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# ASSESSMENT OF COLLECTIVE ACTION IN AGRICULTURAL MARKETING: CASE STUDY OF DAIRY FARMS IN CAYAMBE, ECUADOR

**By**

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# ABSTRACT

## ASSESSMENT OF COLLECTIVE ACTION IN AGRICULTURAL MARKETING: CASE STUDY OF DAIRY FARMERS IN CAYAMBE, ECUADOR

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Cattlemen's Association has developed a project to assist small dairy farmers in Cayambe, Ecuador to market milk collectively and receive higher benefits. This research investigates potential extensions of this real project by assessing scenarios that reflect horizontal integration and gradual vertical integration for the viability to start a dairy cooperative among small, medium and large farms in the region.

Strategic analysis and planning was used to identify key success factors as well as the action strategies that should be implemented to enable the cooperative to be successful in the future. The core strategy elements differentiate between a bargaining cooperative, which includes three scenarios, and a processing cooperative that evolves from the third scenario of the bargaining cooperative.

Financial analysis was used to assess the viability of the four scenarios, which showed that farmers would receive increasing benefits if they engage in horizontal and gradual vertical integration while enhancing quality of milk and dairy products. The estimated cooperative sales price, which was obtained by regression analysis, would cover operational costs and return higher prices to members across the scenarios. The highest potential benefits for farmers result from starting a dairy processing cooperative and offering quality milk to processors in the bargaining scenarios.

To
My parents, Andres and Jimena
My brothers, Simon and Santiago
My nephews, Felipe, Juan and
Francisco

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I owe my special thanks to my project supervisor, Dr. Christopher A. Wolf. Chris's insight and guidance provided clarity to help me produce a professional document that is the basis for my future career.

I would like to thank my advisor Dr. H. Christopher Peterson. His comments enabled me to attain a deeper understanding of strategic planning for the challenging task of starting a dairy cooperative.

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## KEY TO ABBREVIATIONS

| | |
|---|---|
| BCE: | Central Bank of Ecuador |
| CA: | Cattlemen's Association |
| INEC: | National Institute of Statistics and Census (acronym in Spanish) |
| HTST: | High Temperature Short Time |
| SICA: | Agricultural Information System of Ecuador (acronym in Spanish) |

# CHAPTER I

# INTRODUCTION

## 1.1. BACKGROUND

Dairy cooperatives emerged in developed countries during the second half of the 1800's and early 1900's (Empson, 1983). According to the International Dairy Federation, the first formal establishment of a dairy producer cooperative was in Norway in 1856 and later they arose in other European countries, New Zealand, Australia, the U.S. and then in developing countries. Nevertheless, dairy cooperatives have not emerged in a widespread manner in Ecuador whereas in other countries in Latin America they arose during the 1930's.

The importance of the producer cooperative form of organization is greater in marketing milk than any other agricultural commodity. In a group of 20 countries, collectively providing 60 percent of the world's total milk supplies, up to 86% of milk was marketed through producer cooperatives (Empson, 1983).

Only one dairy cooperative has emerged in the highlands of Ecuador, being the support of non-profit organizations determinant for this cooperative to arise. This cooperative has been successful with specialized production of fresh and mature cheese. The quality of its products is recognized nationwide to the extent that it had also started to export its products to neighbor markets.

The region of Cayambe in Ecuador is an important dairy zone that includes a wide range of dairy farm sizes. In the highlands of Cayambe exist indigenous communities of small dairy farmers whose members have an average of four milking cows (CA, 2001) while in other areas of Cayambe exists dairy farms with up to 150 milking cows. The results from the 2000 Census of Agriculture show that Cayambe contributes with 14% of milk production in the province of Pichincha, which is the largest producer of milk in Ecuador representing 20% of national milk production.

A common justification for farmer cooperation is that through collective action farmers are able to counterbalance the market power of their trading partners, leading to more equitable and efficient market outcomes (Galbraith, 1956). Cooperatives have used their countervailing power to raise farm incomes in two ways: through redistributing existing income in the farmers' favor and through increasing the efficiency of the economic system.

Dairy farmers in Ecuador are dispersed and contract individually with the processor or milk buyer. The market of raw milk that is processed by the dairy industry resembles an oligopsony and most processors have no incentives for farmers to produce high quality milk. According to statistics of Cattlemen's Association of Ecuador (CA), there are about 30 dairy processors in Ecuador. The four largest dairy processors procure 60% of raw milk that is processed and only two processors have defined premiums for high quality milk.

Other justifications for farmer cooperation among farmers in Cayambe are the missing market for quality milk and transaction costs. The missing market for quality milk refers to the fact that most processors pay to dairy farms based only on minimum quality standards. There is lack of high quality milk standards as well as a pricing policy that creates incentives for the production of high quality raw milk. On the other hand, the cooperative route for dairy farmers is an attempt to minimize transaction costs thus the cooperative would be able to increase benefits to farmers.

The likely benefits for dairy farmers of starting a cooperative in Cayambe are mainly two. First, increasing farm income will be achieved by raising the price of outputs, which will result from marketing large volumes of high quality milk, and by distributing to farmers any net savings of the cooperative. Second, improving or providing a missing service that will result in either a higher efficiency of farm production practices or in enhancing the income received by farmers.

## 1.2. PROBLEM STATEMENT

This research assesses the feasibility of starting a dairy cooperative as an organizational outcome for dairy farmers in Cayambe region of Ecuador. The formation of cooperatives may be a desirable alternative to increase their bargaining power, enhance the quality of raw milk, integrate forward in the supply chain and also may appeal to dairy farmers as a way of strengthening rural communities and redistributing power in society. In this way, dairy farmers of Cayambe region may receive a higher income and increase their wealth.

This research constitutes a case study that includes 28 dairy farmers of Cayambe region in Ecuador in order to assess the feasibility to start a dairy cooperative and define the strategic actions that should be implemented in order to assure its success. The research provides results for whether or not farmers may join together to start a cooperative and also assesses whether it would be viable a dairy bargaining and/or processing cooperative.

## 1.3. OBJECTIVES

This research has two main objectives with five sub-objectives that encompass the reach of the research. The main objectives are to *develop a strategic analysis and plan for the start-up of a dairy cooperative* and *assess the feasibility of the dairy cooperative* in Cayambe, Ecuador.

The first main objective focuses in identifying the strengths that the cooperative as a participant in the dairy market should develop, and also in stating the actions and resources needed in order to assure its success.

The second main objective of this research is addressed by the following sub-objectives, which are the major elements to determine the cooperative's viability.

a. Assess the characteristics, categories and motives of dairy farmers that may want to join together in order to start a cooperative. Cayambe region includes small-size, medium-size and large-size farms, so it is important to identify and examine the characteristics of the dairy farmers as well as under what conditions a cooperative may be conceived in order to assure commitment of its members.
b. Identify the type of cooperative that dairy farmers may be interested in forming. Dairy farmers may start a bargaining cooperative or a dairy processing cooperative. The specific role of the cooperative will be assessed in order to increase the participation of dairy farmers in the dairy supply chain.
c. Evaluate the current role of institutions and policies that are likely to support or discourage the start-up of a dairy cooperative. The analysis of the governance

structure in which a dairy cooperative may arise must be assessed in order to identify the external key factors for the start-up of a cooperative.

d. Develop a financial analysis of the dairy cooperative that may emerge in Cayambe region in order to assess its economic viability. This sub-objective includes the analysis of the capital that is required and the viability to start the bargaining or processing cooperative.

e. Identify the potential benefits to farmers of starting a cooperative according to the role that it will assume in the dairy supply chain. This sub-objective analyzes the benefits that dairy farmers would gain by acting collectively in the supply chain of dairy products.

The research objectives would be addressed further in this research, but first the methods and procedures for collecting and analyzing the data are presented below.

## 1.4. METHODS AND PROCEDURES

This section lays out the methods and procedures that were used for this research. The case study research approach is presented as the research method used for this thesis. Also, the procedures for data collection are described as well as data preparation to address the objectives of this research.

### 1.4.1. Case study analysis

This research consists of a set of case studies of dairy farmers in Cayambe region of Ecuador. Case study analysis is used because it allows the investigation to retain the holistic and meaningful characteristics of real-life events. For this research the real-life event refers to an organizational outcome for dairy farmers. The case study method could be used to deliberately cover contextual conditions, believing that they might be highly pertinent to the phenomenon of study (Yin, 1994).

The assessment of collective action among dairy farmers in Cayambe region of Ecuador represents a revelatory and exploratory case study. The revelatory case refers to the fact that interviewing dairy farmers about collective action issues has not been addressed by previous researchers thus this research is the pioneer in this topic, while the exploratory case refers to address the characteristics of farmers about their willingness to start a dairy cooperative.

Also, this research consists in a single-case study with three subunits of analysis. The subunits of analysis are given by the categories of dairy farms according to size. Although Chapter III will present the characteristics of these categories of farms, the subunits of analysis are the following:

1. Small dairy farms which have up to 10 milking cows in the herd. Most of these farms belong to communities of small farmers in Cayambe, like the community of La Chimba, which is an indigenous organization of dairy farmers located in the highlands of Cayambe,
2. Medium dairy farms which have more than 10 but less than 30 milking cows in the herd,
3. Large dairy farms which have more than 30 milking cows in the herd.

Thus, this research includes three units of analysis within a single case study; therefore, this research is an embedded single-case study. (Yin, 1994) This type of case

study may have some pitfalls. A major one occurs when the case study focuses only on the subunit level and fails to return to the larger unit of analysis. Nonetheless, for this research the units of analysis would provide evidence in order to define and assess the likely collective action outcomes for dairy farmers in Cayambe region. In this way, this research will not fail to focus at the large unit of analysis.

### 1.4.2. Interview methods and data collection

The data required for this research was obtained from primary and secondary sources of data. The major contribution was gathering the primary data, which consisted in an interview to dairy farmers in Cayambe region and also industry expert interviews to processors and retailers, while the secondary data was obtained from private and public sources of information about the dairy sector in Ecuador.

In order to collect the primary data required to address the proposed objectives, an interview to dairy farmers in Cayambe region was conducted. Since there was no public record of dairy farmers in Cayambe, the second best alternative was to rely on data provided by the private sector, which was represented by Cattlemen's Association (CA). Although this dairy farmers' organization provided a list of potential farmers to be interviewed, there was a need to define other ways in order to reach the largest number of dairy farmers to be interviewed. Therefore, the interviews were not randomly selected and were constrained to the willingness of the dairy farmer to be interviewed when contacting by telephone or meeting with the farm manager when visiting a farm.

The main limitation from non-random selection of the interviews is that the data collected for each subunit of analysis may have a poor recall of the population.

According to case study research, the interviewers should be selected deliberately and relying only on availability would not be enough. As it is presented in detail in Chapter II and VI, this research has the limitation that calculations for the population based on the interview may not be representative of the population, especially for the small farms category. Nevertheless, the procedure to conduct the interviews was the best alternative available to interview the largest number of farmers.

There were used three different approaches to interview the farmers. First, the list of farmers in the region with contact information provided by CA, which included the location for some dairy farms, in order to arrange an appointment for the interview either at the farm or at his office or home. Second, CA had an array of stores that offer agricultural inputs to farmers and the store located in Cayambe was the most visited by the majority of dairy farmers thus, in fact, one dairy farmer was contacted at the dairy store in order to arrange an appointment at a later time. Third, since some farms were located close to each other in the same area, the interview was also made to nearby farmers based on information provided by CA as well as by the previously interviewed farmer. On average, two interviews were made daily and as a result 28 dairy farmers where interviewed in Cayambe region.

In addition, in order to have access to small dairy farmers the relationship between Cattlemen's Association and the leader of the community of La Chimba allowed the interviewing in site of small dairy farms. It should be mentioned that CA provided assistance to members of La Chimba in the adoption of pastures and technologies to increase the production of milk. Therefore, with the support of CA this research included this group of dairy farmers, which is an organization of indigenous farmers who have innovated their farming practices and their main agricultural activity is dairy farming.

Appendix A-1 lays out the interview carried out to dairy farmers in Cayambe. The first page of the interview consisted of a consent form, which explained the objective of the research to the farmer and assured the confidentiality of the data to be provided. Upon the farmer's consent to be interviewed by signing the consent form, the next step was to conduct the interview to the farmer. It should be mentioned that the actual interview for the field research was translated to Spanish in order to collect the data in the appropriate language.

The interview had four sections in order to collect the required data for the analysis. The first section consisted in questions about marketing of milk, the second section comprised questions about collective action, the third section included production questions and the fourth section consisted of general questions about the farm and farmer. The data collected by the farmers' interview was the basis for Chapters III, IV, VI and VIII of this thesis.

In addition to the interview to dairy farmers, industry expert interviews were carried out to dairy processors and retailers in Cayambe (see Appendices A-2 and A-3). A total of eight processors were interviewed and four retailers. The data collected from the processors consisted of production data, the seasonality of processing, the price policy adopted to pay dairy farmers, and the wholesale price of dairy products, among others. On the other hand, the interview to retailers included data about the volume and procurement frequency of dairy products, the wholesale and retail prices and the willingness to accept other dairy products for sale. The results of these interviews are presented in Chapter V.

Secondary data was obtained from the following main sources: Cattlemen's Association, the Agricultural Information System of the Ministry of Agriculture (SICA), the Central Bank of Ecuador, and the National Institute of Statistics and Census (INEC). The data obtained from these sources was about the dairy sector and economic variables of Ecuador, which were the basis for Chapters II and VIII.

Primary and secondary data was also collected for the investment analysis of the dairy cooperative. The data was obtained contacting suppliers of dairy equipment in the U.S. as well as from the secondary sources mentioned above. The primary data consisted basically in quotes for the dairy equipment and supplies that would be used by the bargaining and processing dairy cooperative.

### 1.4.3. Data preparation

The data collected in the 28 interviews to dairy farmers was entered in a spreadsheet in order to have coded each question for the analysis. The 60 questions of the interview were codified and entered in a spreadsheet of 195 columns and 29 rows. In this way the data was available for statistical analysis and to create the output tables that would be analyzed.

In a similar way, the data obtained from the industry expert interviews was also codified and entered in a spreadsheet in order to be analyzed. For the processors' interview a spreadsheet with 29 columns and 97 rows was created in order to enter the data collected whereas for the retailers' interview the spreadsheet had 14 columns and 51 rows. For the case of the industry expert interview, the output tables were created in the statistical package SPSS.

For the feasibility analysis of the dairy cooperative the data collected was for 2002; therefore, the information for the estimation of the stream of cash inflows and cash outflows was based on prices for 2002. An investment analysis model was created in a spreadsheet in order to estimate the financial key ratios and sensitivity analysis for the alternatives of collective action among dairy farmers.

# CHAPTER II

# DAIRY MARKET IN ECUADOR: SUPPLY, DEMAND AND POLICIES

This chapter overviews the dairy market in Ecuador including policies and regulations that may affect the formation of a dairy cooperative. The analysis of milk supply products provides an understanding of the actors that participate in the supply chain in order to define the role of a dairy cooperative. Similarly, analysis of demand provides a characterization of end consumers of dairy products who would be potential customers of the dairy cooperative. In addition, the policies and regulation provide the framework under which the cooperative would operate.

## 2.1. SUPPLY

This section includes analysis of raw milk production, dairy farms, trends in farm milk price, processors, distribution channels of milk and dairy products, and imports of dairy products. The potential dairy cooperative would have as members dairy farmers from Cayambe region in Ecuador thus this section focuses on markets participants in this region.

### 2.1.1. Milk production

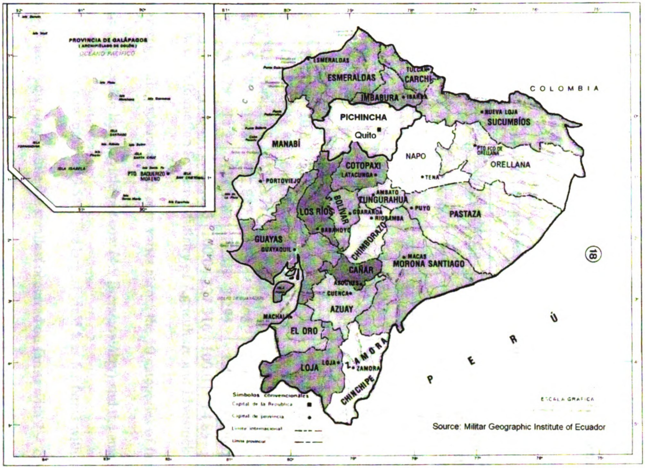
According to the Agricultural Information System (SICA) of the Ministry of Agriculture and Livestock of Ecuador, the production of raw milk totaled 1,922 million liters for 1998. In 1999 production of raw milk grew 8.2% to 2,081 million liters whereas for 2000 decreased 2% to 2,040 million liters.

Milk production of Ecuador is concentrated in the Inter-Andean region (Central Region), where most of the dairy herds are located. Seventy-three percent of the national milk production (2000 Census of Agriculture) takes place in this region, while approximately 18% in the Coast Region (Western Region) and nine percent in the Eastern and Insular Regions (see Figure 1).

According Ministry of Agriculture and Livestock estimates, 32 percent of the gross production of milk is used to feed calves (auto-consumption), and approximately two percent are lost across the supply chain due to mishandling of milk. Therefore, the availability of raw milk for human consumption and processing is 66% of gross production and totaled 1,346 million liters for 2000. The distribution of milk for human consumption is the following: 49% of raw milk available for human consumption is consumed as fluid milk without being processed, 19% percent is processed into pasteurized fluid milk by industrial processors, 6% is transformed into other dairy products like yogurt, cheese, butter, cream and powdered milk, 25% is used by small processors to produce fresh cheese and yogurt, and approximately 1% is exported to Colombia.

The data presented above were the most recent estimates for the domestic distribution of raw milk and corresponded to 1993 (MAG, 1993). It should be mentioned that the current distribution of milk had changed, a relevant fact being the reduction in consumption or raw milk without processing due to the market entry of a transnational dairy processor in 1996.

## Figure 1: Map of Ecuador



Source: Militar Geographic Institute of Ecuador

### 2.1.2. Dairy farms

According to the 2000 Census of Agriculture, there were 237,316 dairy farms in Ecuador. There were 808,856 lactating cows and the average production per cow was 4.4 liters per day or 1,330 liters per year. Table 1 shows the number of milking cows, milk production, farms, average liter per farm, and yield per cow according to the farm size (measured in hectares operated).

**Table 1. Milking cows, milk production and farms in Ecuador**

| Farm Size | Milking Cows | | Milk Production | | Farms | | Average | Yield |
|---|---|---|---|---|---|---|---|---|
| | # | % | Liters/day | % | # | % | Liters/ Farm/ day | Liters/ cow/ day |
| Less than 1 ha | 52,232 | 6.5 | 224,469 | 6.4 | 39,014 | 16.4 | 5.75 | 4.3 |
| 1 - 1.9 ha | 45,558 | 5.6 | 191,574 | 5.4 | 30,247 | 12.7 | 6.33 | 4.2 |
| 2 - 2.9 ha | 39,396 | 4.9 | 160,288 | 4.5 | 22,801 | 9.6 | 7.03 | 4.1 |
| 3 - 4.9 ha | 54,720 | 6.8 | 227,188 | 6.4 | 27,795 | 11.7 | 8.17 | 4.2 |
| 5 - 9.9 ha | 80,210 | 9.9 | 327,755 | 9.3 | 32,338 | 13.6 | 10.14 | 4.1 |
| 10 – 19.9 ha | 87,353 | 10.8 | 345,282 | 9.8 | 27,330 | 11.5 | 12.63 | 4.0 |
| 20 – 49.9 ha | 151,665 | 18.8 | 644,654 | 18.3 | 31,556 | 13.3 | 20.43 | 4.3 |
| 50 – 99.9 ha | 119,962 | 14.8 | 531,871 | 15.1 | 16,132 | 6.8 | 32.97 | 4.4 |
| 100 – 199.9 ha | 87,581 | 10.8 | 432,847 | 12.3 | 6,808 | 2.9 | 63.58 | 4.9 |
| 200 + ha | 90,179 | 11.1 | 439,098 | 12.5 | 3,295 | 1.4 | 133.26 | 4.9 |
| Total | 808,856 | 100.0 | 3,525,026 | 100.0 | 237,316 | 100.0 | 14.85 | 4.4 |

Source: Agricultural Information System, Ministry of Agriculture and Livestock

The average milk production per cow varies across the 10 categories of farm size. The difference between the largest yield per cow (4.9 liters/cow/day) and the smallest yield per cow (4.0 liters/cow/day) is 19.5%. The largest yield was for farms with more than 100 ha (4.9 liters/cow /day) while the smallest occurred on farms with 2 – 2.9 ha and for farms with 5 – 9.9 ha (4.1 liters/cow/day). The results from the 2000 Census of Agriculture did not provide data about the national number of farms according to the size of the milking herd. However, the smallest categories of farms (0 – 0.99 ha) owned, on average, 1.33 milking cows, medium farms (10 – 19.9ha) had 3.2 milking cows and the largest farms (200 + ha) had 27.4 milking cows.

The three largest categories of farms (50 - + ha) produce 40% of the milk in Ecuador and account for 11% of farms, whereas the six smallest categories of farms produce 42% of milk and account for 75% of farms. Farms between 20 and 50 ha produce the largest volume of milk (644,654 liters per day). This category of farms comprises the largest number of milking cows (151,655) and the second largest number of farms (31,556).

#### 2.1.2.1. Dairy farms in Cayambe

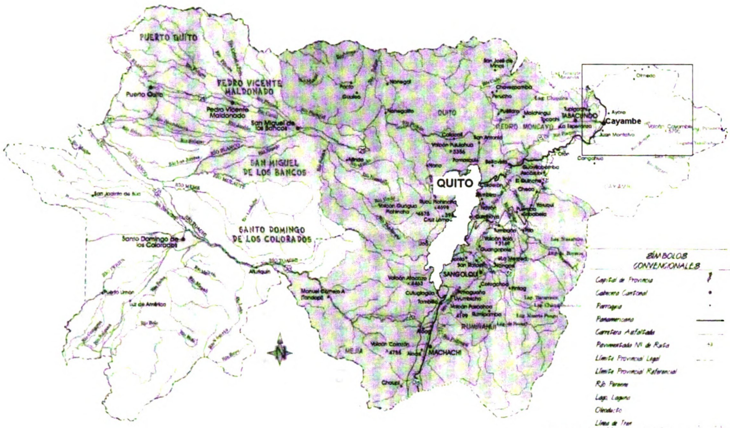
The results from the 2000 Census of Agriculture revealed that there were 3,891 dairy farms in Cayambe, which produced a total of 103,751 liters per day[1]. Milk production in Cayambe represented 14% of milk production in the province of Pichincha, which produced 720,666 liters per day and is the province with the largest production nationwide (20% of national milk production). Figure 2 lays out the map of the province of Pichincha.

Table 2 displays the number of farms, milking cows, milk production and milk marketed according to farm size. Note that about 96% of farms are small with no more than 10 milking cows while 2.6% of farms milk from 11 to 30 cows and 1.3% of farms milk 30 cows or more per day.

[1] This data was requested to the Agricultural Information System of the Ministry of Agriculture, which is the entity that carried out the 2000 Census of Agriculture.

