is used in all dairy products. Therefore, it is better to use a weighted average of the two broad classes of milk products. In order to accurately weight the figures, we need a time series of the milk utilization ratio (see figures 7 and 8). These data clearly show that the milk utilization ratio has been shifting from a fairly equal split between fluid and manufacturing to a point where nearly two-thirds (63% in 2003) of milk is currently processed into manufactured products.⁷



Sources: USDA/ERS, 2006b; USDA/ERS, 2005a.

Figure 7. Milk utilization for fluid and manufacturing products in the United States, 1970-2003

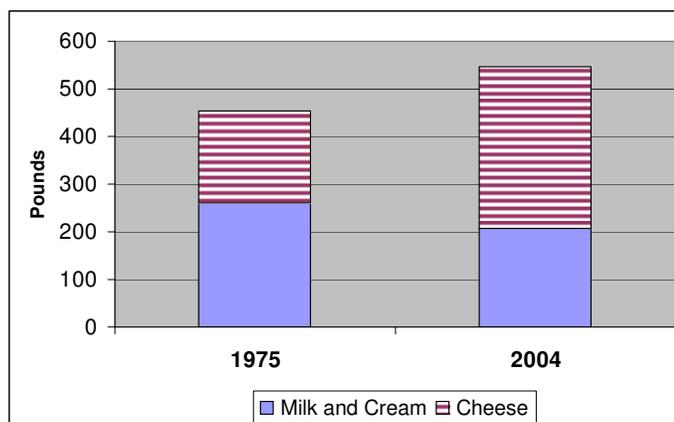
⁷ The reason there is unaccounted milk in Figure 7 is because the USDA and the ERS do not publish supply and use data for fluid milk and manufactured milk products as one data series. When combining numbers from two different data series, the two do not sum. Although there is a difference each year, the general trend remains apparent.



Sources: USDA/NASS, 2006a; USDA/ERS, 2005a.

Figure 8. Manufacturing to fluid milk ratio (1970-2003)

Several reasons exist for this shift. First, fluid milk consumption per capita has been declining for several decades as consumers have shifted to other drinks. Secondly, people eat away from home more often and when they do eat at home, they tend to eat prepared meals. Prepared meals and restaurants use high levels of cheeses and other manufactured dairy products as ingredients. This shift in dairy consumption is illustrated below in figure 9. A conversion of 10 pounds of milk to 1 pound of cheese was used to



Sources: USDA/ERS, 2006c and USDA/ERS, 2006e.

Figure 9. Change in per capita consumption of milk and cheese products (1975-2004)

place both groups of dairy products on equal ground. According to this data, there has been a 26% decrease in milk and cream consumption and a 43% increase in the consumption of cheese products in the last 30 years.

It can be assumed that the ratio will continue to move gradually in favor of a higher ratio. Therefore, a weight of 2:1 (manufacturing:fluid) will be used to weight the average of the two elasticity measures. In addition to taking the weighted average of the mean elasticity values, the weighted average of the maximum and minimum values will also be calculated to convey a sense of the probable range of impacts.

In addition to weighting the fluid and manufacturing elasticities on a nationwide basis, two regional estimates will be illustrated. The Florida and Upper Midwest federal orders lie on opposite ends of the milk utilization scale. For example, the Florida order had a manufacturing:fluid ratio of 18:82, while the Upper Midwest order has a ratio of 8:2 for the year 2005. Using these two extreme examples will show the differing impacts on the amount of milk removal by CWT required to elevate the price of milk.

To determine the impact of CWT's actions on the price of milk, a farm-level reference price must be identified. This price will serve as a basis for comparison when answering various questions related to this study. Beginning in 1995, the Agricultural Marketing Service (AMS) began collecting and publishing both a simple and weighted average monthly price that producers actually received (mailbox prices). The data are summarized on both a regional and national basis. These data typically take three months to become available. The data used to calculate the reference price will be based on the weighted average mailbox prices for all federal orders beginning January 1995 and ending December 2005 (the most recent mailbox price available).

Once the impact on price has been estimated, a decision can be made as to whether CWT has had a large enough impact on the price of milk to return the contributing producers' investment to them. To return at least the producers' investment, the milk price needs to be raised by more than \$0.05/cwt. If CWT has resulted in positive returns above \$0.05/cwt, we can reject the null hypothesis and conclude that CWT has had a positive effect. Moreover, we can also conclude that they have had an impact even without 100% of the nation's producers contributing. This knowledge would be particularly interesting to those who are not participating because it may encourage them to begin contributing.

In addition, the estimated price flexibility can be used to calculate the amount of milk removal that would allow producers to just break even (an increase of \$0.05/cwt) on their assessment. Although the method for determining this break even amount is slightly different than the first problem of determining the price increase due to actual milk removal, it can be calculated quite easily through a manipulation of the price flexibility formula:

$$\left(\frac{1}{E_p}\right) \approx \frac{\left(\frac{\Delta P}{P}\right)}{\left(\frac{\Delta Q}{Q}\right)} \equiv \left(\frac{\Delta P}{P}\right) \approx \left(\frac{1}{E_p}\right) \left(\frac{Q_0 - Q_1}{Q_0}\right)$$

Where

$$\left(\frac{\Delta Q}{Q}\right) = \left(\frac{Q_0 - Q_1}{Q_0}\right) \text{ and } F_i \approx \left(\frac{1}{E_p}\right).$$

To find the breakeven amount, we must solve for (Q_1). This necessitates determining values for (1) a reference price, (2) the desired percentage change in the

reference price ($\Delta P/P$), (3) a price flexibility ($1/E_p$), and (4) the base quantity of milk (Q_0). The reference price will be calculated from mailbox prices described earlier, the desired percentage change in the reference price will be \$0.05 divided by the reference price, the price flexibility will be calculated from an elasticity based on table 2, and the base quantity of milk will be the amount produced nationally during CWT's existence.

When determining the level of milk removal necessary to allow producers to break even on their assessment, an understanding of the implications associated with differing elasticities and current farm-level prices is necessary. A lower elasticity raises the price flexibility, which, in turn, lowers the amount of milk that would need to be removed to break even. Also, as the milk price increases, \$0.05 becomes a lower percentage of the milk price, which in turn also lowers the amount of milk that would need to be removed to break even. These implications should be considered when the breakeven level of milk is calculated.

Given the dynamic nature of the dairy industry, the methodology regarding the survey requires flexibility. Originally, surveys were to be sent to producers who placed successful bids in the first two rounds of CWT's herd retirement program. The goal was to gain an understanding as to why they desired to leave the industry and determine what they were currently doing. Unfortunately, CWT was unwilling to provide contact information for those who had exited. CWT indicated that they had already surveyed the second round retirees and were uninterested in facilitating a second survey. However, CWT's survey was very general and retrieved limited information. A tentative agreement was reached with CWT to allow a survey of those producers who had their bids rejected in the first two rounds, but when a sample survey was sent to CWT, they withdrew their

agreement because they felt the survey asked for proprietary information. Fortunately, access was obtained to a listing of Utah producers who had exited the industry during the period of CWT's existence and we are now able to survey them regarding their exit decision and whether they were participants in CWT.

The main purpose for conducting a survey of Utah dairy producers was to gain insight as to whether CWT was effective in aiding producers who wished to exit. Because CWT does not accept every bid placed, it was assumed that a certain number of operators were not able to exit through any of the three retirement rounds. The desired outcome was to determine which, if any, producers exited as a result of participation in the CWT program as well as other reasons for exiting the industry.

To identify the sample set, the Utah Department of Agriculture and Food (UDAF) provided a list of current (2005) list of Utah producers. This list was compared to a similar list prepared by UDAF in 2002. When the two lists are compared, there were approximately 90 producers on the 2002 list that were not on the list for 2005. It was assumed that these producers had exited the industry. A survey was drafted, approved (see Appendix B), and mailed to each of the approximately 90 producers identified. To improve the response rate, a second mailing was sent two weeks after the first mailing.

CHAPTER 4

RESULTS

In light of the high level of positive publicity the CWT program has received, evidence suggesting that the price of milk has been consistently above the long-term average, the increasing number of producers becoming members of CWT (which signifies its acceptance), and the generally optimistic attitudes of producers, it was anticipated that the null hypothesis (CWT has not increased the farm-gate price of milk) would be rejected.

Based on a combination of NASS and ERS data, total milk production from mid-2003 to the end of 2006, the period during which CWT has operated, will be approximately 614.5 billion pounds (see table 3 on next page). Based on CWT activity conducted up until the end of 2005, approximately 2.9 billion pounds has been removed from the nation's supply (see table 1). This amount is likely to increase somewhat before the end of this contract period (December 2006) due to anticipated reductions associated with the export assistance program. Based on the goal for this program, it is possible that the amount could increase by one billion pounds⁸ (milk equivalent), bringing the total to about 3.9 billion pounds (CWT, 2006a). Dividing the 3.9 billion pounds removed by 614.5 billion yields 0.63%. This represents the amount of milk (percentage) that is estimated to have been removed during the 42 months of the CWT program.

⁸ In light of the high volume of accepted bids from the export assistance program in recent months, the probability of reaching the goal is likely.

Table 3. U.S. All-State Milk Production (selected years)

Year	Total Production (Billion Pounds)
2003 *	85.2
2004	170.9
2005	177.0
2006 **	181.4
Total	614.5

Source: USDA/NASS, 2006a.