***Figure 2: Map of Pichincha Province***

# Figure 2: Map of Pichincha Province




Source: Military Geographic Institute of Ecuador

**Table 2. Dairy farms, milking cows and milk production in Cayambe**

| Category of Farm | Farms | | Milking cows | | Milk production | | Milk marketed | |
|---|---|---|---|---|---|---|---|---|
| | # | % | # | % | Liters/day | % | Liters/day | % |
| 1 – 10 cows | 3,741 | 96.1 | 7,792 | 60.6 | 38,212 | 36.8 | 35,177 | 36.8 |
| 11 – 29 cows | 99 | 2.6 | 1,398 | 10.9 | 11,613 | 11.2 | 10,286 | 11.2 |
| 30 - + cows | 50 | 1.3 | 3,664 | 28.5 | 53,925 | 52.0 | 47,765 | 52.0 |
| TOTAL | 3,891 | 100.0 | 12,855 | 100.0 | 103,751 | 100.0 | 93,229 | 100.0 |

Source: Agricultural Information System, Ministry of Agriculture and Livestock

Considering average number of cows per farm according to farm size, the data reveal that for small farms the average is 2.1 cows, for medium farms 14.1 cows and for large farms 73 cows. Similarly, average milk marketed per farm and milk production per cow is higher according to farm size. Small farms marketed an average of 9.4 liters of milk per day with a yield per cow of 4.9 liters per day. Medium farms marketed on average 104 liters per day with yield per cow of 8.3 liters per day, while large farms marketed on average 955 liters per day with yield per cow of 14.7 liters per day. This indicates that even the small farms in Cayambe have a yield higher than the national average (4.4 liters/cow/day).

The volume of milk marketed in Cayambe is about 93 thousand liters per day. Approximately 38% is supplied by small farmers, 11% by medium farmers and 51% by large farmers. So that while large farm numbers are significantly less than small farmers, they produce a total volume of milk that is 36% larger than the volume produced by small farmers.

The number of small farms provided by the 2000 Census of Agriculture included farms that did not market milk and the entire production was for self-consumption. Therefore, the 3,741 small farms include farms which would not be potential members of the cooperative whereas all medium and large farms would be potential members. The number of small farmers that did not market milk according to the 2000 Census of Agriculture was provided by the Agricultural Information System and the data shows that 828 small farmers used the production of milk for self-consumption, which reached 3,035 liters of milk that were milked from 966 cows. In this way, the potential number of small farms as members is estimated at 2,913 farms. Thus, the potential members of the cooperative are estimated at 3,062 farms, which comprise 2,913 small farms, 99 medium farms and 50 large farms. The volume of milk marketed by each category would be 35,177 liters per day (12 liters/day/farm), 10,286 liters per day (104 liters/day/farm) and 47,765 liters per day (955 liters/day/farm), respectively.

The size of the categories of farm size in Cayambe was used to estimate averages for the region based on the number of farmers interviewed for each category. This research interviewed eight small farms, five medium farms and 15 large farms (see Figure 3 for location of farms). The small farms belonged to an indigenous community of farmers called "La Chimba", whose characterization is presented in the next section.

The farms were not a random sample; however, for our estimation the interviewed dairy farms are assumed to represent the farms in that size category. A probability of selection is estimated by dividing the number of interviewed farms in the size category by the total number of farms in the category.

In order to estimate averages for the region, the weight or expansion factor placed on such sample farm category is the inverse of the probability of selection. Table 3 lays out the probabilities of selection and the expansion factors for the three categories of farms.

Figure 3: Location of interviewed farms in Cayambe

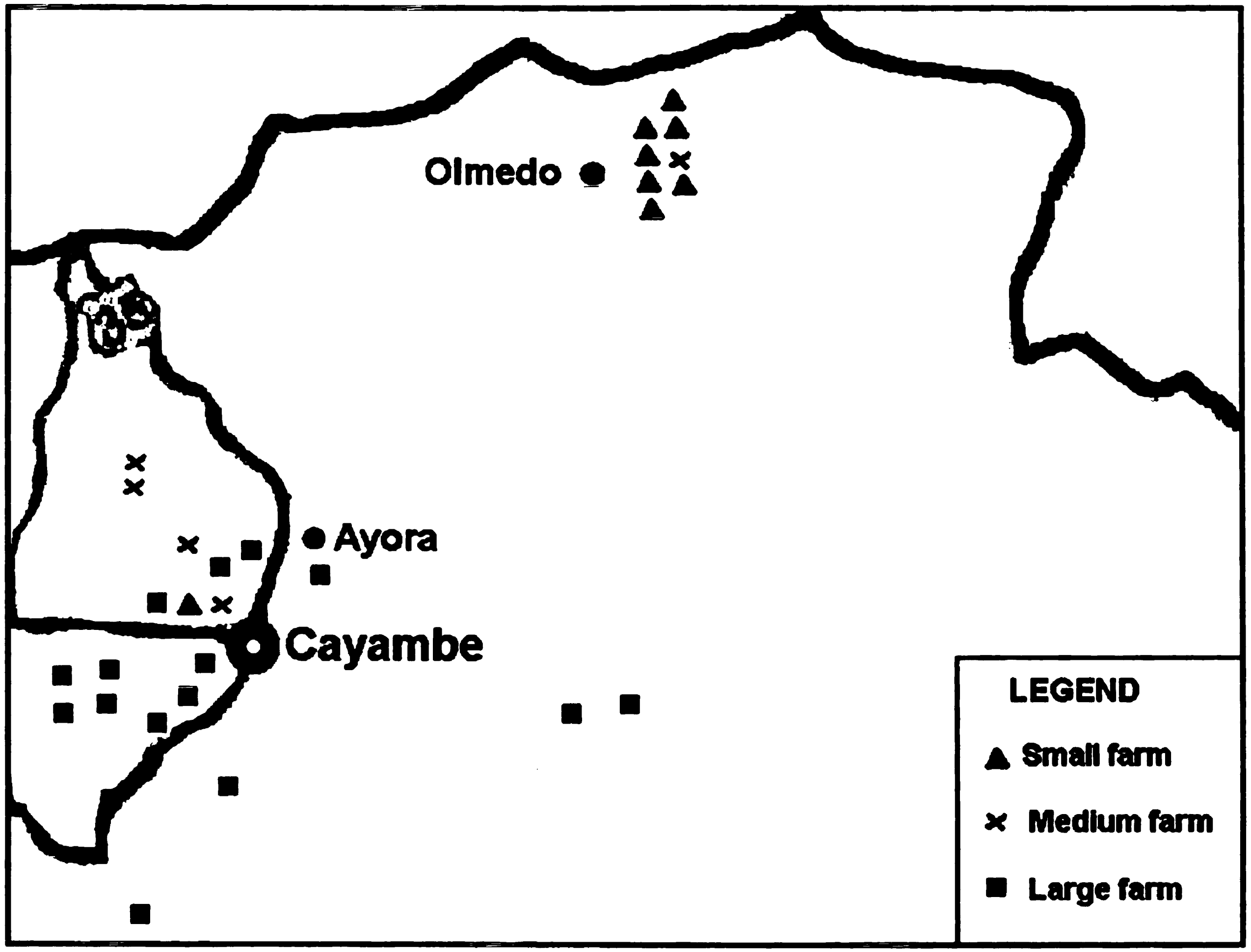


**Table 3. Probability of selection and expansion factors for farm categories**

| Farm size category | Probability of selection per farm | Expansion factor |
|---|---|---|
| Small (1 – 10 cows) | 0.27% | 364.12 |
| Medium (11 – 30 cows) | 5.05% | 19.8 |
| Large (31 - + cows) | 30.0% | 3.33 |

Source: 2000 Census of Agriculture, Agricultural Information System
Interviews to dairy farmers

The expansion factors are the basis to estimate average responses for the region for each size category given the responses of the 28 interviewed farmers. In order to obtain an average for the region each expansion factor is multiplied by the value of the variable. Then, these products are added and divided by the total number of farms, which were 3,062.

Table 4 lays out the destination of milk produced by the dairy farms in Cayambe (2000 Census of Agriculture). About 90% of the milk produced in the farm is marketed, whereas 7.2% is processed in the farm and 2.9% is consumed in the farm for calves' feed or human consumption.

**Table 4. Destination of milk in Cayambe**

| Destination of milk | Liters/day | % |
|---|---|---|
| Milk marketed | 93,229 | 89.9 |
| Self-consumption | 3,035 | 2.9 |
| Processed in farm | 7,464 | 7.2 |
| Other | 23 | 0.0 |
| TOTAL | 103,751 | 100.0 |

Source: Agricultural Information System, Ministry of
Agriculture and Livestock

### 2.1.2.2. Community of "La Chimba"

"La Chimba" is one of six communities of small indigenous farmers that are located in the highlands at Cayambe region close to the village of Olmedo. Cattlemen's

Association carried out a survey in 2001 to farmers of this community and data was collected from 112 farmers. For the purpose of this research, data analyzed includes the use of land, categories of livestock, production of milk, technical practices among the farmers, and categories of milk buyer.

The 112 dairy farmers owned an average of 7.5 ha and the average use of land was 2.4 ha in natural pastures, 1.3 ha in cultivated pastures, 2.6 ha for crops and 1.20 ha were not farmed. Land used for crops totaled 291.75 ha and the main crops were potatoes (32.2%), barley (22.5%), maize (9%), wheat (8%) and fava beans (7%).

Dairy farmers owned on average a dairy herd of 11 animals, which included 4.21 lactating cows, 1.54 dry cows, 1.9 heifers, 1.49 calves, 0.90 steers and 0.93 bulls. There were a total of 472 lactating cows, 172 dry cows, 213 heifers, and 167 calves. The farmers also owned other livestock, including 1.16 horses on average, 2.95 pigs and 7.84 sheep.

The production of milk in "La Chimba" totaled 3,107 liters per day with an average production per farm of 27.75 liters and 6.58 liters for the yield per cow. The gross production of milk was either marketed to a middleman (96.69%) or self-consumed in the farm (3.31%). Thus, the volume of milk marketed was 3,005 liters per day.

The survey included two questions about herd management. The first consisted in asking whether the farmer washes the cow's udder before milking and 80.36% of farmers affirmed to practice this technique. Farmers were also asked about the breeding technique. Fifty-five percent of farmers used controlled natural breeding, 12.5% used free natural breeding, and 16% used artificial insemination, 14.3% used a mixed breeding technique, and the remaining 2.2% did not own a dairy herd.

Regarding the milk buyer, there were 16 individuals and one processor that bought the milk from the dairy farmers. The market of raw milk in "La Chimba" can be characterized as oligopsonistic since the four-buyer concentration ratio is 63%. The largest volume acquired by one middleman was 724 liters per day and represented 24% of the marketed volume of milk in the community.

### 2.1.3. Farm prices of milk

The farm prices of milk in Ecuador have varied significantly during the period 1998-2001. Table 5 shows that the average farm price was 28 cents per liter of milk in the first quarter of 1998 and declined to reach the lowest value of 11 cents in the first quarter of 2000. Then, the farm price increased gradually until the third quarter of 2001 to the level of 27 cents (CA, 2001).

**Table 5. Average farm prices of milk in Ecuador (US dollars / liter)**

| Year | Quarter I | Quarter II | Quarter III | Quarter IV | Average |
|---|---|---|---|---|---|
| 1998 | 0.28 | 0.27 | 0.27 | 0.25 | 0.27 |
| 1999 | 0.20 | 0.19 | 0.18 | 0.13 | 0.18 |
| 2000 | 0.11 | 0.16 | 0.19 | 0.20 | 0.17 |
| 2001 | 0.22 | 0.24 | 0.27 | 0.27 | 0.25 |

Source: Cattlemen's Association, 2001

The declining trend of the farm price in US dollars during 1998 and 1999 was a result of macroeconomic instability and banking crisis, which eroded the value of the domestic currency (sucre). The combined effect that during 1999 the sucre (Ecuadorian currency) was devaluated 179% and the inflation reached 60% drove to a decrease of 46% in the farm price of milk in US dollars. In January 2000, the Government adopted the US dollar as the domestic currency with fixed exchange rate of 25,000 sucres per dollar. Since January 2000 the farm prices of milk increased significantly to reach the levels previous to the crisis that affected the economy during 1999.

The price policy adopted by the dairy processors to pay dairy farmers for milk differs significantly. Dairy processors define their own quality standards for raw milk. The most common tests for raw milk is for fat, water content and reductase whereas processors that pay for high quality milk test also on antibiotics and some on total solids and the pricing policy is communicated effectively to encourage high quality raw milk. Processors that pay for high quality milk are usually mid-size processors that procure about 30,000 liters per day while the largest processors, which procure above 100,000 liters per day, have less clear pricing policy with regard to quality incentives to the extent that it is often not communicated effectively to dairy farmers.

### 2.1.4. Dairy processors

Milk is processed either by industrial processors or by small cheese processors. Industrial processors are characterized for processing more than 10,000 liters per day while small processors purchase less than 10,000 liters of milk per day and produce mainly cheese and yogurt. There were 26 industrial processors and more than 2,000 small processors for 2000. The four largest industrial processors process 62% of the raw milk that is absorbed by the industrial processors and represents 17% of raw milk available for human consumption. (Cattlemen's Association, 2000)

According to data collected by Cattlemen's Association of Ecuador, 72% of milk processed by industrial processors was marketed as pasteurized milk while 13% is transformed in whole milk powder, 9% into cheese, 4% yogurt and less than 2% in butter and cream.

Regarding the procurement of raw milk, most industrial processors have either integrated backward in the supply chain by providing the transportation service of milk from the farm to the processing facility or contracted with private milk haulers. The processors that have integrated backward own cooling milk trucks and/or trucks to transport the milk to the processing facility. On the other hand, most small processors acquire milk from middlemen who buy the milk from dairy farms and transport the milk in 40-liter cans.

There were no public statistics about the volume that processors process in Cayambe. However, on the basis of data obtained from the industry expert interview to processors as well as data from the 2000 Census of Agriculture and Cattlemen's Association, an estimation of the flow volume of milk from dairy farms to processors can be estimated. Four dairy industrial processors in Cayambe region processed a total of about 246,000 liters per day, and about 27%[2] (67,400 liters per day) of the milk was acquired from farmers in Cayambe region. In contrast, there were about 40 small processors, which collect approximately 25,600 liters per day, and procured the milk only from dairy farmers in Cayambe. In this way, the volume of milk marketed in Cayambe reached 93,000 liters per day. Industrial processors in Cayambe produced daily among the most important dairy products the following: 23,830 kg of milk powder, 7,650 liters of pasteurized milk, 9,000 liters of yogurt, 1,944 kg of fresh cheese and 1,775 kg of

[2] Estimation obtained from data provided by Cattlemen's Association and from the industry expert interviews to processors (analysis in Chapter VII).

mozzarella cheese. Small processors produced mainly fresh cheese, mozzarella cheese and yogurt.

### 2.1.5. Distribution channels for milk and dairy products

As it was described above in the section about milk production, 49% of raw milk was marketed to the consumer without being processed while the remaining 51% was processed into dairy products and marketed to the end consumer. Thus, there were two main distribution channels, an informal channel for the raw milk that is consumed and a formal channel for milk that is processed. Most milk that was marketed through the informal channel was produced by small dairy farms while most raw milk marketed through the formal channel was originated in medium and large farms.

The marketing channel for raw milk that is consumed directly consists of one or two distribution agents between the dairy farm and the end consumer. These agents are a middleman and a clandestine distributor who acquire raw milk from the dairy farms and transports it to the urban areas to either sell directly to the consumer in unsafe plastic bags or supply with raw milk to small retailers.

The marketing channels for processed milk are divided in two stages across the supply chain. The first stage includes the marketing channels of raw milk from dairy farms to the processors, and the second stage includes marketing channels of dairy products from the processor to the consumer. In the first stage, either a dairy processor or a middleman acquires raw milk from dairy farms. The common marketing channels in this stage are: 1) industrial processors buying milk from large and medium size farmers, and 2) small processors and middlemen buying milk from small and also medium farms.

For the second stage, the industrial and small processors market dairy products to the wholesaler who delivers to the retailer. In addition, there are small processors that have integrated forward in the supply chain and offer their products to the consumer in their own retail stores.

### 2.1.6. Imports of dairy products

Ecuador's dairy products imports declined between 1998 until 2000 and increased in 2001. Table 6 shows that for 1998 imports were 74,684 thousands liters milk-equivalents and decreased 90.4% to reach 7,188 thousand liters milk-equivalents in 2000. For 2001 imports increased about 100% to reach 14,292 thousand liters milk equivalents[3]. The volume of imports in 1998 was the highest in the decade of the 1990's.

**Table 6. Imports of dairy products in milk equivalents**

| PRODUCT | 1998 | | 1999 | | 2000 | | 2001 | |
|---|---|---|---|---|---|---|---|---|
| | 1,000 lt | % | 1,000 lt | % | 1,000 lt | % | 1,000 lt | % |
| Nonfat dry milk | 27,971 | 37% | 2,258 | 13% | 712 | 10% | 1,921 | 13% |
| Whole milk pow. | 27,095 | 36% | 5,984 | 34% | 932 | 13% | 2,002 | 14% |
| Milk cream | 1,524 | 2% | 661 | 4% | 71 | 1% | 883 | 6% |
| Condensed milk | 2,109 | 3% | 1,419 | 8% | 1,866 | 26% | 2,325 | 16% |
| Evaporated milk | 348 | 0% | 339 | 2% | 407 | 6% | 469 | 3% |
| Cheese | 4,896 | 7% | 2,516 | 14% | 1,016 | 14% | 2,227 | 16% |
| Yogurt | 5,601 | 8% | 1,841 | 10% | 24 | 0% | 282 | 2% |
| Whey powder | 5,139 | 7% | 2,538 | 14% | 2,161 | 30% | 4,183 | 29% |
| TOTAL | 74,684 | 100% | 17,556 | 100% | 7,188 | 100% | 14,292 | 100% |

Source: Foreign Trade Statistics, Central Bank of Ecuador.

Regarding the composition of dairy imports, there were two trends between 1998

[3] The volume of imports were obtained from the Central Bank of Ecuador and converted to milk-equivalents obtained from Bailey, Kenneth, Marketing and Pricing of Milk and Dairy Products in the United States, Iowa State University Press, 1997.

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and 2001. The imports of nonfat dry milk (NFDM), whole milk powder (WMP) and yogurt declined significantly while the imports of condensed milk, evaporated milk and whey powder were relatively constant.

The behavior described above reflects the fact that the domestic market of dairy products depends less on imports of those products that are also produced domestically, which include NFDM, WMP, and yogurt. In contrast, the supply of dairy products not produced domestically, like evaporated and condensed milk, relies on imports.

Although dairy products were imported from 29 different countries in the period 1998-2001, 83% of total imports were supplied by five countries, which include Colombia (34%), Chile (20%), USA (17%), the Netherlands (7%) and Peru (5%). The main suppliers of powdered milk were the USA (49% NFDM and 18% WMP), the Netherlands (12.3% NFDM and 18% WMP%), Germany (10% NFDM and 7% WMP) and Chile (15.5% WMP). The imports of condensed milk, evaporated milk, cream and yogurt originated at least 75% in solely one country for each product. Colombia provided 93% of the imports of cream and 98% of imports of yogurt, whereas Chile supplied 75% of condensed milk imports and Peru 99% of evaporated milk imports. The imports of cheese originated 52% in Colombia and about 44% in USA while the imports of whey were supplied primarily by the USA (about 32%) and other countries with at least a 10% share were Belgium, the Netherlands and Chile.

## 2.2. DEMAND

This section includes the analysis of the actors in the demand side of the dairy market. Milk and dairy products have a high nutritional value and are consumed daily by the population. However, household income level is a budget constraint relevant to food consumptions decisions in developing countries. This section analyzes the population and income level, consumption of dairy products, supply and utilization of milk, and also exports of dairy products.

**2.2.1. Population and income level**

Ecuador is a developing country with a low gross domestic product (GDP) per-capita and wealth distribution is very uneven. During the period 1999-2000 the Ecuadorian economy experienced a major economic contraction as a result of a banking crisis and macroeconomic instability. According to the Central Bank of Ecuador, the GDP per-capita decreased from $2,035 in 1998 to $1,338 in 2000 but in 2001 this economic indicator increased to $1,729.

The percentage of population below the poverty line has been increasing in the recent years. Thirty-four percent of the population was below the poverty line in 1995 and increased to 56% in 1999. The high percentage of population under the poverty line is explained since the minimum wage set by the government for April 2002 was $128.8 and the cost of the basket of goods was $330.31 for a 5-member family. The level of extreme poverty has also increased significantly in the last years from 12% of population in 1995 to 21% in 1999, which means that more than one of each five Ecuadorians live in households that can not afford to satisfy its food needs. (SIISE, 2002)

The latest data available from the National Institute of Statistics and Census of Ecuador (INEC) for population according to income level was for 1995 and included only the urban households. The income-level structure of urban population for 1995 was calcul

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calculated and used to estimate the figures of income-level structure for 2001 based on the preliminary results of the 2001 Census of Population, which indicate that total population was 12,090,804 habitants and urban population represented 61% of total population.

**Table 7. Urban Population by income level for 2001 (estimation)**

| Annual Income Level (US dollars) | Urban Population | % | Households | % |
|---|---|---|---|---|
| 0 - 1,876 | 666,653 | 9.0% | 194,410 | 12.1% |
| 1,877 – 3,754 | 2,165,484 | 29.4% | 504,051 | 31.3% |
| 3,755 – 7,508 | 2,718,614 | 36.9% | 550,567 | 34.2% |
| 7,509 - 11,263 | 857,637 | 11.6% | 166,545 | 10.3% |
| 11,264 - 15,017 | 362,264 | 4.9% | 73,502 | 4.6% |
| 15,018 - 18,771 | 194,770 | 2.6% | 37,540 | 2.3% |
| 18,772 - 26,279 | 191,913 | 2.6% | 38,170 | 2.4% |
| 26,280 - 33,788 | 82,817 | 1.1% | 17,190 | 1.1% |
| 33,789 - 84,469 | 107,065 | 1.5% | 22,369 | 1.4% |
| 84,470 - + | 25,313 | 0.3% | 5,095 | 0.3% |
| Total | 7,372,528 | 100% | 1,609,441 | 100% |

Sources: 2001 Census of Population, INEC.
1995 Consumption Survey to Urban Households, INEC.

Table 7 shows that about 66% of urban population earned an annual income between $1,877 and $7,508 dollars while 2.9% of urban population earned an annual income of more than $26,279 dollars. The minimum annual wage set by the government was $1,655 for 1995 and $1,503 for 2001. Thus, urban population was concentrated in the low ranges of income and earned an annual income that at most represented five times the minimum wage.

### 2.2.2. Consumption of dairy products

The per-capita consumption of dairy products was 107 liters/person/year for 1999 (SICA, 2002) and there are no officially estimated figures for later years. Nevertheless, the estimation of the volume of milk-equivalents for human consumption and dividing this value by the population provides a proxy indicator of the average per-capita consumption of dairy products. Table 8 displays the calculations and for 2000 the per-capita consumption of dairy products for urban population reached 90.4 liters/pers/year.