* CWT began operations in July 2003, so only 6 months' data are used

** 2006 is an estimate from USDA/ERS, 2006f.

In order to answer the question of whether or not the CWT program has had a positive effect on the farm gate price of milk, it is necessary to determine if 0.63% is enough to cause a significant difference. To put the size of the CWT program into perspective, it is beneficial to compare it to the DTP. The DTP removed 11.3 billion pounds during a 17-month period (Dixon and Susanto, 1991). This is 2.9 times more milk removed in 60% less time than CWT. The 11.3 billion pounds removed under the DTP represented approximately 8.7% of the amount of milk produced during the period of time it operated (Lockeretz, 1987). Referring to figure 2, the impact of the DTP appears to be at least partially attributable to the large drop in milk production in the mid-1980s. In light of the differing scales between the two programs, it was tempting to make a quick judgment and dismiss CWT as being insignificant. However, a calculation using the previous discussion on elasticity and price flexibility gave an indication as to whether CWT has had a positive impact on the price of milk.

Table 4. Estimated Impact of the CWT Program - Nationwide

	Elasticity of Demand for Processed Milk	Elasticity of Demand for Fluid	Weighted Average Elasticity of Demand for Milk (2:1)	Estimated Percent Change in Price Due to CWT	Change in Price/cwt
Average	-0.29	-0.14	-0.24	2.63	\$ 0.36
Maximum	-0.35	-0.23	-0.31	2.03	\$ 0.28
Minimum	-0.22	-0.07	-0.17	3.71	\$ 0.51

Table 2 shows the elasticity values from previous studies for fluid and manufacturing milk. Table 4 applies elasticities from these previous studies and shows the steps taken to determine the estimated impact of CWT on the industry. The weighted averages of the mean, maximum, and minimum were calculated using a 2:1 ratio to reflect the mix of fluid and processed milk. Taking the reciprocal (price flexibility) of each elasticity and then multiplying by 0.63 yields an estimated percentage change in price due to CWT's activity.

To calculate the increase in price/cwt attributable to CWT, a reference price of \$13.67/cwt was used.⁹ Working through the top line in table 4 shows that CWT's actions have increased the price by 2.63%, or about \$0.36/cwt. This same operation is done for the maximum and minimum values. These results suggest that the amount of milk that CWT has removed has increased price by more than \$0.05/cwt under mean, maximum, and minimum elasticities. This same exercise could be done with a higher or lower average mailbox price. Because a percentage is being applied, the price impact/cwt will gradually raise as the average mailbox price increases.¹⁰

⁹ Calculated according to method described in previous discussion.

¹⁰ For example, an increase of 2.63% is greater for \$17.00/cwt than for \$13.67/cwt.

Towards the beginning of the CWT program, NMPF officials made the claim that the program had raised the milk price by \$0.59/cwt (CWT, 2006b). The difference between this claim and the results summarized in table 4 could have come from a number of sources. The differences may have resulted from comparisons based on different time periods, the use of different elasticities, the use of a different reference milk price, or differences in estimates of total milk production.

When calculating the change in price/cwt for the regional examples shown in tables 5 and 6, the differing impacts become apparent. As expected, the Florida order saw an estimated average increase higher than the Upper Midwest order. This is due to the fact that more of Florida's milk is used for fluid purposes, which has a lower elasticity.

Table 5. Estimated Impact of the CWT Program – Florida Order

	Elasticity of Demand for Processed Milk	Elasticity of Demand for Fluid	Weighted Average Elasticity of Demand for Milk (18:82)	Estimated Percent Change in Price Due to CWT	Change in Price/cwt
Average	-0.29	-0.14	-0.17	3.71	\$ 0.51
Maximum	-0.35	-0.23	-0.25	2.52	\$ 0.34
Minimum	-0.22	-0.07	-0.10	6.30	\$ 0.86

Table 6. Estimated Impact of the CWT Program – Upper Midwest Order

	Elasticity of Demand for Processed Milk	Elasticity of Demand for Fluid	Weighted Average Elasticity of Demand for Milk (80:20)	Estimated Percent Change in Price Due to CWT	Change in Price/cwt
Average	-0.29	-0.14	-0.26	2.42	\$ 0.33
Maximum	-0.35	-0.23	-0.33	1.91	\$ 0.26
Minimum	-0.22	-0.07	-0.19	3.32	\$ 0.45

Under all situations presented, the null hypothesis that CWT has not increased the farm-level price of milk was rejected. This suggests that a smaller quantity of milk needed to be removed for participants to just “re-coup” the contributions made. To determine this amount, solve the following equation for Q_1 :

$$\left(\frac{1}{E_p}\right) \approx \frac{\left(\frac{\Delta P}{P}\right)}{\left(\frac{\Delta Q}{Q}\right)} \equiv \left(\frac{\Delta P}{P}\right) \approx \left(\frac{1}{E_p}\right) \left(\frac{Q_0 - Q_1}{Q_0}\right),$$

By using specific numbers,

$$0.37\% = 4.17 \left(\frac{614.5 - Q_1}{614.5}\right).$$

The number on the left-hand-side of the equation represents a \$0.05/cwt (0.37%) increase in price based on \$13.67/cwt milk. On the right-hand-side of the equation, (4.17) is the price flexibility based on a weighted average mean price elasticity of (-0.24) from table 4 and 614.5 is the total amount of milk (in billion pounds) produced during CWT’s existence. Solving for (Q_1) yields 613.953 billion pounds. This says that production would only need to be reduced by 547 million pounds (0.089%) to increase the price to a breakeven level of \$13.72/cwt on a national level.