INEC carried out in 1995 a survey to urban households in order to estimate the consumption level of food items including raw and processed goods. The results from this survey were the basis to estimate the per-capita consumption of dairy products for urban households.

**Table 8. Per-capita consumption of dairy products for urban population**

| Income level | Per-capita consumption in milk-equivalents (liters) | | | | | |
|---|---|---|---|---|---|---|
| | Raw milk | Pasteurized milk | Fresh cheese | Yogurt | Powdered milk | Total |
| 0 - 1,876 | 13.8 | 15.2 | 15.7 | 0.0 | 0.7 | 45.5 |
| 1,877 - 3,754 | 16.8 | 25.4 | 22.8 | 0.1 | 1.8 | 66.9 |
| 3,755 - 7,508 | 23.0 | 35.5 | 26.4 | 0.2 | 2.4 | 87.5 |
| 7,509 - 11,263 | 31.4 | 47.9 | 35.3 | 0.5 | 4.7 | 119.7 |
| 11,264 - 15,017 | 34.1 | 64.9 | 43.7 | 0.8 | 6.5 | 150.0 |
| 15,018 - 18,771 | 33.5 | 63.2 | 42.6 | 1.0 | 5.0 | 145.2 |
| 18,772 - 26,279 | 38.9 | 67.0 | 52.6 | 1.0 | 9.9 | 169.4 |
| 26,280 - 33,788 | 32.4 | 80.7 | 58.8 | 1.2 | 8.8 | 182.0 |
| 33,789 - 84,469 | 22.8 | 66.1 | 51.2 | 2.0 | 16.3 | 158.4 |
| 84,470 - + | 17.1 | 37.4 | 54.0 | 13.5 | 11.2 | 133.1 |
| Total urban pop. | 22.7 | 36.1 | 28.2 | 0.3 | 3.1 | 90.4 |

Source: 1995 Survey to Urban Households, INEC.

Table 8 shows that the highest per-capita consumption of dairy products was concentrated in high-income households. The population in the third largest range of income consumed 182 liters per year and comprised only 1.1% of urban population. Conversely, the lowest per-capita consumption (45.5 liters/hab/year) was for population in the lowest income level and included 9% of urban population. In addition, the second and third income-level ranges included 65% of urban population and consumed on average about 67 and 87 liters per year, respectively.

Regarding per-capita consumption of the five dairy products considered in the survey, for raw milk, pasteurized milk and fresh cheese the per-capita consumption increases until the third or fourth largest range of income and then it decreases, which means that these dairy products are normal goods for low and middle income level and inferior goods for high-income levels. On the other hand, yogurt and powdered milk are normal goods for urban population, except for powdered milk, in the highest range of income-level. This behavior suggests that high-income urban households replace some of the reduction in the per-capita consumption of pasteurized milk, raw milk and fresh cheese with more value-added dairy products like yogurt and powdered milk.

### 2.2.3. Retail prices of pasteurized milk

Similarly as the farm price of raw milk, the price of pasteurized milk varied significantly during the period 1998-2001. Table 9 shows that the average retail price was 50 cents per liter in the first quarter of 1998 and declined to reach the lowest value of 24 cents in the first quarter of 2000. Then, the retail price increased gradually to reach 49 cents for the third and fourth quarters of 2001.

**Table 9. Average retail prices of pasteurized milk in Ecuador (USD / liter)**

| Year | Quarter I | Quarter II | Quarter III | Quarter IV | Average |
|---|---|---|---|---|---|
| 1998 | 0.50 | 0.51 | 0.51 | 0.47 | 0.50 |
| 1999 | 0.40 | 0.40 | 0.35 | 0.26 | 0.35 |
| 2000 | 0.24 | 0.35 | 0.38 | 0.38 | 0.34 |
| 2001 | 0.44 | 0.48 | 0.49 | 0.49 | 0.48 |

Source: Agricultural Information System, Ministry of Agriculture and Livestock

Similar as the behavior of the farm milk price, the declining trend of pasteurized milk retail prices during 1998 and 1999 was the result of high inflation and devaluation of the domestic currency that affected the economy during 1999. During 1999 the retail price decreased 41% (44 cents in January to 26 cents in December 1999). The adoption of the US dollar as the domestic currency in January 2000 stopped the devaluation process and the retail price increased significantly.

### 2.2.4. Exports of dairy products

Ecuador's dairy products exports are marginal in the balance of trade. According to the Central Bank of Ecuador, dairy products exports for the period 1998-2001 accounted for an average of 3% of total exports measured in US dollars. Table 10 shows that, in general, Ecuador's dairy products exports increased from 1,932 thousand liters milk-equivalents in 1998 to 10,902 thousand liters in 2000. In 2001 dairy exports decreased 74% to only 2,834 thousand milk-equivalent liters.

**Table 10. Exports of dairy products in milk equivalents**

| PRODUCT | 1998 | | 1999 | | 2000 | | 2001 | |
|---|---|---|---|---|---|---|---|---|
| | 1,000 lt | % | 1,000 lt | % | 1,000 lt | % | 1,000 lt | % |
| Nonfat dry milk | 1,262 | 65% | 2,457 | 31% | 1,654 | 15% | - | 0% |
| Whole milk pow. | - | 0% | 3,342 | 42% | 5,375 | 49% | 2,127 | 75% |
| Fluid milk | 11 | 1% | 115 | 1% | 86 | 1% | 100 | 4% |
| Milk cream | - | 0% | 1,480 | 19% | 2,383 | 22% | 43 | 2% |
| Butter | 265 | 14% | 140 | 2% | 1,300 | 12% | 533 | 19% |
| Cheese | 234 | 12% | 283 | 4% | 79 | 1% | 18 | 1% |
| Yogurt | 160 | 8% | 105 | 1% | 25 | 0% | 13 | 0% |
| TOTAL | 1,932 | 100% | 7,923 | 100% | 10,902 | 100% | 2,834 | 100% |

Source: Foreign Trade Statistics, Central Bank of Ecuador.

There is an inverse correlation between the changes in farm price (Table 5) and changes in exports (Table 10). Most foreign trade of dairy products is made by a single transnational processor and in order to maximize its profitability exports increase when the real cost of milk procurement is lower in the exporter country than in other regional countries where the firm has processing plants.

Regarding the dairy products exported, the largest quantity was powdered milk (nonfat dry milk or whole milk powder) and accounted for 64% or more of total dairy exports. The destinations of powdered milk were mostly countries members of the Andean Community of Nations. The major market of powdered milk was Venezuela with 66% of the total exports of powdered milk during 1998-2001, and other relevant markets were Colombia and Peru. The markets for fluid milk and milk cream in order of importance were Colombia (78%), Peru (15%) and Belize (7%).

In general, the exports of dairy products have not been regular to the destination countries with the exception of whole milk powder to Venezuela, butter to Colombia, and cheese to USA. Exports of cheese, butter and milk cream were erratic during 1998-2001 while the exports of yogurt declined. The largest volume of cheese was 283 thousand milk-equivalent liters in 1999 and the lowest 18 thousand milk-equivalent liters in 2001, whereas for butter the largest volume was 1,300 thousand liters in 2000 and the lowest 140 thousand milk-equivalent liters in 1999. During the period 1998 – 2001 the markets for cheese were Colombia (64%), Peru (13%), USA (13%) and N. Korea (10%), for butter and milk cream was Colombia (100%), and for yogurt were Trinidad & Tobago (62%), USA (26%) and Jamaica (12%).

### 2.2.5. Supply and utilization of milk

An analysis of the supply and utilization of milk helps explain dependence of the domestic dairy market from on foreign production. Table 11 shows that the participation of total imports of dairy products in total supply had decreased from 3.8% in 1998 to 0.4% in 2000 whereas the participation of exports in total utilization had increased from 0.1% to 0.5%.

**Table 11. Supply and utilization of milk and dairy products**

| | 1998 | 1999 | 2000 |
|---|---|---|---|
| Gross Production (thousand liters) | 1,922,942 | 2,081,376 | 2,040,000 |
| - Losses (2% of GP) | 38,459 | 41,628 | 40,800 |
| = Production available (thousand liters) | 1,884,483 | 2,039,748 | 1,999,200 |
| + Imports of dairy products (thousand milk-equivalents) | 74,684 | 17,556 | 7,188 |
| **= SUPPLY (thousand liter milk-equivalents)** | **1,959,167** | **2,057,304** | **2,006,388** |
| Feed for calves and consumption in farms (thousand liters) | 615,341 | 666,040 | 652,800 |
| + Human use (thousand milk-equivalents) | 1,341,894 | 1,383,341 | 1,342,686 |
| + Exports (thousand milk-equivalents) | 1,932 | 7,923 | 10,902 |
| **= UTILIZATION (thousand liter milk-equivalents)** | **1,959,167** | **2,057,304** | **2,006,388** |
| Total imports / Supply | 3.8% | 0.9% | 0.4% |
| Total exports / Supply | 0.1% | 0.4% | 0.5% |
| Total imports / Human use | 5.6% | 1.3% | 0.5% |
| Total exports / Human use | 0.1% | 0.6% | 0.8% |
| Population (thousands) | 12,175 | 12,411 | 12,646 |
| Per-capita consumption of milk and dairy products (liters/yr.) | 110.22 | 111.46 | 106.17 |

Sources: Agricultural Information System, Ministry of Agriculture
Foreign Trade Statistcis, Central Bank of Ecuador

Ninety-six percent of the supply of milk in Ecuador has been produced domestically in 1998 and increased to 99% in 2000. Thus, the foreign market of dairy products has a marginal participation in the supply of milk given in milk - equivalents. Similarly, when calculating the share of dairy imports in the volume of milk for human use, the participation of imports decreased from 5.6% in 1998 to 1.3% in 1999 and 0.5% in 2000. Further, for 1998 imports of WMP represented 10.6% of pasteurized milk processed domestically, which is WMP's direct substitute in households' consumption, and declined to 2.2% in 1999 and 0.3% in 2000. For other dairy products like evaporated milk, condensed milk and whey powder, imports represent 100% of total supply since these products are not produced domestically.

The statistics suggests that the domestic market of milk for human use has decreased its dependency in the foreign market to supply dairy products that are widely consumed, which is the case of powdered milk as a substitute for pasteurized milk.

## 2.3. POLICIES AND REGULATIONS

This section presents the analysis of policies and regulations that affect the dairy market in Ecuador with the objective to draw the framework under which a dairy cooperative may be conceived. The elements of the framework that are relevant for a start-up dairy cooperative are the "price band" and the "law for cooperatives".

### 2.3.1. Price Band

Ecuador adopted a price band for agricultural products where international markets are characterized by high price instability and distortions as a result of agricultural policies adopted by the major exporting and importing countries of agricultural commodities and food. This instrument was introduced in January 1993 for rice, corn, barley and sugar, and in July 1993 milk was included in the mechanism. Later, the Price Band Andean System (PBAS) was adopted in February 1995 as an instrument to harmonize imports among member countries of the Andean Community of Nations, with the exception of Peru. PBAS stabilizes import costs of the included agricultural goods. (SICA, 2002)

The Price Band consists in fixing a floor price and a ceiling price for the import cost of a commodity and these prices are calculated annually. Imports price stabilization is achieved by increasing the ad-valorem tariff whenever the international referenced price is below the floor price and reducing the tariff whenever the international price is above the ceiling price. For the first case the additional tariff level that is added to the ad-valorem is called 'extra variable duty' and for the case when the ad-valorem tariff is reduced is called 'tariff reduction'. The international referenced price is updated fortnightly and for milk is the price in New Zealand.

There are two different kinds of commodities in the price band, referenced and related commodities. Referenced commodities are those which international prices are used to calculate the price band whereas related commodities are either a result of processing or mixing referenced commodities, or a substitute good for industrial use or final consumption of a referenced commodity or byproduct. Thus, the price band includes all the substitute goods or byproducts in order to avoid trade distortions. For the case of milk the referenced commodity is whole milk powder[4] and there are 27

[4] Powdered milk with at least 26% fat, free of sugar or any other sweetener and packed in containers weighting at least 2.5 Kg net weight.

related commodities, including NFDM, dry milk fat, evaporated milk, whey, butter and cheese.

Table 12 lays out the average tariff for whole milk powder given by the PABS between 1995 and 2001. The ad-valorem tariff for milk is 20% thus PABS has increased the tariff for most of the cases. During 1996, the international referenced price boost so there was a tariff reduction that reached 11% on average during the second trimester. From March 1999 until February 2001 the Government[5] established a safeguard for imports being 10% for milk thus the ad-valorem tariff increased during this period to 30%. In contrast, from 1998 through 2000 the international referenced price dropped so the tariff included up to 33% of extra variable duty on average for the first semester of 2000. During 2001, the international referenced price increased and reached a level between the floor and ceiling prices so the tariff was solely the ad-valorem.

**Table 12. Tariff for whole milk powder**

| Year | Quarter I | Quarter II | Quarter III | Quarter IV |
|---|---|---|---|---|
| 1995 | 45% | 35% | 24% | 19% |
| 1996 | 17% | 9% | 18% | 17% |
| 1997 | 20% | 26% | 27% | 36% |
| 1998 | 38% | 36% | 41% | 39% |
| 1999 | 46% | 55% | 53% | 56% |
| 2000 | 63% | 62% | 57% | 44% |
| 2001 | 37% | 22% | 21% | 20% |

Source: Agricultural Information System, Ministry of Agriculture and Livestock.

[5] The Executive Decree No. 609 of February 19, 1999 established a safeguard of 10% for whole milk powder.

### 2.3.2. Law for cooperatives[6]

The Ecuadorian law for cooperatives is given by the Law and Regulations for Cooperatives. The legislation was issued in 1966 and the latest reform was in 1999. The following sections depict the elements that should be taken into account to start a dairy cooperative.

#### 2.3.2.1. Principles of cooperatives

Cooperatives must abide the universal principles of cooperatives, including the following:

- Equal rights to all members,
- Open membership,
- Every member has the right to vote, elect and be elected,
- Limited interest rate over the capital invested and for neither case would be higher than 6%,
- Distribution of earnings according to the volume of operations that members have done with the cooperative or based on work done by members,
- No discrimination and neutrality in politics, religion and race,
- Variability of equity capital.

These principles provide a typical framework for cooperatives and assert the basic conditions for the start-up. Further are presented the types of cooperatives related to dairy

[6] The law was issued on the Supreme Decree 1031, Official Registry 123, September 20, 1966. This law has been modified by the Supreme Decree 3688-A (OR 892, Aug. 9, 1979), the Law 56 of Internal Taxes Regime (OR 341, Dec. 22, 1989), the Resolution of the Constitutional Guarantees Tribunal (OR 798, Oct. 25, 1991), Resolution of the Supreme Court of Justice (OR 299, Oct. 19, 1993), and the Law 74 of General Insurance (OR 290, Apr. 3, 1998).

farming, the rights and responsibilities of members, and the distribution of earnings among members.

#### 2.3.2.2. Types of cooperatives related to dairy farming

The legislation for cooperatives defines four categories of cooperatives: production, services, credit, and consumption cooperatives. Dairy farmers may organize cooperatives in any category, except for consumption cooperatives.

Production cooperatives are those whose members are devoted to legal activities in a jointly managed firm. Within this type of category there are two kinds of cooperatives where dairy farmers may be involved, *livestock cooperatives* and *dairy cooperatives*. Livestock cooperatives are devoted to promote and improve livestock production, and to market or process milk, meat and byproducts whereas dairy cooperatives are dedicated to processing and marketing milk and dairy products.

Services cooperatives organize to satisfy needs of members like transportation, electricity, irrigation and agricultural services. At least two kinds of cooperatives within this category may be organized by dairy farmers. First, *agricultural input cooperatives*, which purchases inputs like seeds, fertilizers and tools for its members; and second, *agricultural machinery rent cooperatives*, which rent machinery and equipment to farmers that lack the use of machinery for farming.

Credit cooperatives are financial institutions that receive deposits from members and offer loans to them. Within this category of cooperatives, dairy farmers may organize an *agricultural financial services cooperative*. This kind of cooperative devotes to offer credit to members for agricultural development or for purchasing inputs.

#### 2.3.2.3. Cooperative Members – rights and responsibilities

In order to start a cooperative the minimum number of members is at least eleven individuals or legal entities or only three legal entities, except for consumption cooperatives whose minimum number is 50 individuals.

The rights and responsibilities of members are:

- Pay at least 50% of the membership value when acquiring the share of certificates and cancel the remaining amount in a deadline agreed between the member and the cooperative,
- Attend annual meetings,
- Every member will have the right to one vote, regardless of the number of shares the member owns,
- Abide the obligations and commitments with the cooperative,
- Have access to reports about the cooperative's performance from higher hierarchy organizations,
- Receive benefits the cooperative offers to members,
- New members that join a cooperative will be equitably responsible for past liabilities acquired by the cooperative,
- Members can leave the cooperative at any time, in which case they will not be responsible for future liabilities of the organization,

(Ley de Cooperativas, 2001).

#### 2.3.2.4. Member investment and distribution of earnings

The capital invested by members in a cooperative is represented by *membership certificates* of the same value and transferable only to other members under the approval of the Cooperative's Administration Council. Cooperatives must have authorization from the Ministry of Labor and Human Resources to issue membership certificates.

The net earnings gained by the cooperative includes deductions for administrative expenses, depreciation and the interest of membership certificates. The resulting net earnings must be distributed in the following way:

- At least 20% will go to the non-distributable reserve account until its balance equals the amount of capital. Thereafter, this fund will receive 10% of net earnings permanently.
- 5% will be used for education and another 5% for social assistance and prevention.
- The remaining net earnings will be distributed among members based on the business or work of members with the cooperative.

Nevertheless, the cooperative's general assembly may decide not to pay interest on membership certificates, net earnings to members, or both during a defined period of time with the objective to raise capital for the cooperative. In this case the cooperative must issue membership certificates for the amount of interests not paid and earnings not distributed.

#### 2.3.2.5. Benefits for cooperatives

Cooperatives are subject to a particular treatment by the State in order to promote their creation and development. The special benefits for cooperatives are:

- Taxes exemptions and responsibilities: Cooperatives are exempt of fiscal, municipal and other especial taxes that are charged when trading real state buildings. Cooperatives are also exempt of taxes and fees required to become a legal organization and for the participation in judicial processes. However, according to the Law of Internal Taxes Regime[7], cooperatives are exempt of income taxes only when members are the only small farmers. If this is not the case, the cooperative is subject to income tax and for 2002 was 15%. Also, members are not exempt of paying their income taxes that are an obligation of Ecuadorian citizens.
- Cooperatives will give preference in bids summoned by the Government, Municipalities or other public organizations whenever cooperatives participate under the same conditions as other participants.
- State guarantee: The State will be the guarantor of credits contracted between cooperatives and international agencies, banks or organizations. It is a requirement that the resources are used to finance projects or programs of the lending institutions which success is assured.
- Cooperatives could have agreement with foreign cooperatives to trade products.

#### 2.3.2.6. Organizational levels of cooperatives

Cooperatives may establish links with other cooperatives and would also bond together into national organizations. The horizontal coordination across cooperatives may result in two kinds of outcomes, which are unions and associations. Unions are the result of partnering two or more cooperatives of a same type either in a temporary or permanent timeframe, and their objectives are to become more successful and have more

[7] Law 56 of Internal Taxes Regime (OR 341, Dec. 22, 1989)

power to defend their economic and social interests. Likewise, associations follow the same objectives as the unions but are the result of partnering two or more cooperatives of different kind.

National federations of cooperatives are second level organizations that gather together cooperatives of the same kind. The minimum number to form a national federation is 21 cooperatives from at least seven different provinces. Provided that cooperatives are devoted to promote the production of such commodities that could only be produced in certain regions of the country, the requirement of the minimum number of different provinces may be excluded. The objective of each federation is to coordinate and encourage the formation of cooperatives, and also to supervise and control the cooperatives. The National Office of Cooperatives, which is the agency of the Ministry of Labor and Human Resources that deals with cooperatives, must approve the work plans of each federation of cooperatives.

The National Confederation of Cooperatives (NCC) is a third level organization that puts together all the national federations of cooperatives as well as other cooperatives that do not belong to any federation. NCC is the highest organization among cooperatives and all national federations are obliged to be affiliated.

# CHAPTER III

# FARM AND OPERATOR CHARACTERISTICS

This chapter examines the farm and operator characteristics of the 28 interviewed farms. Key characteristics include milk production volume, dairy herd composition, herd breed, and the use of land. Also, facilities and technology of the farms are analyzed and the operator and labor characteristics are presented. Finally, farm income is analyzed to reveal the importance of milk sales and other agricultural products in farm income.

## 3.1. FARM SIZE

Across the 28 dairy farmers interviewed, farm size ranged from five to 150 milking cows while the average was 44 milking cows per farm. To facilitate later marketing analyzes the 28 interviewed farms were divided in three categories according to the number of milking cows. The three categories were the same as the categories of dairy farmers according to the 2000 Census of Agriculture. The first category is farms with 10 or less milking cow and contains eight farms. The second category includes farms with 11 to 30 milking cows and contains 5 farms. The third category includes large farms with more than 30 cows and contains fifteen farms.

In the case of the small farms, seven of the eight farmers interviewed belonged to a single indigenous community called La Chimba, which is located in the Andes highlands 16 kilometers from the town of Cayambe. There was also one farmer in the medium size category that belongs to this community. The other 20 farms were located at a lower altitude and closer to the town of Cayambe.

Dairy farm size varies significantly across the Cayambe region. Table 13 shows statistical data of land used for farming, the number of milking cows, and the level of milk production. Regarding land used for farming, the average farm size was 6.9 hectares (ha) for the small farms, while for the medium farms was 21.7 ha and for the large farms was 68.3 ha.

**Table 13. Size of interviewed farms**

| Category | Data | Land (Hectares) | Milking cows | Milk production (liters per day) |
|---|---|---|---|---|
| 5 – 10 Milking cows (8 farms) | Average | 6.9 | 7.4 | 84 |
| | Minimum | 4.5 | 5 | 40 |
| | Maximum | 11.5 | 9 | 140 |
| | Standard Deviation | 2.3 | 1.6 | 34.1 |
| 11 – 30 Milking cows (5 farms) | Average | 21.7 | 18.4 | 194 |
| | Minimum | 6.5 | 12 | 100 |
| | Maximum | 45 | 25 | 300 |
| | Standard Deviation | 14.5 | 4.7 | 84.7 |
| 31 – 150 Milking cows (15 farms) | Average | 68.3 | 72.6 | 1,028.2 |
| | Minimum | 27 | 32 | 400 |
| | Maximum | 280 | 150 | 2,200 |
| | Standard Deviation | 66.9 | 34.9 | 542.9 |
| Total | Average | 42.4 | 44.3 | 609.5 |
| | Minimum | 4.5 | 5 | 40 |
| | Maximum | 280 | 150 | 2,200 |
| | Standard Deviation | 56.4 | 40.1 | 604.5 |

The average number of milking cows for small farms was seven, for medium farms 18, and for large farms 73. The largest farm produced 2,200 liters per day compared to 40 liters per day for the smallest. The average milk production for the small size category was 84 liters per day, while for the medium farms increased significantly to 194 liters per day, and for the large farms category to 1,028 liters per day.

### 3.1.1. Milk production and dairy herd

Table 14 shows the data of milk production and herd composition for each of the three categories of farms. The average milk production among the 28 farms was about 610 liters per day. Herd composition included 44 milking cows, 14 dry cows, 42 heifers and calves and four steers and bulls.

**Table 14. Herd according to farm size**

| Category | Data | Milk Production (liters/day) | Herd (# animals) Milking cows | Dry cows | Heifers & Calves | Steers & Bulls |
|---|---|---|---|---|---|---|
| 5 – 10 Milking cows (8 farms) | Average | 84.1 | 7.4 | 2.8 | 7.1 | 1.3 |
| | Minimum | 40 | 5 | 0 | 4 | 0 |
| | Maximum | 140 | 9 | 7 | 14 | 2 |
| | Stand. Dev. | 34.1 | 1.6 | 2.2 | 3.3 | 0.9 |
| 11 – 30 Milking cows (5 farms) | Average | 194 | 18.4 | 8.4 | 19.4 | 0.6 |
| | Minimum | 100 | 12 | 6 | 8 | 0 |
| | Maximum | 300 | 25 | 12 | 33 | 2 |
| | Stand. Dev. | 84.7 | 4.7 | 2.6 | 11.3 | 0.9 |
| 31 – 150 Milking cows (15 farms) | Average | 1,028.2 | 72.6 | 22.7 | 71.3 | 6.9 |
| | Minimum | 400 | 32 | 5 | 27 | 0 |
| | Maximum | 2,200 | 150 | 54 | 166 | 35 |
| | Stand. Dev. | 542.9 | 34.9 | 14.3 | 39.3 | 11.3 |
| Total | Average | 609.5 | 44.3 | 14.4 | 42.7 | 4.1 |
| | Minimum | 40 | 5 | 0 | 4 | 0 |
| | Maximum | 2,200 | 150 | 54 | 166 | 35 |
| | Stand. Dev. | 604.5 | 40.1 | 13.9 | 41.5 | 8.6 |

Regarding heifers and calves, the average was about seven for small farms, 19 for medium farms and 71 for large farms. For the three categories of farms, the number of heifers and calves was about the same as the number of milking cows. This suggests that on average farms have a moderate reserve in animal capital to increase and sustain the production of milk.

**Table 15. Milk production per cow according to farm size**

| Category | Data | Milk production per cow (liters per day) |
|---|---|---|
| 5 – 10 Milking cows (8 farms) | Average | 11.2 |
| | Minimum | 7.5 |
| | Maximum | 15.5 |
| | Standard Deviation | 2.9 |
| 11 – 30 Milking cows (5 farms) | Average | 10.6 |
| | Minimum | 5.6 |
| | Maximum | 17.6 |
| | Standard Deviation | 4.3 |
| 31 – 150 Milking cows (15 farms) | Average | 14.2 |
| | Minimum | 9.2 |
| | Maximum | 20.2 |
| | Standard Deviation | 3.5 |
| Total | Average | 12.7 |
| | Minimum | 5.5 |
| | Maximum | 20.2 |
| | Standard Deviation | 3.8 |

Table 15 shows the average production per cow per day for the three categories of farms. The average milk production per cow was 12.7 liters per day for the 28 farms, while for the small farms was 11.2, for medium farms was 10.6, and for large farms was 14.2. The highest milk production per cow was 20.2, which was attained by a large farm, whereas the smallest milk production per cow was 5.6 liters per day a medium size farm.

### 3.1.2. Herd breed

The most common breed among the 28 farms was a crossbred with high content of Holstein Friesian. This crossbreed is the most common across dairy farms in the highlands of Ecuador and it is the result of crossbreeding a native breed with Holstein Friesian. The high genetic potential for production traits of Holstein breed has been crossed, for more than 20 years in some cases, to a native breed that is resistant to high altitudes, cold weather, and steep fields. There were 24 farms that had some animals of this cross, three farms had less than 50% of this breed, 11 farms had between 50% and 99% of this breed, and 10 farms had 100% of animals of this breed.

Other breeds found in the farms included pure-bred Holstein Friesian with 21% of farms, Brown Swiss 21%, pure-bred Jersey 7%, crossbreed Jersey 11% (three farms), New Zealand Holstein 7% (two farms), Brown Swiss mixed breed 7% (two farms) and pure-bred Norman and crossbreed Norman with 4% (1 farm) for each one.

When comparing the Holstein breed among the categories of farms, at least 61% of the cattle were Holstein (pure breed or crossbreed) in 88% of the small farms, 87% of the cattle in all medium farms, and 50% or more of the cattle were Holstein for 80% of the large farms.

### 3.1.3. Land Use

The most important uses of land for the 28 farms were grazing, feed crops, and other crops. Table 16 presents the statistical data for these uses of land. The dairy farmer grows feed crops in order to provide feed to the herd while the other crops were used either for animal feed or for sale to other farmers.

The dairy farmers analyzed in this study on average use most of their land for grazing. The average area for grazing pastures was 27.7 hectares, which represent 75% of the total farming area. For the small farms the average grazing area was 5.2 ha, for the medium-size 16.2 ha, and for the large farms 43.6 ha.

**Table 16. Pastures, feed crops and other crops**

| Category | Data | Pastures | | Feed Crops | | Other Crops | |
|---|---|---|---|---|---|---|---|
| | | Ha | % Land | Ha | % Land | Ha | % Land |
| 5 – 10 Milking cows (8 farms) | Average | 5.2 | 0.7 | 0.1 | 0.1 | 1.5 | 0.2 |
| | Minimum | 3 | 0.5 | 0 | 0 | 0 | 0 |
| | Maximum | 11 | 0.9 | 0.5 | 0.1 | 3 | 0.5 |
| | Standard Dev. | 2.7 | 0.2 | 0.2 | 0.1 | 1.1 | 0.2 |
| 11 – 30 Milking cows (5 farms) | Average | 16.2 | 0.7 | 3.4 | 0.2 | 2.1 | 0.1 |
| | Minimum | 6 | 0.5 | 0 | 0 | 0 | 0 |
| | Maximum | 35 | 0.9 | 10 | 0.5 | 10 | 0.2 |
| | Standard Dev. | 11.9 | 0.2 | 4.2 | 0.2 | 4.4 | 0.1 |
| 31 – 150 Milking cows (15 farms) | Average | 43.6 | 0.7 | 7.1 | 0.1 | 10.4 | 0.1 |
| | Minimum | 20 | 0.3 | 0 | 0 | 0 | 0 |
| | Maximum | 110 | 1 | 37.5 | 0.3 | 70 | 0.3 |
| | Standard Dev. | 27.9 | 0.2 | 10.2 | 0.1 | 20.2 | 0.1 |
| Total | Average | 27.7 | 0.7 | 4.4 | 0.1 | 6.4 | 0.1 |
| | Minimum | 3 | 0.3 | 0 | 0 | 0 | 0 |
| | Maximum | 110 | 1 | 37.5 | 0.5 | 70 | 0.5 |
| | Standard Dev. | 27.2 | 0.2 | 8.1 | 0.1 | 15.3 | 0.2 |

Comparing the three categories of dairy farmers reveals that on average large and medium farms use the highest percentage of land for grazing (75%), followed by the small farms (73%). Among the 28 cases, three large farms used 100% of the land for grazing. In addition, the farm that used the least percentage of land for grazing was 35% and also belongs to this category.

The percentage of land used for feed crops, which were mainly alfalfa, vicia[8], oats and maze, was largest, on average, for medium farms at 19%, which was considerably higher than for the other categories of farmers, 1% for small-size category and 10% for large-size category. The average size of land used for feed crops increases with farm size, from 0.1 ha for the small farms, to 3.4 ha for medium farms and 7.1 ha for large farms.

[8] Vicia (vicia spp.) is a legume grown for forage production.

Regarding the type of feed crop that was grown by dairy farmers, the most common was vicia. Five farms of the 11 that grew feed crops cultivated vicia alone or sowed together with oats. The one small farm that grew feed crops cultivated this legume. For the medium farms there were two farms that grew feed crops, being maze and vicia with oats. Among the large farms, eight of the fifteen farmers grew feed crops, four farms grew alfalfa, three oats and vicia, and one grew corn for silage.

Another use of land in the farms was for crops either to feed the herd and sell to other farmers or only for sale in the marketplace. The average size of land dedicated for this type of crops was 1.5 ha for small farms, 2.1 ha for medium farms, and 10.4 ha for large farms. Conversely, the percentage of land that these crops represent on average was 25% for small farms, 6% for medium farms and 11% for large farms. Fifteen farms, or 53% of the 28 farms, grew these crops. Five farmers grew crops that were used for feed and also to sell to other farmers and 10 farms grew cash crops. The crops used for feed and to sell to other farmers were grains like corn, oats, vicia, and barley. Only one large farmer mentioned the participation of the sales of these crops in gross income. For this farmer the sales of maze, oats and vicia represented three percent of gross income. On the other hand, ten farms grew cash crops like potatoes, fava beans, and flowers.

Concerning cash crops, the 10 farms that grew these type of crops cultivated fava beans, flowers and potatoes, being the latter grown among the largest number of farms. Five small farms grew potatoes and the average sowed area was 1.6 ha, which in average represented 25% of the total farming land. Also, one medium farm and one large farm grew this crop in an area of 0.5 and 5 ha, respectively, which represented about 9% of the farming land for both cases. Among the seven farms that grew potatoes, only one small farm responded the participation of potato sales in gross income indicating that 5% of gross income was from this source.

Other cash crops were flowers, which were produced by two farms. One was a medium farm that used 10 ha for this crop, which represented 22% of the total farming land and the sales of flowers represented 92% of gross income. The other farm was a large farm that used 12 ha, which represented 29% of the farming land, and the sales of flowers represented 93% of gross income.

## 3.2. FACILITIES AND TECHNOLOGY

This section presents an analysis of farm facilities and technology. There were six different facilities that farms may have and technology refers to the breeding and milking technique as well as the use of machinery and animal traction.

### 3.2.1. Facilities

The facilities considered included the barn for calves, barn for milking cows, parlor, storage facility mainly for feed and fertilizers, housing for workers, and management office. Table 17 presents the number of responses according to the farm size category.

The most common facilities among the 28 cases were the stanchion barn, which is a facility with milking stanchions used for feeding while milking the cows, and the housing for workers (20 responses). Seven of the eight farms without a stanchion barn milked the cows in the field by hand and belong to the community of La Chimba. Other common facilities were the storage facility and management office with 18 responses each, and the barns for calves and corrals for milking cows with 17 responses each.

**Table 17. Facilities according to farm size**

| Infrastructure | Farm size | | | |
|---|---|---|---|---|
| | 5 – 10 Milking cows (8 farms) | 11 – 30 Milking cows (5 farms) | 31 – 150 Milking cows (15 farms) | Total |
| 1. Barn for calves | 1 | 4 | 12 | 17 |
| 2. Corrals for milking cows | 0 | 4 | 13 | 17 |
| 3. Stanchion barn | 1 | 4 | 15 | 20 |
| 4. Storage facility | 1 | 3 | 14 | 18 |
| 5. Housing for workers | 1 | 4 | 15 | 20 |
| 6. Management office | 0 | 3 | 15 | 18 |

Regarding the size of the stanchion barn for milking the cows, the results from the interview shows that the largest had 32 stanchions, which was the case of a farm with 150 milking cows, and the smallest had one stanchion. The case of a stanchion barn with one stanchion was a small open construction equipped with a simple milking machine. The most widespread number of stanchions was six, two medium farms and four large farms had this number of stanchions in the barn. Other sizes of stanchion barns had more than one response. Barns with eight stanchions had three large farms, with 10 stanchions had two large farms and 20 stanchions had two medium farms and two large farms.

### 3.2.2. Milking and breeding technology

Table 18 presents the responses for the milking and breeding technique used by farmers. The most common milking technique among the 28 farmers was using a milking machine. Seventy-five percent of small farms milked cows by hand as well as 20% of medium farms, whereas 93% of large farms milked their cows by machine. Every farmer of the 20 that milked by machine owned the equipment.

**Table 18. Milking and breeding according to farm size**

| Category | Milking | | Artificial insemination | |
|---|---|---|---|---|
| | **By hand** | **By machine** | **Yes** | **No** |
| 5 – 10 Milking cows (8 farms) | 6 | 2 | 5 | 3 |
| 11 – 30 Milking cows (5 farms) | 1 | 4 | 5 | 0 |
| 31 – 150 Milking cows (15 farms) | 1 | 14 | 14 | 1 |
| Total | 8 | 20 | 24 | 4 |

The results for the use of artificial insemination show that 86% of the farms used this breeding technique. All the medium farms used artificial insemination while 93% of large farms and 63% of small farms used this technique. However, some farmers used natural service in cases when artificial insemination failed.

### 3.2.3. Machinery and animal traction

The results of the survey showed that 25 of the 28 farmers used machinery in the farm. The use of machinery relates to the operation of any mechanical equipment for either the cultivation of grass and feed crops or for milking the cows. Two small farms and one medium-size farm did not use machinery. It is relevant to segregate between farmers that own and/or rent machinery.

There were 20 farmers that owned machinery, which included all large farms, four medium farms and only one small farm. Every large and medium farm, except one medium farmer, had field machinery, which included at least one tractor with attachments. Other field equipment owned by some farmers included an irrigation system.

The farmers' responses showed that five cases used only rented machinery and three cases both owned and rented machinery. Farms that used only rented machinery were small farms that rented a tractor to prepare the land to grow crops. Farms that owned and also rented machinery consisted of one small farm, which owned a milking machine but rented a tractor. Also, one medium and one large farm owned and rented machinery; both owned milking machines, the medium farm rented a tractor and large farm rented a harvest machine.

The utilization of animal traction was widespread among the small farms; 75% of them used to prepare land to renovate pastures or sow crops. There were also three large farms that used animal traction in addition to machinery.

## 3.3. OPERATOR AND LABOR CHARACTERISTICS

This section depicts the labor and operator characteristics of the farm. Dairy farms use family labor or hire workers in order to accomplish the tasks of the production of milk. Also, it is relevant to understand the characterization of the manager of the farm, which includes the years of experience in dairy farming and whether the manager was the owner, an owner's relative or hired.

### 3.3.1. Family labor

Table 19 lays out the family labor situation on the 28 surveyed farms. In dairy farming is common to have family members working on the farm in order to contribute labor that usually does not perceive a formal wage. The most common family member that worked on the farm was the owner in 26 farms. One large farm was owned by a company and in another large farm the spouse worked but not the owner.

The average number of family laborers per farm in the 28 farms was 2.3 members. Nevertheless, the number of members decreased with the size of the farm. For small farms the average was four family members, for medium farms 2.2 members and for large farms 1.4 members.

**Table 19: Family labor according to farm size**

| Family labor | Farm size | | | |
|---|---|---|---|---|
| | 5 – 10 Milking cows (8 farms) | 11 – 30 Milking cows (5 farms) | 31 – 150 Milking cows (15 farms) | Total |
| Owner | 8 | 5 | 13 | 26 |
| Spouse | 6 | 1 | 2 | 9 |
| Son 1 (20-29 yrs.) | 1 | 0 | 2 | 3 |
| Son 2 (20-29 yrs.) | 1 | 0 | 1 | 2 |
| Son 3 (30-39 yrs.) | 0 | 0 | 3 | 3 |
| Teenager 1 (13-19 yrs.) | 7 | 1 | 0 | 8 |
| Teenager 2 (13-19 yrs.) | 5 | 1 | 0 | 6 |
| Teenager 3 (13-19 yrs.) | 2 | 1 | 0 | 3 |
| Teenager 4 (13-19 yrs.) | 0 | 1 | 0 | 1 |
| Child (< 12 years) | 2 | 0 | 0 | 2 |
| Owner's brother | 0 | 1 | 0 | 1 |
| Total | 32 | 11 | 21 | 64 |
| Average per farm | 4 | 2.2 | 1.4 | 2.3 |

Young members of the family worked in most small farms. Table 19 shows that seven of the eight small farms had at least one teenager as family labor whereas five small farms had two teenagers working in the farm and two small farms relied on children to help with duties in the farm. The spouse was also a common laborer on small farms – six of the eight. Three of the five medium farms had solely the owner as the family labor. The fourth medium farm relied on the spouse and four teenagers as family labor while the fifth medium farm had the owner's brother as the additional family labor. Similarly, large farms had the owner and/or spouse as family labor in the farm and only five of the 15 large farms had at least one adult family members working in the farm.

### 3.3.2. Hired labor

The results of the survey show that 75% of the farmers hired labor to work on the farm. The remaining 25% were six small farms and one medium farm that do not hired labor but they had family members working on the farm. Only two small farms hired one worker to work in the farm; medium farms hired from two workers up to five workers, and large farms hired between four workers and 27 workers, depending on the size of the farm.

There were three worker-contracting options. First, workers can be hired full-time, in Ecuador 40 hours per workweek, in which case they earn the minimum wage determined by the government.[9] Second, workers can be hired on an hourly part-time basis. Third, workers can be hired seasonally. In the latter option the wage that workers received was previously determined according to the duties they were committed to do. The workers hired under this option were often used to clean water ditches, and build or fix infrastructure.

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[9] According to the Central Bank of Ecuador the minimum wage received by a farm worker is $128.90 per month for January 2002.

### 3.3.3. Experience and manager of the farm

The average years of dairy farming experience for the 28 owners of the farms was 20.2 years, with a minimum value of two years and a maximum of 45 years. Analyzing by size categories, the largest average was 22.4 years for the medium farms, followed by the large farms with 21.3 years, and then the small farms with 16.8 years. These results indicate that the medium and large farms had more experience in dairy production than small farms.

Among the three categories, the largest standard deviation for the years of dairy farming was 11.9 and belongs to the large farms, followed by the medium farms with 10.9 and the small farms with 9.6. These results reflect the fact that the range of time in dairy was the largest for large and medium farms with the value of 37 and 30, respectively, while for the small farms was 28. The least number of years in dairy for the small-size category was two and the largest was 20 years. For the medium-size category the smallest number of years in dairy was 10 years and the largest was 40, while for the large-size category the minimum was eight and the largest 45.

Regarding the manager of the farm, the results of the interviews indicate that the owner was the manager of the farm for 19 cases, being six small farms, five medium farms, and eight large farms. The educational level for 66% of the owners that were managers of small farms was the elementary school, while for 17% was half elementary school and the university as well. In contrast, the educational level for 60% of the owners that were managers of medium farms was the university and for 20% of them was high school and half elementary school as well. The educational level for all of the owners that were managers of large farms was the university.

The farm manager was hired in five farms and all were large farms. Two farmers responded that the manager was the son/daughter of the owner; one was the case of a small farm and the other the case of a large farm. Likely, there were two farms where the manager was a relative of the owner; one was a small farm and the other was a large farm. These results indicate that for larger farms hiring a manager or having the owner performing the management duties in the dairy farm was a more widespread practice. In contrast, for small and medium farms the most common practice was to have the owner assuming the duties of the manager.

## 3.4. FARM INCOME

The most important gross income for the 28 farms were the sales of milk, except for two farms whose major income were the sales of flowers. On average milk sales contribute 90 % of gross farm revenue. Ninety-three percent of farms relied on the sale of milk for 80% or more of the total gross income. Seventy-five percent of small farms (or six farms), 80% of medium farms (or four farms), and 40% of large farms (or six farm) gained 100% of their gross income from the sale of milk.

Milk sales represent 80% of the gross income for one small farm and for also one large farm, while milk sales comprised 80% to 90% of the total gross income for four large farms. One small farm and one large farm had sales of milk that represent 95% of the gross income.

As mentioned above, for two farms the sales of flowers were the major source of gross income. The sale of flowers represents 92% of gross income for one medium farm and 93% for one large farm. Other sources of income mentioned were potatoes, grains (maze, oats, vicia), and old dairy cattle. Nevertheless, only two of the seven farms that grew potatoes indicated the percentage of gross income that represented the sales of this crop. For one large farm potatoes sales comprised 18% of gross income and for one small farm represented 5% of gross income. In the same way, only two farms mentioned the percentage of grains sales - 3% of gross income for a large farm and 20% for a small farm. For three large farms the sales of old cattle represented on average about 6% of gross income and for one large farmer the sales of raised cattle comprised 13% of gross income.

# CHAPTER IV

# MARKETING CHARACTERISTICS

Because the primary objective of this thesis is to assess alternative milk marketing arrangements, this chapter discusses the marketing characteristics for the 28 interviewed dairy farmers. The analysis includes the description of the milk buyer, farm milk price, contract, and milk hauling and distance. The last section of this chapter analyzes the factors that influence the pricing of milk in order to identify the most appropriate pricing mechanism. Within the analysis of the milk buyer, this chapter describes the period of time selling to the current buyer, the farmer satisfaction with the current buyer, the reasons for selling milk to the current buyer, and the marketing relationship between the farmer and milk buyer.

## 4.1. MILK BUYER

There were two typical arrangements for farm sale of milk production, directly to a dairy processor or through a middleman. The milk processor was either an incorporated firm or a sole proprietor that purchased raw milk and produced dairy products like pasteurized milk, cheese, yogurt, cream or butter whereas the middleman was an individual that buys raw milk from dairy farmers and sells to a dairy processor.

There were two marketing channels for raw milk and high correlation between the size of the farm and the marketing channel for the 28 farms. All large farms sold their milk to a milk processor while 80% (four of the five) of medium farms and 25% (two of the eight) of small farms sold their milk to this same type of buyer. One medium farm and 75% of small farms marketed their milk through a middleman. Therefore, most small farms relied on a middleman, who assumed the role of a broker that sells the milk to the processor. Seven of the eight farmers that belong to the community of La Chimba sold the milk to a middleman.

Six small farms and one medium farm sold their milk to five different middlemen. The remaining two small farms sold their milk directly to dairy processors. The remaining three large farmers each marked their milk to a different local processor, including one industrial processor and two small cheese and yogurt processors.

#### 4.1.1. Period of time selling to current buyer

Regarding the period of time the farmer has been selling the milk to the current buyer, for the small farms the average time was 3.3 years, while for medium farms was 3 years and for large farms was 7.5 years. For the small farms the minimum time was two months, which had one case, and the maximum time was eight years, which also had one case, while for medium farms the minimum time was nine months and the maximum was eight years. For large farms the minimum time was three months and the longest time 46 years. The periods of time most common among small farms were two and four years, which each had two farmers for frequency, whereas for medium farms the periods of time were different for each of the five farmers, and for large farms was three years, which also had two farmers for frequency.

#### 4.1.2. Satisfaction with current buyer

Regarding the farmer satisfaction level with the current milk buyer, the interview results show that 75% of the farmers were satisfied, while 18% were unsatisfied and 7%

were very satisfied. Thirty-eight percent of small farms were unsatisfied with the current buyer and 62% satisfied while none were very satisfied. In contrast, 80% of medium farms were satisfied with the milk buyer and 20% were unsatisfied. Lastly, for the large farms, 80% were satisfied, 13% were very satisfied, and 7% were unsatisfied with the current milk buyer.