Following the same reasoning on a regional basis, a similar effect is shown in the equation below. For the Florida order, the price flexibility (5.88) is based on a weighted average mean price elasticity of (-0.17) shown in table 5. Solving for (Q_1) yields 614.113 billion pounds. This says that production would only need to be reduced by 0.063% to

increase the price to a breakeven level of \$13.72/cwt. If all regions had the utilization levels found in the Florida order, only 387 million pounds of milk would need to be removed:

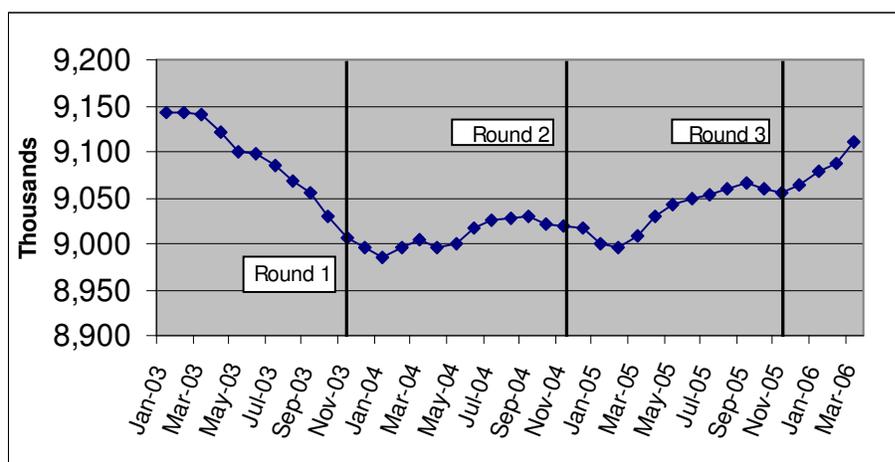
$$0.37\% = 5.88 \left(\frac{614.5 - Q_1}{614.5} \right) \Rightarrow Q_1 = 387 \text{ million pounds .}$$

Similarly, only 590 million pounds of milk would need to be removed if all regions exhibited the same utilization levels found in the Upper Midwest order:

$$0.37\% = 3.85 \left(\frac{614.5 - Q_1}{614.5} \right) \Rightarrow Q_1 = 590 \text{ million pounds .}$$

It should be emphasized that these calculations are for a specific point in time and will not hold true for an extended period because producers' responses to higher prices are not taken into consideration and could affect the ending result. Longer run implications have not been considered. However, any short-term response to an increase in prices would be minimal. This is because of the nature of the industry and its inability to instantaneously boost production.

To the extent that CWT's actions have elevated the price of milk, CWT has stimulated expansion in the dairy industry. This invites those who are contemplating entering to do so and encourages less efficient producers to stay in business. In addition, those producers who are profitable at lower prices are encouraged to get larger. These possible impacts are shown in figure 10 (see next page). According to this figure, CWT does appear to be having an affect on herd numbers in the month of and for a few months



Source: USDA/NASS, 2006b.

Figure 10. Total number of dairy cows in the United States during CWT's existence

following each herd retirement,¹¹ but in all cases, numbers begin to increase shortly thereafter. The increased number of cows only adds extra milk that will exert downward pressure on milk prices in the long run.

In the absence of higher prices, additional producers would be less inclined to enter and less efficient producers would be more inclined to go out of business. Producers would continue to leave the industry until only the most efficient producers remained. However, CWT cannot expect to maintain these elevated prices for an indefinite period of time. It is simply not sustainable in the long run.

The survey (see Appendix B) of Utah dairy operators who exited the industry between 2002 and 2005 yielded interesting insights about the effectiveness of the CWT program. Of the 88 surveys mailed, 27 were returned with valid responses (31% response rate). All of the operators who returned their surveys had ceased operations from 1999,

¹¹ Just because falling herd numbers coincide with CWT's herd retirements does not mean it is fully attributed to their actions. Other factors could also be contributing.

including 1 operator who was exiting in four days after completing the survey. Of the surveys returned, 12 exited during the existence of the CWT program. Of these 12, only 3 operators exited through a herd retirement round. There were 6 producers who submitted bids in one of the first two rounds. Of further interest, 9 of the 12 contributed to CWT through their respective cooperatives (none contributed independently), 8 were at least 55 years of age, 9 had been in business for at least 20 years, and 6 relied on their dairy for at least 75% of their income.