Another way to measure how satisfied were the farmers with the current buyer was to ask whether they had considered switching to another buyer. The responses show that 46% of the farmers had considered switching to another buyer whereas 54% had not. When analyzing within the categories, 50% of small farms, 40% of medium farms and 47% of large size farmers had considered changing to another buyer. The most common reasons stated among the farmers that have not considered switching to another buyer were that they had a good relation (26% of farmers) and that they do not have another choice of buyer (26% of farmers).

### 4.1.3. Reasons for selling the milk to current buyer

Table 20 presents a summary of farmer responses according to size for selling reasons of milk to the current buyer. Farmers had a chance to check one or more motives that drove them to choose their current milk buyer.

The most common reasons for selling milk to the current buyer were "assured payment", 27 of 28, and "assured market", 22 of 28. "Assured payment" meant that the farmer was confident that he/she would receive the payment on time. Only one large farm did not give this reason. "Assured market" means that the farmer had the certainty that the buyer will pickup the milk everyday and the buyer will not refuse to buy the milk in the short-run. For this answer option all small farms, four medium farms, and ten large farms considered this a motive for selling milk to the current buyer. A less common reason was that the buyer "pays the highest price", which had 11 responses.

**Table 20. Reasons for selling milk to the current buyer according to farm size**

| Reason | 1 – 10 Milking Cows (8 farms) | 11 – 30 Milking Cows (5 farms) | 31 – 150 Milking Cows (15 farms) | Total |
|---|---|---|---|---|
| 1. Pays the highest price | 5 | 1 | 5 | 11 |
| 2. Other farms recommended | 2 | 2 | 2 | 6 |
| 3. Assured market | 8 | 4 | 10 | 22 |
| 4. Assured payment | 8 | 5 | 14 | 27 |
| 5. Confident in processor | 0 | 2 | 4 | 6 |
| 6. Experience of the processor | 0 | 0 | 2 | 2 |

### 4.1.4. Marketing relationship between farmer and milk buyer

Describing the marketing relationship between the dairy farmer and the buyer of milk is comprised of two topics. One was what the farmer felt should be improved in the relation with the buyer. The second deals with the main problems that had arisen in the relationship.

With respect to potential improvements, the most recurring response was that the price paid by the buyer should improve with six responses. Another repeated response stated that nothing should be improved in the relation between the two parties with five responses. Thirteen percent of small farms, 20% of medium farms, and 27% of large farms stated that the price received should increase..

Another recurring response among the farmers was that the buyer should measure the quality of the milk and pay accordingly. There were 18% of farmers that responded this way, which comprised 20% of medium farms and 27% of large farms. Other responses for this topic addressed that the buyer of milk may provide agricultural services like credit, fertilization and veterinary services, and also that the communication between the farmer and the buyer should improve in order to solve any problem that could arise.

Regarding the main problems between the farmer and the milk buyer, the results show that only seven farmers answered this question while 21 did not mention any problem. These results suggest that 75% of the farmers did not have a problem with the buyer. Only one small farmer mentioned that the buyer did not provide feed and veterinary inputs on time. It was standard for the buyer of milk (middleman) to offer selected services to small indigenous farmers of La Chimba since they did not have access to any other organization or businessman that offered these services, and also because small farms were located far from the marketplace where agricultural inputs are supplied. Therefore, the milk buyer was the only individual that had a relation with small farmers and assumed the role of a middleman that also provided agricultural services.

Four large farms declared problems with the buyer. The problems mentioned were: lack of communication with the buyer in case of a problem concerning milk quality, fluctuating prices of milk, the fact that the price does not reflect quality of milk, and that the milk volume was not properly measured. On the other hand, only one medium farm stated problems with the buyer which was that milk hauling was not on time.

### 4.2. FARM PRICE OF MILK

This section analyzes the farm price of milk received by the interviewed dairy farmers in Cayambe. It seeks to understand the farm prices received by the three categories of farmers, as well as the price according to the milk buyer and the comparison of the farm price with prices received by other dairy farmers in the region and in other regions.

### 4.2.1. Farm price according to farm size

Table 21 lays out the farm price of milk and the time with the current price for the three categories of dairy farmers. The farm prices are net of hauling cost thus are gross revenue for the farmers. The average price of milk increased with the size of the farm. Small farms received on average a price of 22.63 cents per liter, medium farms an average price of 24.8 cents and large farms a price of 26.35 cents. The average time the farmer had been receiving the price for milk decreases with the size of the farm. The average time for small farms was 16.8 weeks, for medium farms 14.4, and for large farms 7.4 weeks.

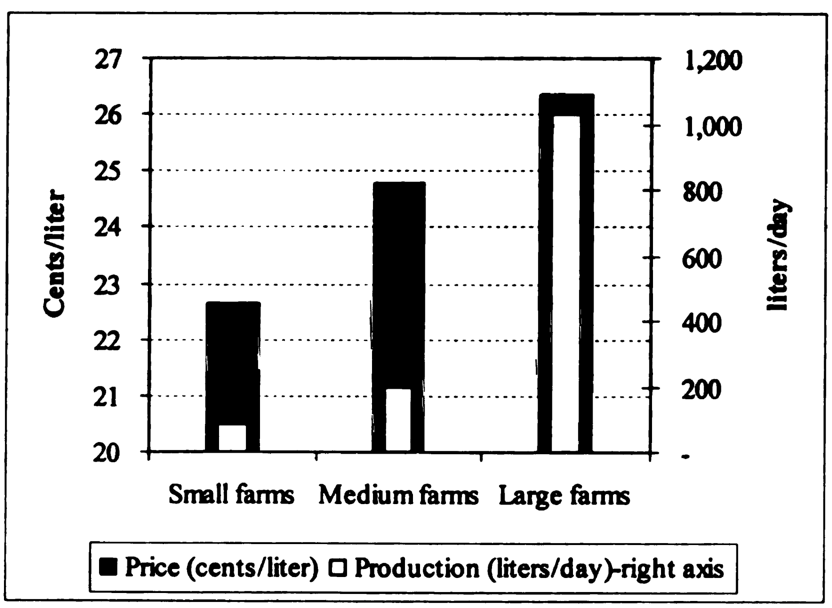
**Table 21. Farm price of milk and time with current price according to farm size**

| Variable | Data | | 5 – 10 Milking Cows (8 farms) | 11 – 30 Milking Cows (5 farms) | 31 – 150 Milking Cows (15 farms) |
|---|---|---|---|---|---|
| Farm Price (cents/liter | Frequency | 22 | 6 | 1 | 0 |
| | | 24 | 1 | 0 | 1 |
| | | 25 | 1 | 3 | 1 |
| | | 26 | 0 | 0 | 6 |
| | | 27 | 0 | 1 | 5 |
| | | 27.5 | 0 | 0 | 1 |
| | | 27.8 | 0 | 0 | 1 |
| | Average | | 22.63 | 24.8 | 26.35 |
| Time at Current Price (weeks) | Average | | 16.75 | 14.4 | 7.38 |
| | Minimum | | 2 | 6 | 2 |
| | Maximum | | 24 | 24 | 16 |

Concerning small farms, 75% received a price of 22 cents per liter, while one farmer received 24 cents and another 25 cents. All the farmers that received 22 cents per liter sell their milk to a middleman and belong to the community of La Chimba. The farmer that received 24 cents per liter marketed milk to a middleman, and the farmer that received $0.25 did not belong to La Chimba and sells milk to a dairy processor. The average time with the current price for small farms was the largest among the three categories; the minimum time was 2 weeks and the longest 24 weeks.

For medium farms, three farmers received 25 cents per liter, one farmer 22 cents, which belonged to the community of La Chimba, and one farmer 27 cents per liter of milk. Regarding the time with the current price, the minimum time for medium farms was 6 weeks, and the maximum time was 24 weeks, or 6 months.

**Figure 4: Average farm prices and milk production per categories of farms**




Regarding large farms, the highest frequency was six, which represents 40% of this farmers' category, and the price received was 26 cents per liter. Other common price was 27 cents, which received 33% of large farms. The highest prices received by this category were 27.5 cents and 27.8 and were paid by the dairy processor located 80 km away from Cayambe. The average time with the current price for this category of farmers was 7.38 weeks, the minimum time with the current price was two weeks, and the maximum time was 16 weeks, or about four months.

It is meaningful to examine the statistical relationship between the farm price of milk ($P_f$) and the production of milk ($Q_m$) since the average farm price per category of farms increases respect to the volume of milk produced in the farm (see Figure 4). A regression was run between these variables and the main results are the following:

$$
\begin{array}{rll}
P_f = & 0.23475 \quad + & 0.00002\, Q_m \\
Se = & (0.00359) & (0.000004) \\
P = & (0.0000) & (0.000002) \\
 & \text{Adjusted } R^2 = 0.565 &
\end{array}
$$

The adjusted $R^2$ indicates that 56.5% of the variation in the farm price of milk is explained by the explanatory variables, which in this case is the production volume of milk. The p-values of the intercept and the coefficient of $Q_m$ show that they are significant at a 5% significance level. Therefore, the farm production of milk is a significant variable that explains almost 60% of the variation in the farm price of milk, which implies that large farms received a higher price than small farms because they marketed a larger volume of milk.

### 4.2.2. Farm price according to milk buyer

It is also relevant to analyze the price received by the farmer according to the type of milk buyer. Table 22 presents the farm price of milk according to the type of buyer and the farm size. The table shows that the middlemen paid in average $0.22 per liter of milk to small farms; the lowest among the 28 interviewed farmers. The processors paid on average a higher price to large and medium farms than to small farms.

**Table 22. Farm price of milk according to type of buyer and farm size**

| Category | Data | Processor (cents/liter) | Middleman (cents/liter) |
|---|---|---|---|
| 5 – 10 Milking cows (8 farms) | Average price | 23.5 | 22.3 |
| | Minimum price | 22 | 22 |
| | Maximum price | 25 | 24 |
| | Number of farms | 2 | 6 |
| 11 – 30 Milking cows (5 farms) | Average price | 25.7 | 22 |
| | Minimum price | 25 | 22 |
| | Maximum price | 27 | 22 |
| | Number of farms | 4 | 1 |
| 31 – 150 Milking cows (15 farms) | Average price | 26.4 | NA |
| | Minimum price | 24.2 | NA |
| | Maximum price | 27.8 | NA |
| | Number of farms | 15 | NA |
| Total | Average price | 26 | 22.3 |
| | Minimum price | 22 | 22 |
| | Maximum price | 27.8 | 24 |
| | Number of farms | 21 | 7 |

The farm price that processors paid to farmers ranged from 22 to 27.8 cents per liter. The average price was the same (26 cents) for medium and large farms while for small farms the average price was 24 cents. Only one farmer of the Community of La Chimba marketed the milk to a local processor and the price received was 22 cents. The other small farm did not belong to La Chimba and the price received was 25 cents. Considering only farms that did not belong to the community of La Chimba, the price paid by processors ranged from 24 to 27.8 cents per liter.

It is relevant to characterize the processors that procured milk from small farms. The processor that paid 22 cents was a local rural processor in La Chimba and the farm belonged to this community. On the other hand, the processor that paid 25 cents was an industrial processor that purchased milk from a small farm that do not belonged to La Chimba and was located close to the city of Cayambe. In this way, there is evidence that the fact that La Chimba is located 16 Km away from Cayambe results in a farm price differential of three cents, which may result in the gross income of middleman.

### 4.2.3. Farm prices received by other farmers

The marketing section of the interview included questions in order to collect data about whether or not the farmer knew the price other farmers in the region and in other regions received for the milk, and also to identify the reasons for the case that the price received was lower. Table 23 lays out the results for the number of farms according to farm size.

There were 19 farmers that indicated they knew the price received by other farmers in Cayambe region and 14 farmers that knew the price received by dairy farmers in other regions. The most common response had 10 responses and was the case of a higher price than in other farms in Cayambe region. There were five farmers considering that the price they receive for the milk was lower than the average received by the farmers in Cayambe, and four farmers that consider that the price was the same. On the other hand, for the case of the price in other regions, the most common response had nine responses and was the case of a lower price than in other regions. Three farmers answered that the price they received was higher than the price in other regions and two farmers answered that the price was about the same.

**Table 23. Number of farms according to level of farm price compared to other farms in Cayambe and other regions**

| Category | Farm price vs. perceived price in other farms of Cayambe | | | Farm price vs. Perceived price in farms of other regions | | |
|---|---|---|---|---|---|---|
| | Lower | Equal | Higher | Lower | Equal | Higher |
| | # respondents | | | # respondents | | |
| 5 – 10 Milking cows (8 farms) | 2 | 0 | 1 | 2 | 0 | 0 |
| 11 – 30 Milking cows (5 farms) | 1 | 1 | 2 | 3 | 1 | 1 |
| 31 – 150 Milking cows (15 farms) | 2 | 3 | 7 | 4 | 1 | 2 |
| Total | 5 | 4 | 10 | 9 | 2 | 3 |

Table 23 shows that five farmers responded that the price they received was lower than the average price received by dairy farmers in Cayambe. The respondents of two large farms and one small farm mentioned that the price was lower because the current buyer pays in general low prices. One small farmer considered that a low volume of milk was the reason for having a lower price, and one medium farmer expressed that the lower price was explained by seasonal factors.

The location of the farms was the most common reason for the nine farmers that responded they received a lower price than the average in other regions. There were five farms, three large-size, one medium-size, and one small farm, that considered this reason for receiving a lower price. Three farmers expressed that the reason for receiving a lower price than in other regions was the low volume of milk; two were large farms and one was a medium farm. One farmer mentioned that the lower fat content of milk was the underlying reason for receiving a lower price than dairy farmers in other regions.

## 4.3. CONTRACT WITH BUYER

The most widespread type of contract between the farmer and the buyer of milk among the 28 farmers was a verbal agreement. Table 24 displays the results for the farm price according to the type of contract and farm size.

Twenty-five farmers negotiated with the buyer in a verbal way and three had a written contract. Every small farmer had established a verbal agreement with the buyer; in contrast, only one medium farm and two large farms had a written contract with the buyer. The verbal agreement consisted in a commitment of the middleman or processor to pay the farmer the price. The frequency for the change in price was not defined between the two parties. In this way, the relation between the farmer and the buyer was informal. There was no judicial framework that enforced the milk buyer to pay the farmer the agreed price.

**Table 24. Farm price of milk according to type of contract and farm size**

| Category | Data | Written Contract (cents/liter) | Verbal Agreement (cents/liter) |
|---|---|---|---|
| 5 – 10 Milking cows (8 farms) | Average price | NA | 23 |
| | Minimum price | NA | 22 |
| | Maximum price | NA | 25 |
| | Number of farms | NA | 8 |
| 11 – 30 Milking cows (5 farms) | Average price | 27 | 24 |
| | Minimum price | 27 | 22 |
| | Maximum price | 27 | 25 |
| | Number of farms | 1 | 4 |
| 31 – 150 Milking cows (15 farms) | Average price | 27 | 26 |
| | Minimum price | 26 | 24 |
| | Maximum price | 27 | 28 |
| | Number of farms | 2 | 13 |
| Total | Number of farms | 3 | 25 |

Table 24 shows that the average price received by the two large farms that had a written contract with the processor was 27 cents per liter, which was higher than the average price received by the 13 large farms that had a verbal agreement with the processor. In the same way, the average price received by the medium farm that had a written agreement was higher than the price received by medium farms that had a verbal agreement.

Regarding the frequency of contract negotiation, the question of the interview that addressed this topic was an open question so the farmer was able to explain how the negotiation was specified. Most farmers responded that the price was defined according to the supply and demand for raw milk. Table 25 summarizes the responses for the frequency of contract negotiation. Only the three farmers, which had a written agreement with the buyer, expressed a straightforward response regarding the frequency for contract negotiation. Sixty-four percent of the 25 farmers who had a verbal agreement answered the time ago they had the latest adjustment in price.

The three farmers that had a written contract with the buyer of milk answered that the contract was negotiated every 15 days, every year, and the third farmer responded that contract was negotiated every 3 years. The farmers that had a verbal agreement with the buyer answered that the most recent price increase took place 15 days ago and the oldest increase was 6 months. The most frequent responses were 6 months, which included two small farms and two medium farms; 4 months, which comprised three small farms and 1 large farm; 3 months, which included one farmer of each category; and 2 months, which comprised one small farm and one large farm. In general, there were no formal parameters that defined the relation between the dairy farmer and the milk buyer.

**Table 25. Contract negotiation frequency or period ago of last adjustment in price according to farm size**

| Contract negotiation frequency/period ago of last adjustment in price | 5 – 10 Milking cows (8 farms) | 11 – 30 Milking cows (5 farms) | 31 – 150 Milking cows (15 farms) | Total |
|---|---|---|---|---|
| 15 days ago | 0 | 0 | 1 | 1 |
| 1 month ago | 0 | 0 | 1 | 1 |
| 2 months ago | 1 | 0 | 1 | 2 |
| 2.5 months ago | 0 | 0 | 1 | 1 |
| 3 months ago | 1 | 1 | 1 | 3 |
| 4 months ago | 3 | 0 | 1 | 4 |
| 6 months ago | 2 | 2 | 0 | 4 |
| Every 15 days | 0 | 1* | 0 | 1 |
| Every year | 0 | 0 | 1* | 1 |
| Every 3 years | 0 | 0 | 1* | 1 |
| Other response | 0 | 0 | 5 | 5 |
| No response | 1 | 1 | 2 | 4 |
| TOTAL | 8 | 5 | | 28 |

*Farmer with a written contract with the dairy processor

Although for most farmers the relation with the buyer of milk consisted in a verbal agreement, 71% of the farmers knew the expected price of milk. Seven percent of the farmers did not know at all the parameters considered by the buyer to pay for the milk, 4% knew the price policy in an intermediate level, and 18% declined to answer the question. Nevertheless, 93% of the farmers received a flat price for the milk, which did not include any premiums for quality. Two cases (7% of farmers) had a verbal agreement with the processor, which had defined a milk pricing policy that included premiums for high quality (fat, reductase and antibiotics) and volume. The buyer for these farmers was the processor located 80 Km away while for the rest of the farmers the processor was located at most 20 km away. This processor was also one of the top processors that produce high quality dairy products in Ecuador and was located in another dairy region.

## 4.4. MILK HAULING AND DISTANCE

Both the middleman and the dairy processor collected raw milk from the 28 farms in trucks, which transported the milk in aluminum cans with a capacity of 40 liters each. The exceptions were two farmers who owned bulk tanks and sold their milk to a processor located in other region, which transported the milk in an insulated milk truck. Among the small farms, for 78% of them the middlemen assumed the hauling cost while for the remaining 22% the dairy processor paid the hauling cost. For the case of medium-size and large farms, the processor incurs in the hauling costs. This means that for all the farms the price received for milk included the deduction of the hauling cost.

Regarding the distance that the milk was transported from the farm to the processor, the average for small farms was 6.57 km, for medium farms 8.80 km, and for large farms 15.83 km. Within the small-size category, the most repeated observation was 13 km with a frequency of three, which all were indigenous farmers located in the community of La Chimba. For the rest of small farms, the distance transported was one, two and three km. For medium farms, the most common distance was four km with two cases. The hauling distance for the other three medium farms were eight, 13 and 15 km. In contrast, for large farms the most frequent distance was eight km with four farms while other recurring distances were 3 and 10 km with two farms each. The largest hauling distance was 80 km and corresponded to two dairy farmers that sold their milk to the processor located in another dairy region.

## 4.5. FACTORS INFLUENCING THE PRICING OF MILK

In order to determine the factors that influence the farm price received by the dairy farmer two regressions were run. For the first regression, the explanatory variables are the milk production level, the distance that the milk is hauled, and a dummy variable that captures whether the milk is marketed through a middleman or not. The second regression includes the same explanatory variables as in the first regression but also the squared hauling distance.

**Table 26. Relationship between farm price and milk production, hauling distance and milk buyer.**

| **Variable** | **Regression 1** | **Regression 2** |
|---|---|---|
| Intercept | 0.250643* (0.002822) | 0.251284* (0.003726) |
| Milk Production | 0.000013* (0.000003) | 0.000013* (0.000004) |
| Distance | -0.000021 (0.000100) | -0.000110 (0.000346) |
| Distance2[a] | | 0.000001 (0.000004) |
| Middleman[b] | -0.029048* (0.003822) | -0.029027* (0.003899) |
| $R^2$ | 0.875 | 0.8705 |

* Indicates significance of at least 0.10 level
[a] Variable given by the square of the hauling distance.
[b] Dummy variable indicating whether the milk is marketed through a middleman or not

Table 26 shows the coefficients and standard errors for the explanatory variables as well as the adjusted $R^2$ of both regressions. The intercept for both regressions is about 25 cents per liter, which indicates the average farm price in the region. The coefficient of the milk production variable shows that for every 1,000 liters the farm price increased in 1.3 cents. The $R^2$ indicates that 87.5% of the variation in the farm prices is explained by the three explanatory variables in the first regression while for the second regression 87.05% of the variation in the farm prices is explained by the four explanatory variables.

For the coefficient of the hauling distance, the regression 2 captures the fact that the greater the hauling distance the farm price would be lower (0.0110 cents per 100 km); however, the farm price would be greater for the case of large farms, which is captured by the coefficient of 0.000001 for the squared distance variable. This latter variable captures the stopping cost of the hauler. For short hauling distances milk is procured mainly from small and medium farms whereas for large hauling distances milk is procured mainly from large farms, therefore the stopping cost per liter is higher in small and medium farms rather than in large farms. Consequently, the net farm price would be higher for large farms than for medium and small farms.

The coefficient of the variable "middleman" indicates that, in general, middlemen receive 2.9 cents per liter of milk that is marketed by the dairy farmer and transported to the dairy processor. This amount results in gross revenue per liter for middlemen, who have an economic role of collecting milk mainly among small farms and deliver to the processor. Nonetheless, the cooperative may perform this role in a more efficient way thus pay dairy farmers a higher price. The cooperative may capture part of the margin received by the middleman to pay off operating costs.

The previous analysis provides meaningful insights about the pricing of milk, being the most relevant the following:

- The intercept of regression 1 is 25 cents and reflects a price without premiums or discounts for dairy farmers. This price would be for milk with minimum quality standards, which consist of at least 3.3 fat content and a maximum of 100,000 CFU/ml for bacteria count at the farm level[10].
- Dairy farmers that market milk to middlemen, which all belong to the community of La Chimba, received on average price 2.9 cents lower than the average price of 25 cents.

[10] Standard adopted in the U.S. to assure high quality raw milk.

- The premium for volume of milk can be defined as 1.3 cents for each 1,000 liters of milk.

- The 12.5% variation in the farm price that is not explained by the explanatory variables would capture the premium for quality of milk. Based on the price that does include premiums or discounts (25 cents), the premium for high quality milk would be 3.1 cents. The milk will have the following characteristics: fat at least 3.7, bacteria count below 50,000 CFU/ml at farm level, total solids 11.5%, and no antibiotics.

These results of milk pricing will be the used on the feasibility analysis for the start-up cooperative in Chapter VIII. Farms will receive a price for milk according to volume marketed and quality.

# CHAPTER V

# PROCUREMENT AND MARKETING OF MILK AND DAIRY PRODUCTS BY PROCESSORS AND RETAILERS IN CAYAMBE

This chapter discusses milk procurement by dairy processors and the marketing of dairy products by retailers. The data for the analysis was obtained from industry expert interviews to processors and retailers in Cayambe. Thus, the analysis of data in this chapter identifies elements for the definition of the organization of the dairy cooperative in Cayambe.