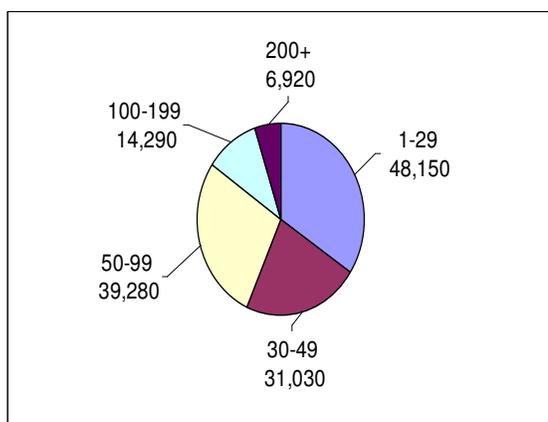
One operator attempted to retire his herd through CWT but their bid was rejected. When this particular operator was asked to judge the quality of the CWT program on a scale of 1-10, they gave it a 2. This operator was obviously not impressed with CWT's efforts to aid operators wishing to exit the industry. It also appears that although a majority of the producers were aware of the herd retirement program, they did not place a bid and opted to exit in other ways. It is unclear why these producers chose alternate exit strategies.

Reasons for exiting were centered on 10 reasons, of which most producers had at least 2. The most frequent reason given for exiting was older age followed by no interested successor and the inability to find good help. According to Blayney (2002), "The notable changes in the number and size of dairy farms have not been matched by major changes in business organization" (page 12). He continues:

In 1997, sole proprietorships and family corporations accounted for 84 percent of specialized dairy farms. Another 15 percent were partnerships, many of which probably involved family members. Non-family corporations, the image of corporate farms that is likely held by many, represented less than 1 percent of the specialized dairy farms, a share that has changed little over the years.

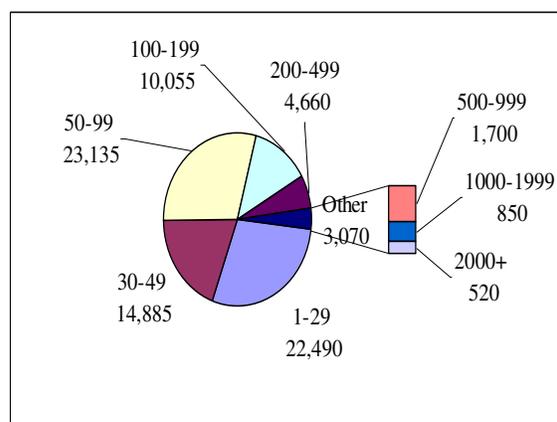
The majority of dairies are still family-owned, but the typical size has increased while the total number of dairies has fallen. In 1995, there were nearly 140,000 dairies in the United States. Just 10 years later, the total number of dairies dropped to about 78,000 (see figures 11 and 12).

Although most dairies are still family-owned nationally, an emerging trend in Utah identified by the survey results suggests that family dairies are gradually reducing their presence. The reasons behind potential family successors having little interest in perpetuating the family dairy are varied, but a few stand out as likely candidates. The first is the low price of milk. It is acknowledged that prices have been relatively favorable in 2004 and 2005. When discussing this current milk prices with a particular producer who had recently exited the industry, he said that he was getting the same price for his milk as when he started 22 years ago. He also cited other reasons for his exit; these were high variable costs such as fuel, the inability to pay competitive wages, and the prohibitive nature of purchasing insurance for employees. Also, with the re-opening of the United States-Canada border, he was fearful of erosion in his heifer equity.



Source: USDA/NASS, 2006c.

Figure 11. Number of United States dairy herds by size groups (1995)



Source: USDA/NASS, 2006c.

Figure 12. Number of United States dairy herds by size groups (2005)

Another interesting thing discovered as a result of this survey was the degree of awareness producers had regarding whether the cooperatives they belonged to were contributing to CWT. Many producers did not know if their co-op was a participant in CWT. Also, many people who did know were unsure of the length of time they had been contributing. This fact signifies either a lack of communication on the part of the co-ops, the producers' lack of interest in the program, or their inability to evaluate milk check deductions.

CHAPTER 5

SUMMARY AND CONCLUSIONS

As demonstrated in the results chapter, CWT appears to have had a positive impact on the price producers receive for their milk. This supports claims made by NMPF since the beginning of the CWT program. Although NMPF claims to have raised the price by more (\$0.59/cwt) than was calculated in this study, the same basic conclusion is suggested.

In addition to concluding CWT has increased the milk price, a breakeven amount of milk removal was estimated. This amount was quite small in relation to what the program has removed. According to the calculations made, CWT has removed slightly more than 7 times (3.9 billion vs. 547 million) the amount necessary to allow the participants to break even on their assessment. Because this large of an impact was not expected, more of an explanation is necessary.