## 5.1. PROCESSOR INFORMATION

The processor analysis in Cayambe provides information about the processing capacity, seasonality of processing volume, procurement of raw milk from dairy farmers in Cayambe, the pricing policy, the transportation means of milk, the dairy products that are processed, and whether the board of directors had considered expanding the processing capacity of the facility in the medium run. In order to assure confidentiality of the data provided by the processors information is presented in summary statistics based on two classes, large processors and small processors.

### 5.1.1. Processing volume

The dairy processor interview included eight processors. The group comprised two of the four[11] processors that acquired more than 10,000 liters of raw milk per day in Cayambe and six of about 40 processors that buy less than 10,000 liters per day of raw

[11] The statistics of the four industrial processors were obtained from Cattlemen's Association and the number of small processors from a officer at the Agricultural Center in Cayambe.

milk. The other two large processors declined to provide data for the interview and the average processing volume was obtained for these processors from Cattlemen's Association.

**Table 27. Processing volume of dairy processors in Cayambe**

| Processor Category | Average | Capacity | | Maximum | Minimum |
|---|---|---|---|---|---|
| | Liters per day | Liters per day | Percent capacity use | Liters per day | Liters per day |
| Large[1] | 186,000 | 195,000 | 95.4% | 187,000 | 180,000 |
| Small[2] | 6,700 | 19,850 | 33.8% | 8,850 | 5,430 |
| Total | 192,700 | 214,850 | 89.7% | 195,850 | 185,430 |

Source: [1] Data of two processors was obtained from expert interviews and of the other two was obtained from Cattlemen's Association.
[2] Expert interviews

Table 27 shows that the average daily processing volume was about 193,000 liters, which resulted in operating at an average of 89.7% of capacity. Only one large processor and two small processors were operating at full capacity while the lowest capacity used among large processors was 64% and for small processors 13.5%.

### 5.1.2. Seasonality of processing volume

There was seasonal behavior for the volume of milk processed. The interviewed processors reached their pick processing volume in April (55,850 liters) which represented on average 91% of full capacity. Only one small processor was not processing the largest volume during this month. The lowest volume for the group of eight interviewed processors was about 45,000 liters in November, but only one large processor and one small processor reached the minimum processing volume, whereas in August four of the eight interviewed processors processed the lowest volume.

The highest processing volumes occurred in the months of December, January and April. One of the motives was the increased demand for cheese during Christmas and Easter seasons. In addition, the supply of raw milk increases during the winter season, which starts in October and lasts until April/May and has more rain and thus more pasture available than in the summer season.

Processing volume reached its lowest levels from July through September for most of the processors. This behavior was a response to the decrease in demand of dairy products, mainly fluid milk and yogurt, because of the vacation period for schools located in the Central and Eastern Regions of Ecuador. On the supply side, production of raw milk decreased during summer, from June through September, because of lack of rain and pasture.

In order to supply with dairy products following the seasonal trend and procure a relatively constant volume of raw milk from dairy farmers, large processors mentioned that surpluses are balanced through a large powdered milk processor.

### 5.1.3. Raw milk procurement from dairy farmers in Cayambe

The large dairy processors acquired milk from dairy farms in Cayambe as well as from farms located in nearby regions, while every small processor purchased raw milk solely from local dairy farmers.

Regarding the size of the farms that provided raw milk to the processors, the largest total volume was supplied by medium size farms, followed by large farms, small farms, and lastly middlemen (Table 28). Large processors procured about 34% of milk from large farms, 49% from medium farms, 15% from small farms and 1.8% from middleman. Small processors procured milk mostly from medium farms (75% of milk) and the rest was originated in small farms (24%) and large farms (1%).

**Table 28. Procurement of raw milk from dairy farmers in Cayambe**

| Processor Category | Raw milk supplier | | | | Total |
|---|---|---|---|---|---|
| | Large | Medium | Small | Middlemen | |
| Large | 7,700 | 11,000 | 3,300 | 400 | 22,400 |
| Small | 100 | 5,000 | 1,600 | - | 6,700 |
| Total | 7,800 | 16,000 | 4,900 | 400 | 29,100 |

Source: Expert interviews

Small farms supplied milk to six of the interviewed processors, medium farms to five processors and large farms to three processors. It was more common to have small and medium farms supply milk to large and small processors whereas large farms concentrated in supplying milk to large processors.

### 5.1.4. Pricing policy

Among the eight interviewed processors, six had a flat price policy for raw milk based on minimum quality standards. Four processors measured water content of milk. One large processor and two small processors used only this procedure to determine the quality of milk while one small processor also measured acidity and antibiotics content. The latter procedures were used because the processor specialized in producing yogurt. Another two small processors measured for fat content and acidity level but paid only a flat price.

Whenever raw milk did not achieve minimum standards, processors would reduce the price but none had defined a deduction schedule. Only one large processor mentioned that the excess water in milk is delineated clearly in the farmer pay check.

Another large processor declared having a pricing policy for internal use but did not communicate it to farmers. The processor mentioned that the price is based on minimum total solids content. This processor was the only that had defined a floor price and premiums for raw milk. The floor price was 25.5 cents per liter for 11.75% total solids and a premium of up to five cents per liter for higher total solids depending on the season.

The dairy processors were also asked whether the price paid for raw milk would be higher when large volumes of milk are supplied. Although one large processor and one small processor acknowledged having this policy, neither currently used this policy. The former policy for the large processor was a minimum volume of 900 liters and the price range would be 27.5 – 33.0 cents per liter depending on the quality of milk and season, which results in a price premium of 0.5 to 6 cents. For the small processor the minimum volume was 400 liters and the price 26 cents per liter.

### 5.1.5. Farm milk prices paid by processors

Dairy processors in Cayambe were asked to indicate the average price that dairy farms receive for milk according to size. Large farms included those with daily production of more than 1,000 liters, medium farms with daily production between 200 and 1,000 liters, and small farms with production of less than 200 liters per day.

Table 29 shows the weighted average farm milk prices paid by large and small processors to farmers, the average price weighted by the volume acquired from each type of farm, and the average price for each size category of farms weighted by milk volume acquired by each processor. The average farm price weighted by milk volume was 25.6 cents per liter. One small processor paid the highest price (28.5 cents per liter) to small farms since this processor procured only 200 liters per day from this category of farms and specializes in cheese processing. On the other hand, another small processor paid the lowest price to small farms (22 cents per liter).

**Table 29. Farm milk prices according to farm size**

| Processor Category | Farm milk price weighted by milk volume (cents/liter) | | | | Average price weighted by milk volume (cents/liter) |
|---|---|---|---|---|---|
| | Large Farms | Medium Farms | Small Farms | Middlemen | |
| Large | 26.2 | 25.6 | 25 | 27 | 25.8 |
| Small | 28 | 25 | 23 | - | 24.8 |
| Weighted price | 26.2 | 25.5 | 24.5 | 27 | 25.6 |

Source: Expert interviews

The prices paid by each processor across the four categories of suppliers were about the same. Only two large processors acquired milk from all three categories of farms. One large processor paid 27 cents to the four categories of milk suppliers, which included the middleman, while the other large processor paid 24 cents to small farms and 25.5 cents to medium and large farms. One of the two small processors that procured milk from more than one category of milk supplier paid 25 cents to medium farms and 22 cents to small farms, whereas the other small farm paid 24 cents to these two categories of suppliers. The price received by small farms had a range of 5.5 cents, for medium farms 3 cents, and for large farms 2.5 cents.

### 5.1.6. Transportation of milk

The transportation of raw milk from the dairy farm to the processor was in either aluminum cans or milk truck. Seven processors transported milk from farms to the milk-receiving unit of the plant in aluminum cans that were delivered by a truck owned by the processor. One large processor was the only to transport milk in both aluminum cans

(83% or milk) and milk truck (17% of milk). The transportation of milk in aluminum cans does not assure that milk temperature constantly below 45°F although the cans are cooled in a reservoir with running water at the farm. Thus, the quality of milk may deteriorate during the delivery process to the processor.

### 5.1.7. Dairy products processed

Large processors manufactured a larger variety of products than small processors, which usually specialized in processing at most three different dairy products and designated no less than 50% for only one dairy product. Table 30 shows that the two interviewed large processors produced nine of the ten dairy products while the six interviewed small processors specialized in processing four different dairy products. The largest volumes of milk were processed into dry milk and yogurt by large processors, while for small processors the largest volumes were for yogurt and fresh cheese.

**Table 30. Volume of milk according to dairy products processed**

| Dairy Product | Processor | | Total |
|---|---|---|---|
| | Large | Small | |
| Dry milk | 18,500 | - | 18,500 |
| Yogurt | 9,000 | 3,400 | 12,400 |
| Fresh cheese | 5,000 | 2,100 | 7,100 |
| Pasteurized Milk | 6,650 | - | 6,650 |
| Mozzarella Cheese | 4,200 | 1,080 | 5,280 |
| Ice cream | 1,000 | - | 1,000 |
| Chocolate Milk | 900 | - | 900 |
| Milk jam | 600 | - | 600 |
| Milk cream | 150 | - | 150 |
| Cheddar cheese | - | 120 | 120 |
| Total | 46,000 | 6,700 | 52,700 |

Source: Expert interviews

One large processor was the only to process dry milk and ice cream and another large processor the only to process pasteurized milk, milk jam[12] and milk cream. The latter processor processed 41% of raw milk procured into pasteurized milk. Another large processor allocated 62% of raw milk in the production of powdered milk.

Two small processors specialized in processing yogurt and one small processor in fresh cheese. Another two small processors produced both yogurt and fresh cheese. One processed also mozzarella cheese and the sixth small processor produced mozzarella and cheddar cheese.

The top five dairy products by volume were dry milk, yogurt, fresh cheese, pasteurized milk and mozzarella cheese. Most raw milk was processed into dairy products which did not require much transformation such as pasteurized milk, fresh cheese and yogurt. Yogurt was processed by the largest number of processors (two large processors and four small processors). Fresh cheese was produced by a large processor and also by three small processors. Lastly, mozzarella cheese was processed by the two large processors and also two small processors.

The smallest volume of milk was processed into more elaborated dairy products like cheddar cheese, milk jam, chocolate milk and ice cream. The three latter products were processed only by either of the two large processors while cheddar cheese was processed by the second smallest processor.

### 5.1.8. Expansion of processing capacity

The dairy processors were asked whether the board of directors had considered expanding the processing capacity of the facility. Six processors (one large and five

[12] Milk jam is a sweet milk spread commonly used for bakery.

small) have considered increasing the production capacity with the "good volume of sales" being the underlying reason for expanding the facility. One large processor mentioned that expansion of processing capacity would take place only if a "star dairy product" was identified and marketed. The "star dairy product" referred to a new product expected to have an increasing demand, with a market study determining which dairy product should be produced. To date, this processor had not yet identified the potential star dairy product thus the expansion of the processing capacity may occur later.

In addition, another large processor and one small processor had not considered expanding the processing capacity of the facility. The large processor supported this statement by mentioning that "the current size of the facility is fine" and the small processor mentioned that the price of raw milk was too high and also that there was lack of government support.

## 5.2. RETAILER ANALYSIS

Four grocery stores were interviewed in Cayambe in order to obtain dairy product market information and the willingness to market other dairy products. All the retailer stores were managed by the owner and offered a wide variety of groceries.

### 5.2.1. Dairy products offered by retailers

The four retailers offered 13 different dairy products and a total of 27 different dairy products, including the different brands and sizes of packaging. The dairy products offered in common by the four interviewed retail stores were pasteurized milk, fresh cheese, powdered milk (in 250g packing), and flavored yogurt (Table 31). The dairy products offered by three of the four retail stores were whole UHT milk and powdered milk in 500g packing. The variety of dairy products for each retailer is in accordance to the size of the grocery store. The largest variety of dairy products for a retailer was 13 different dairy products.

**Table 31. Dairy products by retailer**

| Dairy products | Unit | Frequency (# who said yes) |
|---|---|---|
| Pasteurized milk | 1 liter | 4 |
| Whole UHT milk | 1 liter | 3 |
| | $200cm^3$ | 1 |
| Semi-skimmed UHT milk | 1 liter | 2 |
| Skim UHT milk | 1 liter | 1 |
| Chocolate UHT milk | 1 liter | 2 |
| Fresh cheese | 500g | 4 |
| Mature cheese | 600g | 1 |
| Butter | 1 lb | 1 |
| | 300g | 1 |
| Milk cream | 1 liter | 1 |
| | 0.25 liter | 1 |
| | 300g | 1 |
| Flavored milk | $200cm^3$ | 2 |
| Powdered whole milk | 1 kg | 1 |
| | 500g | 3 |
| | 250g | 4 |
| Milk jam | 500g | 1 |
| Flavored yogurt | 200g | 4 |
| Total | | 38 |

Source: Expert interviews

Regarding the brands of dairy products, three retailers offered pasteurized milk that is produced locally, and one retailer offered pasteurized milk produced by a processor in other region. For fresh cheese, all four retailers did not offered a same brand among the six that were offered. Two local brands were offered by two retailers and one retailer was the only to offer both brands. In contrast, the four retailers offered the same brand of powdered milk. The flavored yogurt offered by retailers was in small containers of 200g. Every retailer offered two brands of yogurt, except retailer #1 who had only one brand.

Regarding the location of facilities that process dairy products offered by retailers in Cayambe, 11 of the 12 brands corresponded to local processors. UHT milk, powdered milk, milk cream and butter were produced by large local processors and cheese and yogurt was produced by small local processors. In addition, one processor from other region supplied yogurt and flavored milk to retailers.

### 5.2.2. Sales volume of dairy products

The volume of dairy products sales was estimated indirectly by asking the retailer the volume and frequency for acquiring dairy products from the processor and/or wholesaler. In order to have a comparable value of sales volume, the quantities collected in the interview were multiplied by a specific factor to obtain the equivalent volume acquired during one month (four weeks). On the other hand, the equivalent volume of milk sales was obtained by calculating the volume of milk that is needed to produce and market the dairy products.

Regarding the number of items sold by type of dairy product, the top five products most sold by the four retailers for a four weeks period were pasteurized milk, flavored yogurt, fresh cheese, whole powdered milk, and whole UHT milk (Table 32). One retailer was the leader in selling the largest volume of these five dairy products. Another retailer was the second largest seller of pasteurized milk, whole UHT milk and flavored yogurt.

**Table 32. Sales volume of dairy products in four weeks**

| Dairy product | Unit | Minimum | Maximum | Average | Total |
|---|---|---|---|---|---|
| | | | Volume / month | | |
| Pasteurized milk | 1 liter | 120 | 840 | 330 | 1320 |
| Whole UHT milk | 1 liter | 0 | 240 | 156 | 336 |
| | $200cm^3$ | 0 | 48 | 12 | 48 |
| Semi-skimmed UHT milk | 1 liter | 0 | 24 | 8 | 32 |
| Skim UHT milk | 1 liter | 0 | 12 | 3 | 12 |
| Chocolate UHT milk | 1 liter | 0 | 6 | 3 | 12 |
| Fresh cheese | 500g | 40 | 360 | 208 | 832 |
| Mature cheese | 600g | 0 | 16 | 4 | 16 |
| Butter | 1 lb | 0 | 12 | 3 | 12 |
| | 300g | 0 | 30 | 7.5 | 30 |
| Milk cream | 1 liter | 0 | 24 | 6 | 24 |
| | 0.25 liter | 0 | 20 | 5 | 20 |
| | 300g | 0 | N/A | N/A | N/A |
| Flavored milk | $200cm^3$ | 0 | 96 | 48 | 192 |
| Powdered milk | 1 kg | 0 | 48 | 12 | 48 |
| | 500g | 0 | 144 | 63 | 252 |
| | 250g | 12 | 288 | 106.5 | 426 |
| Milk jam | 500g | 0 | 24 | 6 | 24 |
| Flavored yogurt | 200g | 120 | 448 | 276 | 1,104 |

Source: Expert interviews

The importance of the products most sold differed across the four retailers. For one retailer the dairy product most sold was fresh cheese with 240 items, followed by whole powdered milk with 192 items, flavored yogurt with 144 and pasteurized milk with 120. Conversely, for another retailer the dairy product most sold were pasteurized milk and flavored yogurt with 120 units, followed by flavored milk with 96 units, and powdered milk with 42 units. For another retailer the product most sold was flavored yogurt with 392 items, followed by pasteurized milk (240 items), fresh cheese (192 items) and whole UHT milk (120 items). Lastly, for the fourth retailer the product most sold was pasteurized milk (840 items), then powdered milk (480 items), and yogurt (480 items).

**Table 33. Milk equivalent of dairy products sales for retailers**

| Dairy product | Minimum | Maximum | Average | Total |
|---|---|---|---|---|
| | | Liters / month | | |
| Pasteurized milk | 120 | 840 | 330 | 1,320 |
| Whole UHT milk | - | 240 | 96 | 384 |
| Semi-skimmed UHT milk | - | 24.4 | 8.1 | 32.5 |
| Skim UHT milk | - | 12 | 3 | 12 |
| Chocolate UHT milk | - | 6 | 3 | 12 |
| Fresh cheese | 144 | 1,296 | 748.8 | 2,995 |
| Mature cheese | - | 96 | 24 | 96 |
| Butter | - | 202 | 81 | 324 |
| Milk cream | - | 253 | 76.5 | 306.1 |
| Flavored milk | - | 19 | 9.5 | 38 |
| Powdered whole milk | 22.8 | 1,459.2 | 532.9 | 2,131.8 |
| Milk jam | - | 9 | 2.25 | 9 |
| Flavored yogurt | 24 | 90 | 55.25 | 221 |
| Total | | | | 7881.4 |

Source: Expert interviews

It is relevant to analyze the milk equivalent of the retailer sales volume in order to determine the volume of milk that is required to produce and market the dairy products. Table 33 shows that the top six dairy products that represented the largest volume of milk were fresh cheese, powdered whole milk, pasteurized milk, whole UHT milk, butter, and milk cream. About 38% of the total milk equivalent marketed by the four retailers represented fresh cheese, 27% was given by powdered whole milk, 16% by pasteurized milk and less than 5% for whole UHT milk, butter and milk cream.

Comparing the total equivalent volume of milk marketed by the retailers, the four retailers sold 3,924 liters per month, 1,983 liters, 1,565 liters and 409.8 liters per month, respectively. Fresh cheese and pasteurized milk represented the largest milk equivalent for two retailers whereas for another two retailers was whole powdered milk and fresh cheese.

### 5.2.3. Gross sales margin

The gross sales margin was calculated for each type of dairy product and retailer, and it was obtained by subtracting the wholesale price from the retail price and multiplying by the four weeks volume. Thus, it is possible to determine which dairy products were likely to generate the largest profits.

**Table 34. Gross sales margin by dairy products and retailer**

| Dairy product | N | USD / month | | | % of monthly margin | | |
|---|---|---|---|---|---|---|---|
| | | Min | Max | Avg | Min | Max | Avg |
| Pasteurized milk | 4 | 6 | 59 | 22.5 | 4.6 | 21.8 | 15.1 |
| Whole UHT milk | 3 | - | 19 | 6.5 | - | 7 | 3.4 |
| Semi-skimmed UHT milk | 2 | - | 1 | 0.5 | - | 1 | 0.4 |
| Skim UHT milk | 1 | - | 2 | 0.5 | - | 2.1 | 0.5 |
| Chocolate UHT milk | 1 | - | 1 | 0.25 | - | 0.8 | 0.2 |
| Fresh cheese | 4 | 8 | 54 | 34.75 | 16.3 | 36.6 | 25.7 |
| Mature cheese | 1 | - | 3 | 0.75 | - | 3.1 | 0.8 |
| Butter | 2 | - | 8 | 2.75 | - | 8.2 | 2.6 |
| Milk cream | 2 | - | 6 | 2.25 | - | 4.6 | 1.9 |
| Flavored milk | 2 | - | 9 | 3.25 | - | 18.4 | 5.6 |
| Powdered whole milk | 4 | 2 | 123 | 47.75 | 2.1 | 45.4 | 28.3 |
| Milk jam | 1 | 0 | 4 | 1 | - | 3.1 | 0.8 |
| Flavored yogurt | 4 | 4 | 25 | 14 | 3.1 | 25.8 | 14.7 |

Source: Expert interviews

Contrasting with the analysis of the sales volume given by the quantity of units and milk equivalent, the top five dairy products with the largest sales margin were powdered whole milk, fresh cheese, pasteurized milk, flavored yogurt, and whole UHT milk. Table 34 shows that the monthly sales margin for powdered whole milk had the highest average of \$47.75 as well as the highest percentage of average monthly margin (28.3%) among the four retailers. For fresh cheese was \$34.75 (25.7% of monthly margin). Pasteurized milk shows the third largest average of \$22.5 (15.1% of monthly margin) followed by flavored yogurt with \$14 (14.7%) and whole UHT milk with \$6.5 (3.4%).

Regarding the order of dairy products in contributing to generate profits by retailer, powdered milk had for three of the four retailers the largest sales margin while fresh cheese occupied the first place for one retailer. Fresh cheese was second in contributing to generate profits for two retailers and pasteurized milk was the second for one retailer but was the third for retailers another two retailers. For two retailers, flavored yogurt was the second most important dairy product contributing to gross sales margin and flavored milk was the third for another retailer.

For the four retailers interviewed, more than 65% of total sales margin in dairy products was generated by the first three products with the largest share in total sales margin. Nevertheless, for the two larger retailers the participation in sales margin of the top three dairy products was 83% and 87%, respectively, whereas for the other two retailers was 66% and 73%, respectively. This suggests that larger retailers gain most profits from dairy products by selling large volumes of fewer kinds of dairy products.

### 5.2.4. Willingness to market other dairy products

The last section of the interview to retailers aimed to assess the willingness of the owners of the grocery stores to market an additional brand of dairy products. The question addressed to the interviewee also asked the reasons or conditions under which they would accept other brand of dairy products.

The four retailers agreed to market an additional brand of pasteurized milk, fresh cheese, and milk cream, being the response of "good quality" a common requirement for two retailers in pasteurized milk, for another retailer in fresh cheese and for the last retailer in milk cream. In addition, one retailer mentioned that a "competitive price" would be a necessary condition to market an additional brand of fresh cheese and milk cream. Other reasons/conditions mentioned only once by retailers were "good sales," "brand is important," "to have variety," "good packing," "customer should ask for it," and "regular delivery of the product."

In addition to the dairy products mentioned above, one retailer was willing to market UHT milk (whole, semi-skimmed, and chocolate milk), butter, flavored yogurt and milk jam. The owner of the grocery store mentioned that a "well known brand" is important to be successful in marketing UHT dairy products, for butter and flavored yogurt to have a "competitive price" was relevant, while the "good sales" of milk jam motivates to offer an additional brand. On the other hand, one retailer was not willing to market powdered whole milk and mature cheese because he/she had bad experiences with other brands for powdered milk and for mature cheese sales were very low.

Another retailer was also willing to market butter, flavored milk, flavored yogurt and pasteurized milk. For flavored milk, the owner responded that the brand is important while an additional brand of butter would increase sales since consumers ask for it and "good sales" of flavored yogurt motivates to offer an additional brand. Also, the condition to market powdered milk was that it must be "good quality". This retailer was not willing to market mature cheese since mentioned that demand is low.

The third retailer was willing to market the largest variety of dairy products. Besides the products that would also be marketed by the other three retailers, this retailer was willing to market UHT milk (semi-skimmed and skim milk), flavored milk and flavored yogurt as long as they have a "competitive price" and also chocolate UHT milk and powdered whole milk as long as the products have "good quality". This retailer was willing to market an additional brand of whole UHT milk since "sales are good" whereas he/she was not willing to market an additional brand of butter.

The last retailer was also willing to market whole UHT milk, powdered whole milk, and butter. The motive to market an additional brand of UHT milk was to "offer more choices to customers," for powdered whole milk the condition was to have a "competitive price" and for butter was to have "regular delivery" of the product. This retailer was not interested in marketing an additional brand of flavored yogurt.

In general, the four retailers were willing to market an additional brand of 13 dairy products. Pasteurized milk, fresh cheese and milk cream were the most common, and UHT whole milk, butter and powdered whole milk were also relevant. There were nine different reasons or conditions under which they would accept an additional brand. The most common responses were "competitive price" with nine cases, "good quality" with seven cases, and "brand is important" with six cases. This suggests that to market a new brand of dairy products they should be high quality, be priced in the range of its competitors, and develop a brand that is well known by consumers.

# CHAPTER VI

# COLLECTIVE ACTION ALTERNATIVES FOR DAIRY FARMERS

This chapter presents a description of the cooperative business form, motivations for forming a cooperative, and results of the dairy farmer interview regarding collective action alternatives. It includes analysis of farmer considerations to develop different outcomes of collective action, conditions under which large farmers would join small farmers, and also current needs of dairy farmers. Lastly, the results of the alternatives of collective action lead to a potential cooperative outcome for dairy farmers.

## 6.1. AGRICULTURAL COOPERATIVES

This section describes the cooperative business form and includes business principles, reasons and objectives for organizing a cooperative, benefits to dairy farmers and rural communities, and a description of the types of cooperatives that dairy farmers may organize.

### 6.1.1. Definition and business principles

Cooperatives are businesses owned and controlled by members. They differ from other businesses because they operate for the benefit of members, rather than earn profits for investors. Farmers use cooperatives to market and process crops and livestock, purchase supplies and services, and to provide credit for their operations (USDA-RBCDS, 1995).

The differences between cooperatives and other businesses are often expressed as three broad principles that characterize all cooperatives and explain how they operate. The principles are adapted from Rapp (1995):

**User-owner principle:** The member-users own the cooperative and provide the necessary financing. Members finance the cooperative mainly by purchasing stock and paying membership fees. Members may reinvest the distributed patronage refunds (profits) to capitalize the business.

**User-control principle:** The members control the business. They elect a board of directors is elected among members and approves changes in the cooperative's structure and operation. As representatives of the members, the directors are responsible for setting policy and overseeing on all the cooperative's business practices. Each member has one vote to elect directors or other issues regardless of the business volume with the cooperative or capital invested.

**User-benefit principle:** This principle assures that the cooperative's purpose is to provide and distribute benefits to members based on use rather than amount of capital invested. Benefits also may include providing market access, providing needed services, or supplying the "best valued" products.

### 6.1.2. Why cooperatives are organized

The reasons/factors that lead to the formation of agricultural cooperatives are analyzed in this section. Although these reasons refer to a developed country, it is useful to present and relate to the likely reasons for the case of a developing economy. There are two major reasons that explain the why of agricultural cooperatives.

First, when analyzing the range of competition for agriculture and input-output industries, agriculture is positioned close to the pure competition end whereas many agricultural many agricultural input-output industries are located close to the monopoly end. Agriculture consists of a large number of farms, producing undifferentiated products, with entry and exit relatively easy, operating in an uncertain and risky environment. Thus, agriculture serves as a prime example of an industry close to the competitive ideal. The individual farm has little ability to affect price in the marketplace by any action it may take, and, therefore, gives no thought as to what other firms will do if it takes any king of action such as offering all or any part of its supply of product for sale. On the other hand, those firms that buy farm output and those that provide inputs to agriculture are made up of relatively few large firms that produce differentiated products in an economic environment over which they have some control in regard to supply, demand and price (McBride, 1986).

Second, the shift in the resource mix of agriculture, showing substantial substitution of capital for labor, reflects the changing productivity of inputs and changes in relative prices of inputs. This substitution process reflects a higher degree of specialization in farming. Productivity has increased tremendously, but in the process, agriculture has become more dependent on purchased inputs and markets for its output and, more importantly, dependent upon the conditions or term of trade under which inputs are made available and markets for output are found (McBride, 1986).

The reasons presented above led, in the United States of America, to the development of public policy that enables the formation of agricultural cooperatives (Capper-Volstead Act in 1922). These factors also reflect the market structure of agriculture in Ecuador, especially on the dairy market. In Ecuador, the first Law of Cooperatives was enacted in 1937 (Vasquez, 1999) and the current law was issued in 1966. The reach of this law was described in Chapter II.

The factors presented define a range of objectives for starting cooperatives. Some cooperatives may provide multiple services for members while others are more specialized. Regardless of the size, geographical location, or purpose, all cooperatives provide at least one of the following:

1. *Improve bargaining power when dealing with other businesses: Combining the volume of several members leverages their position.*
2. *Reduce costs: Volume purchasing reduces the purchase price of needed supplies. Earnings of the cooperative returned to individual members lower their net costs.*
3. *Obtain products or services otherwise unavailable: Services or products that would not attract private business are often supplied by cooperatives.*
4. *Obtain market access or broaden market opportunities-value added to products by processing. Offering larger quantities of an assured type and quality attracts more buyers.*

5. *Improve product or service quality: Value added to their products, competition, and improved facilities and equipment increase member satisfaction.*

6. *Increase farm income: Distribution of the cooperative's earnings boosts the income of members.* (Rapp, 1996, pp. 2-3)

### 6.1.3. Benefits to farmers

In several major ways, cooperatives benefit farmer-members, and often nonmembers. Ten benefits to farmers are identified and are the following:

1. *Ownership and democratic control: Cooperatives enable farmers to own and control, on a democratic basis, business enterprises for marketing their outputs (products) and procuring their inputs (supplies and services). They voluntarily organize to help themselves rather than rely on government. Farmer ownership allows producers to determine services and operations that will maximize their own farming profits rather than profits for the cooperative itself.*

2. *Increased farm income: Cooperatives increase farm income in a number of ways. These include: (1) Raising the general price level for products marketed or lowering the level for supplies purchased; (2) reducing per-unit handling or processing costs by assembling large volumes, i.e., economies of size or scale; (3) distributing to farmers any net savings made in handling, processing, and selling operations; (4) upgrading the quality of supplies or farm products handled; and (5) developing new markets for products. By pooling supply purchases, sales, and handling and selling expenses, cooperatives can operate more efficiently-at lower costs per unit- than farmers can individually.*

*3. Improved service: Cooperatives serve their members' needs by providing services not available or by improving existing services. In dairy farming, insemination associations are outstanding examples of making a new service available in rural areas.*

*4. Quality of supplies and products: Farm supply cooperatives provide the supplies (feed, seed and fertilizer) that gave the farmer the maximum gains or yields rather than those that returned the largest net margins to cooperatives. In marketing farm products, cooperatives' pricing practices have been based on differentials for quality. And they have provided information and advice on ways to produce quality products and to maintain that quality in the marketing process.*

*5. Assured sources of supplies: Cooperatives provide members with a dependable source of reasonably priced supplies, especially during shortages or emergencies. This service may require cooperatives to forego larger net margins from other domestic or foreign business to meet the needs of their member-owners.*

*6. Enhanced competition: Strong successful cooperatives introduce desirable competition that raises the market prices for farm products, the type of services provided, and the quality of supplies farmers purchase. Individual farmers have little bargaining or purchasing power, but by joining in cooperatives they can acquire higher market power. The non-profit and service-at-cost nature of cooperatives tends to push performance closer to the competitive norm. The reason is that they bring more to market at a higher producer price than would be the case if all firms were profit-seeking. When cooperative enhance competition in the marketplace, usually nonmembers as well as members benefit.*

*7. Expanded markets: Through pooling products of specified grade or quality, marketing cooperatives can meet the needs of large-scale buyers better than can individual farmers. A number of cooperatives in the U.S. have opened markets in other countries and their exports provide outlets for more production than members otherwise could sell.*

*8. Improved farm management: Progressive managers and field staffs of cooperatives provide valuable information to members on farm production and management practices. Advice may be offered on the quality of seeds, fertilizers, and pesticides, and on feeding and cropping practices. Also, many cooperatives provide market and economic information about various products or enterprises.*

*9. Local leadership development: Successful and growing cooperatives often develop leaders among directors, managers, and other employees. And members, by participating in business decisions on a democratic basis, become more self-reliant and informed citizens in their communities.*

*10. Family farmer control of agriculture: These benefits vary among cooperatives and they indicate ways cooperative enterprises help the family farm stay in business and thus keep control of production. The credit and supply cooperatives help the family farmer enlarge and operate his production units more efficiently on an independent basis. The marketing and processing cooperatives provide members market access and help them sell their products to advantage.*

(USDA-RBCS, 1990, pp. 1-10)

### 6.1.4. Benefits to rural communities

Cooperatives benefit the economy of rural areas in the following three ways:

*1. <u>Added community income</u>: Most of the additional income farmers get through cooperatives is spent with hometown firms for goods and services. Successful cooperatives also have substantial payrolls and their employees' patronage of local businesses adds to the economic well-being of the community. The cooperatives also spend money for supplies, utilities and insurance.*

*2. <u>Stronger rural communities</u>: A local cooperative usually has several hundred members who use its services frequently. This in turn helps bring patrons to other types of business in the community. In small towns, the cooperative often is the major or only business. Without it, people would have to go elsewhere for goods and services.*

*3. <u>Goods and services to non-farmers</u>: Rural electric cooperatives serve many rural non-farm residents. Likewise, diversified supply cooperatives supply gasoline, fuel oil, car care, fertilizers, pesticides, lawn and garden, and various home supplies and equipment to non-farmers. Some cooperatives also provide custom services related to these supplies and distribute patronage refunds to these customers.*

(USDA-RBCS, 1990, pp. 10-12)

### 6.1.5. Cooperatives in the dairy industry

Milk production has fundamental characteristics that have led dairy farmers to pioneer the application of cooperative principles to marketing dairy products. Milk is a perishable agricultural product produced on a daily basis and transported to the processor every day or every other day. In addition, volume of milk produced varies seasonally and daily for biological reasons. This variation is not coordinated with the changes in demand, which also vary from day to day and from season to season. Finally, storage to balance supplies with demand is feasible only after processing, except in the very short term. As technology developed, conversion of milk from raw product to various intermediary and final products with longer shelf-lives became possible, but capital intensive facilities and technology subject to significant economies of scale were required.

These characteristics of milk production led dairy farmers to jointly own milk handling facilities and manufacturing plants. In this way, dairy cooperatives have taken a variety of paths to address the needs and preferences of their members and specific market situation. Dairy cooperatives may be organized as bargaining cooperatives or processing cooperatives (USDA-RBCS, 2002).

Bargaining cooperatives focus operations on negotiating milk prices and term of trade for members' raw milk but do not engage in manufacturing of processing. Some cooperatives may represent member concerns in the political arena, performing nominal bargaining functions. Bargaining cooperatives have relatively few assets. This type of dairy cooperatives account for 74 percent of all dairy cooperatives of the U.S. in 2000, but represent 24 percent of U.S. cooperative milk volume. There is one organization in

Ecuador which represents dairy farmers in the political arena and performs nominal bargaining with the representatives of the dairy processors.

Processing cooperatives own processing facilities to improve their ability to balance milk supply with customer demand thus improving their negotiation position. Processing cooperatives may be further subdivided into five types: balancing, hard products, branded products, bottled milk processing, and diversified processing cooperatives.

Balancing cooperatives sell most of their raw milk and also operate a plant or two solely for balancing purposes. When their member milk supply exceeds the volume needed by their customers, they process bulk commodity products such as butter and nonfat dry milk powder, and, occasionally, cheese. This type of cooperatives shrunk to 12 by 2000 in the U.S. because it was costly to maintain their small, aging plants.

"Hard products" processing cooperatives focus their resources on processing operations and operate a system of large-scale plants at maximum capacity to achieve low per-unit manufacturing costs. They run a high-volume of member milk through their plants to make "hard products" like undifferentiated or commodity butter, milk powder, and cheese. Unlike balancing cooperatives, these cooperatives may market only a small portion of their member milk in the bulk form. For 2000, there were three medium-sized cooperatives in the U.S. focused on hard product processing and they handled about two percent of the cooperative milk volume. In Ecuador, a dry milk powder facility owned by dairy farmers started to operate in 2002 with the purpose to process the surpluses of raw milk and supply milk powder to the food processing industry.

"Branded products" processing cooperatives use all of their members' milk to process and market branded cheese and other dairy products for particular markets. These cooperatives aim to capture some marketing margins in addition to processor margins, thus taking their operations closer to the consumer. These cooperatives must be able to produce and market a high-quality and unique product. Since they lack size and scale to compete on price with the large commodity cheesemakers, their viability depends upon an ability to find and develop niche for their specialty product. For 2000, there were 22 small and medium-sized cooperatives of this type in the U.S, whereas one dairy cooperative exists in Ecuador that processes specialty cheese.

Bottled milk processing cooperatives use most, if not all, of the milk they handle in their own plants. These fluid processing cooperatives also capture processor margins and at least some marketing margins through their operations. In the U.S., there were five of these cooperatives in 2000 and accounted for one percent of all milk handled by dairy cooperatives, whereas in Ecuador these types of cooperatives are nonexistent.

Diversified processing cooperatives operate a system of plants to process bottled milk and manufacture a variety of dairy products – both commodity and differentiated. At the same time, they sell a substantial portion of their milk supply to other handlers. The diversified operations better positions these cooperatives to direct milk to its most profitable use. These cooperatives have been the result of mergers and consolidation between cooperatives that previously had a more narrow operating focus. For 2000, there were 14 diversified cooperatives in the U.S. and they represent 62% of all milk handled by processing cooperatives.

In order to define an outcome for Cayambe, these alternatives are assessed. The following sections analyzes the motivations for the start-up of the dairy cooperative in Cayambe as well as the results from the interview to dairy farmers to bring about the most likely organizational ourcome(s) for dairy farmers to engage in collective action..

## 6.2. CAYAMBE DAIRY FARMER MOTIVATION TO FORM A COOPERATIVE

The core motivation for the start-up cooperative in Cayambe is to increase farmer income. Farmer income rises as farmers capture rents by integrating forward in the supply chain.

The objective of the cooperative is to pay farmers the highest price and return patronage refunds to members after deducting the operational costs of the cooperative. In the case of Cayambe dairy farmers, a higher farm price may be achieved by 1) bargaining as a group, 2) eliminating the middleman, and 3) improving milk quality. The operational costs of the cooperative have the potential to decrease since reduced transactions costs are potentially achieved by collective action among dairy farmers (Staatz, 1987).

In the dairy market of Cayambe, bargaining as a group may assist in offsetting any existing processor market power. A common justification for group bargaining is that through collective action farmers are able to counterbalance the market power of their trading partners, leading to a more equitable and efficient market outcome. The fact that the milk buyer negotiates with the cooperative the conditions of the transaction results in lower costs than the milk buyer negotiating individually with each farmer.

Cooperatives use their bargaining power to raise farm income in two ways: redistributing existing income in the farmers' favor and increasing the efficiency of the economic system. Supporters of cooperatives also argue that a system that includes cooperatives results in a more desirable regional distribution of income than a system dominated entirely by investor-owned firms (IOFs). Large IOFs extract profits from farming communities and channel them to metropolitan financial centers. In contrast, cooperatives rebate net margins to members who invest them locally.

The fact that middlemen are eliminated will allow farmers to capture a larger share of rents. Middlemen procure milk from small indigenous farmers of La Chimba. It may result in lower operational costs if the cooperative assumes the role of the middlemen and distribute earnings to members. The hauling and stopping cost to procure milk from centralized cooling tanks installed among small farmers may be lower than with the middlemen.

Dairy farmers may receive a higher price by improving raw milk quality. In Ecuador, most dairy processors use deliberately their own pricing formula on the basis of minimum quality standards and there are no incentives for high quality milk. Only a few processors with reputation for high quality dairy products have defined a pricing formula based on premiums for high quality raw milk.

The cooperative will provide high quality milk to processors. The emergence of a market for high quality milk is subject to the definition of raw milk quality standards, which must be defined by agreement between processors and dairy farmers and sponsored by the Government.

In addition, the cooperative should provide assistance to farmers in order to adopt the production practices that promote the production of high quality milk. The assistance may consist of low cost technical advising for milking practices, for feeding and animal health. The cooperative will spread costs among members in order to hire the required field men to assist farmers, which results in lower costs than the farmer contracting individually.

## 6.3. COLLECTIVE ACTION OUTCOMES

The collective action outcomes considered included joining local farmers to (1) sell milk as a group, (2) install centralized cooling tanks, (3) develop processing facilities, and/or (4) purchase inputs as a group. Farmers had the choice to check one or more possible outcomes, and also to rank them. The responses for the four outcomes are presented in Table 35. The analysis of the ranking for each of the outcomes as well as the reasons and advantages of acting collectively are analyzed further in this chapter.

**Table 35. Summary of responses for willingness of collective action outcomes**

| Category of farms | Sell milk as a group | Install a centralized cooling tank | Install a processing facility | Purchase inputs as a group | None |
|---|---|---|---|---|---|
| 5 – 10 Milking cows (8 farms) | 7 | 7 | 4 | 3 | 1 |
| 11 – 30 Milking cows (5 farms) | 4 | 4 | 1 | 4 | 0 |
| 31 – 150 Milking cows (15 farms) | 10 | 4 | 9 | 5 | 3 |
| Total | 21 | 15 | 14 | 12 | 4 |

Among the 28 farmers, the most common response was joining local farmers to sell milk as a group to the processor. Seventy-five percent of farmers, 21 farmers, had this desire, which included 88% of small farms, 80% of medium farms and 67% of large farms. The second and third responses in order of importance were to install a centralized cooling tank and to develop a processing facility with 54%, or 15 farms, and 50%, or 14 farms, respectively. Eighty-eight percent of small farms, 80% of medium farms and 26% of large farms had considered joining local farms to install a centralized cooling tank. In contrast, 50% of small farms, 20% of medium farms and 60% of large farms had considered joining local farmers to develop a processing facility. In addition, 43% of the farmers, or 12 cases, had considered joining local farmers to purchase inputs as a group, which includes 38% of small farms, 80% of medium farms and 33% of large farms. There are four farmers, or 14% of farmers, that would not consider joining local farmers for neither of the outcomes.

### 6.3.1. Selling milk as a group

As described above, 75% of farmers had considered joining local farmers to sell milk as a group to the processor. Table 36 lays out the responses for the ranking of this collective action outcome and also includes a score according to the ranking of the outcomes. The scoring method consisted in assigning four points for the first rank, three points for the second rank, two points for the third rank and one point for the fourth rank. These scores were multiplied by the relative frequency to have a weighted score and then the score for the four ranks were added to have a total score for each category of farms.

The outcome of selling milk as a group obtained 2.32 points among the 28 interviewed dairy farmers, which was the highest score. Small farms gave this option the highest score of 2.9 for the outcome of selling milk as a group, followed by medium farms with 2.2 and large farms with 2.07.

**Table 36. Responses for selling milk as a group**

| Category of farms | Rank | Relative frequency in each category (%) | Weighted Score |
|---|---|---|---|
| Small 5 – 10 milking cows (8 farms) | 1 | 38 | 1.52 |
| | 2 | 38 | 1.14 |
| | 3 | 12 | 0.24 |
| | 4 | 0 | 0 |
| | None | 12 | - |
| | Total | 100 | 2.90 |
| Medium 11 – 30 milking cows (5 farms) | 1 | 0 | 0 |
| | 2 | 60 | 1.80 |
| | 3 | 20 | 0.4 |
| | 4 | 0 | 0 |
| | None | 20 | - |
| | Total | 100 | 2.20 |
| Large 31 – 150 milking cows (15 farms) | 1 | 20 | 0.80 |
| | 2 | 33 | 0.99 |
| | 3 | 14 | 0.28 |
| | 4 | 0 | 0 |
| | None | 33 | - |
| | Total | 100 | 2.07 |
| Total | 1 | 21.4 | 0.86 |
| | 2 | 39.3 | 1.18 |
| | 3 | 14.3 | 0.29 |
| | 4 | 0 | 0 |
| | None | 25 | - |
| | Total | 100 | 2.32 |

Among the four alternatives of collective action, the outcome of selling milk as a group had the second highest score in each of the three categories of farms. Also, as mentioned above, across all the 28 farms this outcome had the highest score in ranking

(2.32). This suggests that this outcome may be worth pursuing among farmers of Cayambe.

Regarding the reasons or advantages mentioned by the farmer of such collective action outcome, farmers had the opportunity to mention up to three different advantages or reasons. For the case of selling milk as a group to the processor, the most common response was to increase the farm price of milk with 38% of small farmers, 60% of medium farmers and 20 % for large farmers. Other reasons included to increase the bargaining power, which was answered by 40% of large farmers. Responses mentioned only once were "selling more milk," "assured sale," and "reduce transportation cost."

### 6.3.2. Installing a centralized cooling tank

The second collective action outcome most widely considered by farmers was installing a centralized cooling tank for milk. Fifty-four percent of farmers considered this outcome. Table 37 presents the responses for the ranking of this outcome among the four alternatives considered as well as the scores for the ranking alternatives.

This outcome obtained a score of 1.71 among the interviewed dairy farmers, which is the second highest score among the four alternatives of collective action. Among the three categories of farms, small farms had the highest score with 3.14 followed by medium and large farms with 2.20 and 0.80, respectively. Among small farms, the highest score (2.00) was for ranking first the outcome of installing a cooling tank, whereas for medium farms the highest score of 0.80 had the first and third ranking and for large farms the first ranking had the score of 0.52. On the other hand, about 46% of farms had not considered this outcome, which included 12% of small farms, 20% of medium farms and 73% of large farms.