The main reason for the larger than expected impact is due to the inelastic nature of dairy products. According to Tomek and Robinson (1990), “a flexible price is consistent with inelastic demand” (page 49). Recall that price flexibility is derived by taking the reciprocal of price elasticity. By definition, dividing 1 by a gradually decreasing number (lower elasticity) will yield an ever-increasing result (price flexibility, or impact on price).

Although it appears the CWT program has increased the price of milk, they may need to redirect their actions in the future. They can only remove cows and expect the same outcome for a certain period of time. Because producers have recently obtained

higher prices, fewer are willing to leave the industry. This is shown by the fact that as the rounds of retirements have progressed, fewer producers have submitted bids and those who have submitted bids have requested larger amounts. As a result, the program is getting progressively more expensive to operate. In addition, CWT is forced to accept a higher percentage of increasingly higher bids. According to *Hoard's Dairyman* (2006), 15% of the bids in the first herd retirement round were accepted at an average price of \$4.02/cwt while 68% of the third round bids were accepted for an average price of \$6.75/cwt (see table 7). This "more expensive" milk reduces the buying power of the nickel assessment. Also of interest is the fact that the retirement rounds may encourage producers who were going to exit immediately to delay their exit in anticipation of a retirement round. This could actually reduce the effectiveness of the herd retirement program.

An option that could prolong CWT's effectiveness would be to focus more on their export assistance program. Because a large percentage of the nation's milk is based primarily on prices of manufactured dairy products, concentrating on removing excess stock caused by the recent expansion will improve the price level of milk. Although focusing on manufactured product inventories is less efficient (higher elasticity) at raising the price of milk than removal of fluid milk, a reduction of these products will still cause

Table 7. The Increasing Cost of CWT's Herd Retirement Program

	Bids Submitted	Bids Accepted	Percentage of Bids Accepted	Average Bid Price
Round 1	2,038	299	15%	\$4.02/cwt
Round 2	736	363	49%	\$5.24/cwt
Round 3	651	442	68%	\$6.75/cwt

Source: *Hoard's Dairyman*, 2006.

a price improvement. If CWT can continuously rid the market of excess product through increased exports, they will likely have a more sustainable impact on prices than focusing primarily on the herd retirement program. However, the longer they attempt to hold the price above equilibrium, the more expensive the program will become. The only way to increase the sustainability of their efforts is to raise the equilibrium price of milk.

Another interesting item worth considering is consumers' feelings toward higher prices. Higher prices benefit producers but also have a negative impact on consumers' purchasing decisions. Although consumers in the United States spend less than 10% of their disposable income on food, they are unlikely to be very excited about spending more (USDA/ERS, 2006d). Just because fluid milk at the farm level is quite inelastic does not mean it is impervious to substitutes. Beverage milk is already struggling to compete with soft drinks, bottled juices, and water. Higher retail prices will only make the struggle more difficult.

The survey of Utah producers yielded some interesting findings. Of most interest was that few of the producers indicated that the CWT had any influence on their decision to cease production. From the responses returned from those who exited during CWT's existence, it was apparent that even though the option was available to exit through the CWT herd retirement program, they chose alternative strategies. This begs the question of why they did not take advantage of CWT's offering. Without personally contacting each producer, definite answer(s) cannot be known. However, these producers either (1) did not know about the program; (2) did not have confidence in the program; (3) did not want to prolong their exit by going through CWT's procedure; or (4) had a lack of interest in the program. As a result, producers opting for an alternative exit strategy may

have chosen an avenue which yielded lower economic gain. A case study of a few producers who chose an alternative exit strategy would likely reveal some interesting insights.

Most of the producers who completed a survey were older and had been in the industry for an extended period of time. They expressed their primary reason for leaving the industry as an inability to perpetuate the family business. These producers' children were simply not interested in staying at home to work on the dairy. They know it is very hard work. It is an all-day, every-day job with little flexibility. There is likely to be more monetary opportunity available elsewhere for these producers' children. And it is quite obvious which avenue many of them are choosing. Perhaps they would remain at home if the business became more lucrative. This is what CWT is attempting to do. Hopefully, with a lot of thought and sound application of economic principles, they will be able to succeed.

In terms of judging CWT's success in enabling producers wishing to exit the industry to do so, they were not entirely successful. Half of those who submitted bids to a CWT herd retirement round were rejected. Most likely, the reason the bids were rejected were because they were too high. Perhaps these producers already had plans to exit and were just testing the waters to see if they could do better exiting through a retirement round. After they were rejected, they pursued their original plan.

The Cooperatives Working Together program is having a positive impact on producers' milk checks in the short run. Producers are excited to be in the industry. These producers should be proud of their efforts, primarily because they have not come at the direct expense of tax payers. The success which has been exhibited thus far is not

without its future challenges, but as good decisions are made, CWT will continue to play an important part of the dairy industry for years to come.

Several areas relating to this study and the Cooperatives Working Together program would be worthy of further research. For example, what potential effect(s) is CWT having on the dairy industry? Effects could be exhibited both on a structural and geographical level. Are dairies getting bigger because of CWT? Will higher prices encourage producers to relocate to areas where a greater share of milk is used for fluid purposes?

A second topic worthy of further research would be to determine the effect free riders have on the effectiveness of the CWT programs. This concept was only briefly mentioned in this study, but the concept does have implications regarding the viability of CWT in the future.

Under current World Trade Organization (WTO) definitions, CWT's actions are not considered trade distorting practices. This is because, unlike the Dairy Export Incentive Program, CWT is a private organization. They are therefore not subject to the enforcement power of the WTO. However, whether or not CWT must conform to WTO rules, nations currently importing United States dairy products may choose to deny such products from entering in the future on the basis that they feel CWT's actions are trade-distorting. What sorts of implications would this have for the United States dairy industry?

When the DTP was conducted, it has been argued that the beef industry suffered from lower prices as a result of the increased slaughter of dairy cattle. Could the same be argued of CWT today? The size of CWT's herd retirement program is significantly

smaller than the DTP, but the likelihood for adverse effects on the beef industry is still a possibility.

CHAPTER 6

DISCUSSION

Writing this thesis has definitely been a learning experience. When the idea was first conceived in December 2004, the original plan was to see whether the Cooperatives Working Together program, through its \$0.05/cwt assessment of participating producers, had actually had as big of an impact on farm-level milk prices as they claimed. This seemed like a good topic since it seemed to be making so much news and the industry was very excited about the published results. While I was studying in England during the first half of 2005, the program was in the back of my mind.

Upon returning to the United States, I began a more focused effort on the problem. As I thought about a potential methodology, I decided to first see how much milk the CWT program had actually removed and then compare that to what the total United States production had been during the time the program had operated. At the time, it seemed unlikely that this small amount would have had an impact on the farm gate price of milk. This hasty decision led me down several other paths, only to come back full circle to the original topic.

Through the course of my quest for a robust topic, I entertained the idea of researching something unrelated to the dairy industry. This did not have much appeal to me since I have a dairy background and had invested so much effort into a topic related to the dairy industry. Because of this desire, I was forced to look at my original question and critically judge it from more than one angle. This allowed me to obtain a more well-rounded understanding of the atmosphere CWT operates in.

One important thing I learned from my research was a result of my findings. Because CWT was more influential than I originally thought, I was prompted to look beyond what the results implied. To understand my results more fully, my search led me to a book written by Tomek and Robinson (1990). In this book the authors discuss price elasticity quite extensively and identify the implications it has for price flexibility. Although the concept is quite simple to show algebraically, I did not fully understand the effects associated with the concept. Learning things like this likely would not have happened until a later date had I not continued to pursue my original topic.

One constant component of every research avenue pursued was a survey of dairy producers. Although the characteristics of the sample set changed throughout the process, I felt it was important to get feedback from those who were actually faced with the decision of whether or not to exit the industry. Too many times, research becomes detached from reality and loses meaning. I am of the opinion that real-life examples only add to the integrity and readability of a research paper.

Looking back on the research I have done, I now realize that I have a better understanding of how to conduct research. Throughout the course of this study, I have learned that it is necessary to approach a problem with an open mind and not with preconceived ideas as I initially did. I admit that although frustration was at times my companion, pursuing alternate paths was not entirely a bad thing. Had I not gotten “distracted,” my research would have been less insightful to those interested in the farm-level improvements CWT has attempted to make. In the end I learned that it is long-run realizations that make short-run frustrations worthwhile.

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APPENDICES

Appendix A. Federal Milk Order Price Information (USDA/AMS, 2006a)

Price Formulas - 2006

Note: Milk prices are per 100 pounds or cwt., rounded to the nearest cent.

Component prices are per pound, rounded to nearest one-hundredth cent.

Cheese, dry whey, butter, and nonfat dry milk prices are weighted monthly averages of weekly NASS survey prices, rounded to the nearest one-hundredth cent.

Class I Price = (Class I skim milk price x 0.965) + (Class I butterfat price x 3.5).

Class I Skim Milk Price = Higher of advanced Class III or IV skim milk pricing factors+ applicable Class I differential.

Class I Butterfat Price = Advanced butterfat pricing factor+ (applicable Class I differential divided by 100).

Note: Advanced pricing factors are computed using applicable price formulas listed below, except that product price averages are for two weeks.

Class II Price = (Class II skim milk price x 0.965) + (Class II butterfat price x 3.5).

Class II Skim Milk Price = Advanced Class IV skim milk pricing factor + \$0.70.

Class II Butterfat Price = Butterfat price + \$0.007.

Class II Nonfat Solids Price = Class II skim milk price divided by 9.

Class III Price = (Class III skim milk price x 0.965) + (Butterfat price x 3.5).

Class III Skim Milk Price = (Protein price x 3.1) + (Other solids price x 5.9).

Protein Price = ((Cheese price – 0.165) x 1.383) + (((Cheese price – 0.165) x 1.572) - Butterfat price x 0.9) x 1.17).

Other Solids Price = (Dry whey price – 0.159) times 1.03.

Butterfat Price = (Butter price – 0.115) times 1.20.

Class IV Price = (Class IV skim milk price x 0.965) + (Butterfat price x 3.5).

Class IV Skim Milk Price = Nonfat solids price times 9.

Nonfat Solids Price = (Nonfat dry milk price - 0.14) times 0.99.

Butterfat Price = See Class III.

Somatic Cell Adjustment Rate = Cheese price x 0.0005, rounded to fifth decimal place.
Rate is per 1,000 somatic cell count difference from 350,000.

Appendix B. Cover Letter and Survey Sent to Utah Producers

Name	Date
Address	
City, State, ZIP	

Dear _____,

Dr. Bruce Godfrey, in the Department of Economics at Utah State University (USU) and Spencer Parkinson, a graduate student researcher, are doing research to evaluate what factors lead to dairy farmers to cease production. You have been identified as a producer in Utah who ceased production in the last 2-5 years. You should have received a copy of this survey about two weeks ago. We have not received a response from some who were sent the previous letter. Your comments are very important so we are sending you a second copy. If you have already sent a response, please disregard this second mailing. Your input will enable us to better understand the reasons dairy operators, such as yourself, exit the industry. We anticipate that we will learn how to provide better and timelier assistance from this research.

The information you provide will remain strictly confidential. A code number will be used to replace your name so we can track and distribute the survey a second time if we do not receive a response. The data and code list will be kept separate in a locked room, in a locked cabinet in Dr. Godfrey's office at USU. If you would like a copy of the results of this survey, please include your contact information on the last page of the survey. At the end of the study, the code list will be destroyed; no identifying information will be available.

There are no anticipated risks to participating in this study. You may withdraw from this study at any time without consequence. The benefit from this study may help us improve and enable dairy producers to make wise decisions about continuing or ceasing dairy operations.

The Institutional Review Board for the protection of participants in research at USU has approved this research. If you have any questions about your rights in this study you may call them at (435) 797-1821.

When you have completed the survey, please return it in the envelope provided. If you have any questions about this study, please feel free to contact me by phone or email.

Thank you for in advance for your participation.

To be completed by (or on behalf of) the current or former dairy operator.

Name (optional) _____

Address (optional) _____

1. Do you currently operate a dairy? (yes or no) _____

If **yes**, disregard this survey

If **no**, please continue

2. When did you cease operating your dairy? Month/Year

3. Do you intend to resume milking at a later date? Yes or No

4. What was your rolling herd average when you ceased operation?

5. How many cows (including dry cows) were in your herd at the time you ceased operation? _____

6. What was/were your primary reason(s) for going out of the dairy business?

_____ (Skip to Question 9)

7. Do you still own your milking facilities? Yes or No

If **yes**, continue to question 8

If **no**, what is their current use?

8. What are your dairy facilities currently used for?

Idle

Heifer operation

Leased to another dairy operation

Other (explain) _____

9. During operation, what percentage of your family income was from dairy operations?

0-24% 25-49% 50-74% 75-99% 100%

10. How many years did you operate a dairy?

1-5 6-10 11-15 16-20 21-30 More than 30

11. What was/were the primary breed(s) that you milked?

12. What was your age when you ceased operations?

Under 25 25-34 35-44
45-54 55-64 65 and over

13. If you are currently working, what is your occupation?

14. Did you contribute to the Cooperatives Working Together (CWT) program?

Yes or No

If **yes**, continue to question 15

If **no**, What was your primary reason(s) for not contributing to the CWT program?

(Skip to Question 19)

15. Did you contribute independently or through a cooperative?

16. How many months did you contribute to the CWT program?

17. Did you ever place a bid in CWT's herd retirement program?

Yes or No _____

If **yes**, continue to question 18

If **no**, skip to question 19

18. What was your CWT bid price in the following years?

<u>Year</u>	<u>Price/cwt</u>	<u>Was Bid Accepted?</u>
2003	_____	_____
2004	_____	_____

19. On a scale of 1-10 (10 being very beneficial), rate the quality of the CWT program.

1 2 3 4 5 6 7 8 9 10

***Thank you for taking the time to complete this survey. Please return your responses with the included business reply envelope. If you would like a copy of the results, please provide the following:**

Name _____

Address _____

Email _____