**Table 37. Responses for installing a centralized cooling tank for milk**

| Category of farms | Rank | Relative frequency in each category (%) | Weighted Score |
|---|---|---|---|
| Small 5 – 10 milking cows (8 farms) | 1 | 50 | 2.00 |
| | 2 | 38 | 1.14 |
| | 3 | 0 | 0 |
| | 4 | 0 | 0 |
| | None | 12 | - |
| | Total | 100 | 3.14 |
| Medium 11 – 30 milking cows (5 farms) | 1 | 20 | 0.80 |
| | 2 | 20 | 0.60 |
| | 3 | 40 | 0.80 |
| | 4 | 0 | 0 |
| | None | 20 | - |
| | Total | 100 | 2.20 |
| Large 31 – 150 milking cows (15 farms) | 1 | 13 | 0.52 |
| | 2 | 7 | 0.21 |
| | 3 | 0 | 0 |
| | 4 | 7 | 0.07 |
| | None | 73 | - |
| | Total | 100 | 0.80 |
| Total | 1 | 25 | 1.00 |
| | 2 | 17.8 | 0.53 |
| | 3 | 7.2 | 0.14 |
| | 4 | 3.5 | 0.04 |
| | None | 46.5 | - |
| | Total | 100 | 1.71 |

The outcome of installing a centralized cooling tank had the highest score for small farms, whereas for medium farms this outcome had the second highest score (2.20) and for large farms had the lowest score (0.80). Therefore, it is likely that centralized cooling tanks would be installed among small farms. Recall that only the two large that marketed raw milk to the processor from other region had cooling bulk tanks.

Regarding the advantages mentioned by farmers of installing a centralized cooling tank, the most common responses were "improve milk quality" with 25% of small farms, 80% of medium farms and 20% of large farms, and "increase farm milk price" with 63% of small farms, 20% of medium farms and 7% of large farms. Several other statements were mentioned only once, which were "increase bargaining power," "capability to negotiate with non-local processors," and "assured sale."

### 6.3.3. Installing a dairy processing facility

The collective action outcome of joining local farmers to install a dairy processing facility was the third most widely considered alternative by the farmers. Fifty-percent of farmers had considered this outcome and the score obtained was 1.64. Table 38 presents the ranking of the responses for each category of farms as well as the scores for each ranking alternative.

Among the three categories of farms, the highest score (2.20) was for large farms, of which 40% ranked the outcome of installing a processing facility in the first place and 20% in the second place. In contrast, the scores of this outcome for small and medium farms were 1.12 and 0.80, respectively.

The score obtained by large farms for the outcome of installing a processing facility was the highest for this category of farms among the four alternatives of collective action.

**Table 38. Responses for installing a dairy processing facility**

| Category of farms | Rank | Relative frequency in each category (%) | Weighted Score |
|---|---|---|---|
| | 1 | 0 | 0 |
| Small | 2 | 12 | 0.36 |
| 5 – 10 | 3 | 38 | 0.76 |
| milking cows | 4 | 0 | 0 |
| (8 farms) | None | 50 | - |
| | Total | 100 | 1.12 |
| | 1 | 20 | 0.80 |
| Medium | 2 | 0 | 0 |
| 11 – 30 | 3 | 0 | 0 |
| milking cows | 4 | 0 | 0 |
| (5 farms) | None | 80 | - |
| | Total | 100 | 0.80 |
| | 1 | 40 | 1.60 |
| Large | 2 | 20 | 0.60 |
| 31 – 150 | 3 | 0 | 0 |
| milking cows | 4 | 0 | 0 |
| (15 farms) | None | 40 | - |
| | Total | 100 | 2.20 |
| | 1 | 25 | 1.00 |
| | 2 | 14.3 | 0.43 |
| Total | 3 | 10.7 | 0.21 |
| | 4 | 0 | 0 |
| | None | 50 | - |
| | Total | 100 | 1.64 |

The most widespread reason to install a processing facility mentioned by farmers was to "increase income". Thirty-eight percent of small farms, 20% of medium farms, and 33% of large farms indicated this statement. Other common responses were "integrate forward in supply chain" with 20% of large farms, and "reduce the role of middlemen" and "assured sale" with 13% of large farms. Responses mentioned only once included "increase farm milk price" and "reduce the risk of the farmer".

If so, farmers were asked to check the amount range he/she would be willing to invest. The farmer could choose among eight increasing ranges of investment, Two farmers among the 14 that were willing to join and install a processing facility did not respond to this question of the interview.

Farmers that had considered joining local farmers to install a processing facility were also asked whether or not they would invest in a processing facility. If the farmer answered "yes" to invest resources in a processing facility, the next question asked was "what amount of capital would you be willing to invest?" The farmer had the choice to select one among eight ranges of investment, the lowest range being $1 to $100 and the highest range $10,000 to $20,000. Considering the average for each investment range, owners of small farms were willing to invest a small amount of capital, being $650 what could be raised among the four small farmers willing to install a dairy processing facility. The owner of the medium farm willing to install a processing facility would invest $7,500. Lastly, owners of seven large farms willing to install a processing facility would invest $72,500.

### 6.3.4. Purchase inputs as a group

The collective action outcome of joining local farmers to purchase inputs as a group was considered by the least number of farmers, i.e. 12 farmers or 43% of farmers, and the score for this outcome was 1.15. Table 39 lays out the responses according to the ranking indicated by the farmers as well as the score for the rankings in the categories of farms.

The collective action outcome of purchasing inputs as a group had the highest score (2.60) for medium farms, which was significantly higher than the score obtained for small farms (0.62) and for large farms (0.93). Within the categories of farms, the highest score (2.40) was for medium farms ranking first the outcome, whereas for small farms the highest score was for ranking third and for large farms was for ranking second.

**Table 39. Responses for purchasing inputs as a group**

| Category of farms | Rank | Relative frequency in each category | Score |
|---|---|---|---|
| Small<br>5 – 10<br>milking cows<br>(8 farms) | 1 | 0% | 0 |
| | 2 | 0% | 0 |
| | 3 | 25% | 0.50 |
| | 4 | 12% | 0.12 |
| | None | 63% | - |
| | Total | 100% | 0.62 |
| Medium<br>11 – 30<br>milking cows<br>(5 farms) | 1 | 60% | 2.40 |
| | 2 | 0% | 0 |
| | 3 | 0% | 0 |
| | 4 | 20% | 0.20 |
| | None | 20% | - |
| | Total | 100% | 2.60 |
| Large<br>31 – 150<br>milking cows<br>(15 farms) | 1 | 7% | 0.28 |
| | 2 | 13% | 0.39 |
| | 3 | 13% | 0.26 |
| | 4 | 0% | 0 |
| | None | 67% | - |
| | Total | 100% | 0.93 |
| Total | 1 | 14.3% | 0.57 |
| | 2 | 7.2% | 0.22 |
| | 3 | 14.3% | 0.29 |
| | 4 | 7.2% | 0.07 |
| | None | 57% | - |
| | Total | 100% | 1.15 |

Medium farms obtained the highest score (2.60) for the outcome of buying inputs as a group when comparing with the scores got by this category of farms in the other three collective action outcomes. This result could be explained by the fact that medium farms purchase more inputs than small farms and thus would prefer reduce their costs and increase profits by buying inputs at a lower price. Also, for large farms this outcome may not be desirable because they may already get reduced prices when purchasing inputs.

Regarding the advantages or reasons of joining local farmers to purchase inputs as a group, the most widespread response was "pay lower prices for inputs" with 80% of medium farms, 20% of large farms and 13% of small farms. Other common response was "better quality of inputs", which included 20% of medium farms and 13% of large farms. Responses that were mentioned only once by medium farms were "have inputs specific for the region" and "experiment with cooperatives" while one large farm mentioned "gain from economies of scale" and one small farm "improve service."

### 6.3.5. Reasons for not considering any collective action outcome

The four farmers that have not considered joining local farmers for any of the four collective action outcomes discussed above were asked to for up to three reasons that explained their choice. The responses of each of the farmers were different and are discussed below.

The small farm that had not considered joining local farmers indicated that sanitary management of the herd varies among farmers thus milk quality differs among farms. The other three farmers that have not considered joining local farmers for any of the four collective action outcomes were large farmers. The owners of two large farms mentioned that there were not successful previous tries to join local farmers and the third farmer mentioned that dairy farmers do not have ability to work as a group. The second reason mentioned by owners of large farms was that they were pessimistic of having positive results of joining local farmers and that dairy farmers must not manage processing facilities. A third reason mentioned by a large farmer was that dairy farmers must focus on other activities that are more important.

## 6.4. CONDITIONS FOR COLLECTIVE ACTION

The interview to farmers contained a set of questions to evaluate the conditions under which large farms would join small farms to market milk as a group. The viability of implementing a pricing policy would be a straightforward mechanism to motivate milk marketing among large and small farms as well as other benefits that large farmers might be willing to receive.

### 6.4.1. Premium for milk volume

The farmers that had more than 50 cows (milking + dry cows) were asked whether they would join farmers that have fewer cows with the purpose of selling milk as a group or install a centralized cooling tank as long as there is a premium for volume of milk.

Of the thirteen farms with more than 50 cows, 10 farms would consider joining local farmers to either sell milk as a group or install a cooling tank only if there was a premium for volume of milk. Eight large farms expressed the expected premium. The average premium indicated by the eight farms was 2 cents per liter while the most common responses were 2 cents with three farms, 3 cents with two farms, and 1.5 cents with two farms, and 1 cent for the final farm.

On the other hand, farmers with less than 50 cows (milking + dry cows) were asked whether they would join farmers that have more cows with the purpose of selling milk as a group or installing a centralized cooling tank and would agree to include the volume as one component or milk pricing. Fifteen farms had less than 50 cows, being two in the large-size category and all the five medium farms and eight small farms.

Eleven farms considered joining local farms to sell milk as a group or install a centralized cooling tank and agreed with the milk pricing according to volume. Seven farms were small and four were medium size.

### 6.4.2. Other benefits

The thirteen farmers that owned more than 50 cows were also asked to indicate any other benefits they should receive in order to join smaller farms. Only five farmers responded to this question. Two responded that they would not expect additional benefits since the objective is to help small farms. The three farmers that provided responses mentioned that large farmers should "receive veterinary assistance," "pay lower prices for inputs," and "receive advanced payments." These additional benefits for large farmers were mentioned by 23% of farmers with more than 50 cows and may be taken into account when considering the benefits for members of the cooperative.

## 6.5. NEEDS OF DAIRY FARMERS

Dairy farmers were asked to check and rank the needs they had in order to improve milk production practices thus increase farm profitability. The needs of dairy farmers identify services that a cooperative may provide to members. The farmers had four alternatives to check and could mention two additional needs. In this way, the farmer ranked up to six alternatives. Table 40 presents the results for the ranking of the farmers needs.

**Table 40. Responses for needs of dairy farmers**

| Needs | Rank | 5 – 10 Milking Cows (8 farms) | 11 – 30 Milking Cows (5 farms) | 31 – 150 Milking Cows (15 farms) | Total |
|---|---|---|---|---|---|
| Pastures management and fertilization | 1 | 7 | 2 | 10 | 19 |
| | 2 | 1 | 0 | 4 | 5 |
| | None | 0 | 3 | 1 | 4 |
| Herd management | 1 | 0 | 0 | 2 | 2 |
| | 2 | 5 | 2 | 4 | 11 |
| | 3 | 2 | 0 | 1 | 3 |
| | None | 1 | 3 | 8 | 12 |
| Accountancy and tax management | 1 | 0 | 1 | 1 | 2 |
| | 2 | 0 | 1 | 3 | 4 |
| | 3 | 0 | 1 | 1 | 2 |
| | 4 | 2 | 0 | 4 | 6 |
| | None | 6 | 2 | 6 | 14 |
| Improve quality of milk | 3 | 4 | 0 | 5 | 9 |
| | 4 | 2 | 1 | 0 | 3 |
| | None | 2 | 4 | 10 | 16 |
| Genetics | 2 | 2 | 0 | 1 | 3 |
| | 3 | 1 | 1 | 0 | 2 |
| | None | 5 | 4 | 14 | 23 |
| Irrigation | 1 | 1 | 1 | 1 | 3 |
| | 2 | 0 | 1 | 0 | 1 |
| | None | 7 | 3 | 14 | 24 |
| Loan | 1 | 0 | 1 | 0 | 1 |
| | 4 | 2 | 0 | 0 | 2 |
| | 5 | 1 | 0 | 0 | 1 |
| | None | 5 | 4 | 15 | 24 |
| Artificial insemination technician | 3 | 1 | 0 | 0 | 1 |
| | 6 | 1 | 0 | 0 | 1 |
| | None | 6 | 5 | 15 | 26 |

The top two most common needs mentioned by the farmers were pasture management/fertilization and herd management. The need for pastures management advising was ranked first by 19 farms, including 88% of small farms, 40% of medium farms and 67% of large farms. Herd management was ranked second by 11 farms, which included 63% of small farms, 40% of medium farms and 26% of large farms.

The need for herd management consisted in having technical advice for nutrition, animal health and reproduction. High quality milk is obtained from having the adequate nutrition and avoiding mastitis in the milking herd. Consequently, the field men that the cooperative may hire would provide advice to members in these matters.

The third most common need was accountancy and tax management with 14 farms. Six farms (21% of farms) ranked this option on the fourth place, four farms (14% of farms) ranked in the second place, and only two farms (7% of farms) ranked in the first and third place. In contrast, the need to improve the quality of milk was the fourth most common mentioned by the farmers with 12 responses and nine farms ranked this need in the third place and three farms ranked in the fourth place.

Other needs mentioned less frequently included the need to improve genetics (five farms), irrigation and financial resources (4 farms) and two small farms required the need of an artificial insemination technician.

## 6.6. PROPOSED COLLECTIVE ACTION OUTCOMES

For the start-up of a cooperative in Cayambe is relevant to analyze four likely scenarios based on the results of the interview and assuming a gradual process of vertical integration. Dairy farmers ranked with a higher weighted score the outcome of selling milk as a group than to install a processing facility. Thus, the assumption that the cooperative will start bargaining and then might integrate into processing is considered.

The first three scenarios consist of a *bargaining cooperative* that will market the milk to processors or middlemen while the fourth scenario consists of a *two-phase* *cooperative* that include a bargaining phase (bargaining cooperative) and a processing phase ("branded products" cooperative).

In the next sections the assumptions for the growth of the membership are presented, as well as the description of the four scenarios, which are illustrated by the bargaining and processing cooperative.

### 6.6.1. Assumptions for the cooperative membership

The assumptions for the growth of the cooperative's membership and the volume of milk to be marketed are the following. The total members of the cooperative will follow the results from the collective action section of the interview and from the 2000 Census of Agriculture provided by the Agricultural Information System. The percentages of interviewed farmers by categories that agreed to sell milk as a group would be applied to the categories of farms according to the census in Cayambe. In this way, 88% of small farms, 80% of medium farms and 67% of large farms will be members of the cooperative. The cooperative's membership will include 2,675 farms, being 2,563 small farms (2,913x88%), 79 medium farms (99x80%) and 33 large farms (50x67%).

The starting members of the cooperative would be the interviewed large and medium size dairy farmers that were willing to market milk as a group. This group included 10 large farmers and 4 medium farmers, and for the small size category would be the 200 dairy farmers that would install five centralized cooling tanks with the assistance of CA.

In a period of 24 months or two years all the potential dairy farmers (2,675 farmers) would join the cooperative at a decreasing rate, which means that a larger

**Table 41: Cooperative membership growth and milk marketed**

| | Month | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| **Small farms** | | | | | | | | | | | | |
| Monthly growth rate | 11.7% | 11.7% | 11.7% | 11.7% | 11.7% | 11.7% | 11.7% | 11.7% | 11.7% | 11.7% | 11.7% | 11.7% |
| Farms to find trend to be inversed | 200 | 223 | 250 | 279 | 312 | 348 | 389 | 435 | 486 | 543 | 606 | 677 |
| Increment number farms | | 23 | 26 | 29 | 32 | 36 | 40 | 45 | 50 | 56 | 63 | 71 |
| Number of farms | 200 | 469 | 709 | 924 | 1,116 | 1,288 | 1,442 | 1,580 | 1,703 | 1,813 | 1,912 | 2,000 |
| Average production per farm | 28 | 10.77 | 10.77 | 10.77 | 10.77 | 10.77 | 10.77 | 10.77 | 10.77 | 10.77 | 10.77 | 10.77 |
| Total milk marketed | 5,500 | 8,397 | 10,982 | 13,298 | 15,366 | 17,218 | 18,877 | 20,363 | 21,688 | 22,873 | 23,939 | 24,887 |
| Number of centralized cooling tanks | 5 | 7 | 8 | 10 | 11 | 12 | 13 | 14 | 15 | 15 | 16 | 17 |
| **Medium farms** | | | | | | | | | | | | |
| Monthly growth rate | 13.8% | 13.8% | 13.8% | 13.8% | 13.8% | 13.8% | 13.8% | 13.8% | 13.8% | 13.8% | 13.8% | 13.8% |
| Farms to find trend to be inversed | 4 | 5 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 13 | 15 | 17 |
| Increment number farms | - | 1 | - | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 |
| Number of farms | 4 | 14 | 22 | 29 | 36 | 42 | 47 | 51 | 55 | 58 | 61 | 64 |
| Average production per farm | 194 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 |
| Total milk marketed | 776 | 1,767 | 2,560 | 3,254 | 3,947 | 4,542 | 5,038 | 5,434 | 5,830 | 6,128 | 6,425 | 6,722 |
| **Large farms** | | | | | | | | | | | | |
| Monthly growth rate | 5.3% | 5.3% | 5.3% | 5.3% | 5.3% | 5.3% | 5.3% | 5.3% | 5.3% | 5.3% | 5.3% | 5.3% |
| Farms to find trend to be inversed | 10 | 11 | 11 | 12 | 12 | 13 | 14 | 14 | 15 | 16 | 17 | 18 |
| Increment number farms | | 1 | - | 1 | - | 1 | 1 | - | 1 | 1 | 1 | 1 |
| Number of farms | 10 | 12 | 13 | 15 | 16 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| Average production per farm | 1,028 | 924 | 924 | 924 | 924 | 924 | 924 | 924 | 924 | 924 | 924 | 924 |
| Total milk marketed | 10,280 | 12,128 | 13,052 | 14,901 | 15,825 | 17,673 | 18,597 | 19,521 | 20,446 | 21,370 | 22,294 | 23,218 |
| **Total** | | | | | | | | | | | | |
| Total milk marketed | 16,556 | 22,293 | 26,595 | 31,452 | 35,138 | 39,434 | 42,512 | 45,319 | 47,964 | 50,371 | 52,658 | 54,828 |
| Number of members | 214 | 495 | 744 | 968 | 1,168 | 1,348 | 1,508 | 1,651 | 1,779 | 1,893 | 1,996 | 2,088 |
| Number of milk truck stops | 19 | 33 | 43 | 54 | 63 | 72 | 79 | 85 | 91 | 95 | 100 | 105 |

**Table 41 (Cont'd)**

| | Month | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| **Small farms** | | | | | | | | | | | | |
| Increase rate farms | 11.7% | 11.7% | 11.7% | 11.7% | 11.7% | 11.7% | 11.7% | 11.7% | 11.7% | 11.7% | 11.7% | 11.7% |
| Farms to find trend to be inversed | 757 | 846 | 945 | 1,055 | 1,179 | 1,318 | 1,472 | 1,645 | 1,838 | 2,053 | 2,294 | 2,563 |
| Increment number farms | 79 | 88 | 99 | 110 | 123 | 138 | 154 | 172 | 192 | 215 | 240 | 269 |
| Number of farmers | 2,079 | 2,150 | 2,213 | 2,269 | 2,319 | 2,364 | 2,404 | 2,440 | 2,472 | 2,501 | 2,527 | 2,563 |
| Average production per farm | 10.77 | 10.77 | 10.77 | 10.77 | 10.77 | 10.77 | 10.77 | 10.77 | 10.77 | 10.77 | 10.77 | 10.77 |
| Total milk marketed | 25,738 | 26,503 | 27,181 | 27,784 | 28,323 | 28,808 | 29,238 | 29,626 | 29,971 | 30,283 | 30,563 | 30,951 |
| Number of centralized cooling tanks | 17 | 18 | 18 | 18 | 19 | 19 | 19 | 19 | 20 | 20 | 20 | 20 |
| **Medium farms** | | | | | | | | | | | | |
| Increase rate farms | 13.8% | 13.8% | 13.8% | 13.8% | 13.8% | 13.8% | 13.8% | 13.8% | 13.8% | 13.8% | 13.8% | 13.8% |
| Farms to find trend to be inversed | 19 | 22 | 25 | 28 | 32 | 36 | 41 | 47 | 54 | 61 | 69 | 79 |
| Increment number farms | 2 | 3 | 3 | 3 | 4 | 4 | 5 | 6 | 7 | 7 | 8 | 10 |
| Number of farmers | 66 | 68 | 70 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 78 | 79 |
| Average production per farm | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 |
| Total milk marketed | 6,921 | 7,119 | 7,317 | 7,515 | 7,614 | 7,713 | 7,813 | 7,912 | 8,011 | 8,110 | 8,110 | 8,209 |
| **Large farms** | | | | | | | | | | | | |
| Increase rate farms | 5.3% | 5.3% | 5.3% | 5.3% | 5.3% | 5.3% | 5.3% | 5.3% | 5.3% | 5.3% | 5.3% | 5.3% |
| Farms to find trend to be inversed | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 27 | 28 | 30 | 31 | 33 |
| Increment number farms | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | 2 |
| Number of farmers | 25 | 26 | 27 | 28 | 29 | 29 | 30 | 31 | 31 | 32 | 32 | 33 |
| Average production per farm | 924 | 924 | 924 | 924 | 924 | 924 | 924 | 924 | 924 | 924 | 924 | 924 |
| Total milk marketed | 24,142 | 25,066 | 25,990 | 26,915 | 27,839 | 27,839 | 28,763 | 29,687 | 29,687 | 30,611 | 30,611 | 31,535 |
| **Total** | | | | | | | | | | | | |
| Total milk marketed | 56,801 | 58,688 | 60,489 | 62,214 | 63,776 | 64,360 | 65,814 | 67,225 | 67,669 | 69,004 | 69,284 | 70,695 |
| Number of members | 2,170 | 2,244 | 2,310 | 2,369 | 2,421 | 2,467 | 2,509 | 2,547 | 2,580 | 2,611 | 2,637 | 2,675 |
| Number of milk truck stops | 108 | 112 | 115 | 118 | 121 | 122 | 124 | 126 | 128 | 130 | 130 | 132 |

number of farmers would join the cooperative in the beginning months than in the latter months. A growth rate was calculated based on the starting and target membership for each farm category. Then, the incremental number of farms for each month was calculated and the incremental number of farms for the 24th month became the new members for the 2nd month, the incremental farms for the 23rd month became the new members for the 3rd month and so on until the incremental farms of the 2nd month became the new members for the 24th month. As a result, for the 24th month the members of the cooperative would be the 2,563 small farms, 79 medium farms and 33 large farms (see Table 41).

The volume of milk available would result from multiplying the number of farms in each size category by the average volume of milk marketed by farm for each category according to the 2000 Census of Agriculture. Nevertheless, the fact that the milk volume from the starting members was either obtained from the interviews (for large and medium farms) or provided by Cattlemen's Association (small farms) led to different averages of milk marketed by farm. In this way, starting in the second month the average volume of milk to be marketed by farms according to size was obtained by subtracting the volume of milk marketed and the number of members that joined the cooperative in the first month from the total number of farms and milk volume in each size category, respectively. Thus, the average volume of milk marketed per farm was about 10 liters, 99 liter and 924 liters per day for small, medium and large farms, respectively. By the end of the 12th month the volume of milk marketed would be 54,828 liters per day and would reach 70,695 liters per day by the end of the 24th month.

**Table 42: Forecast of member milk production**

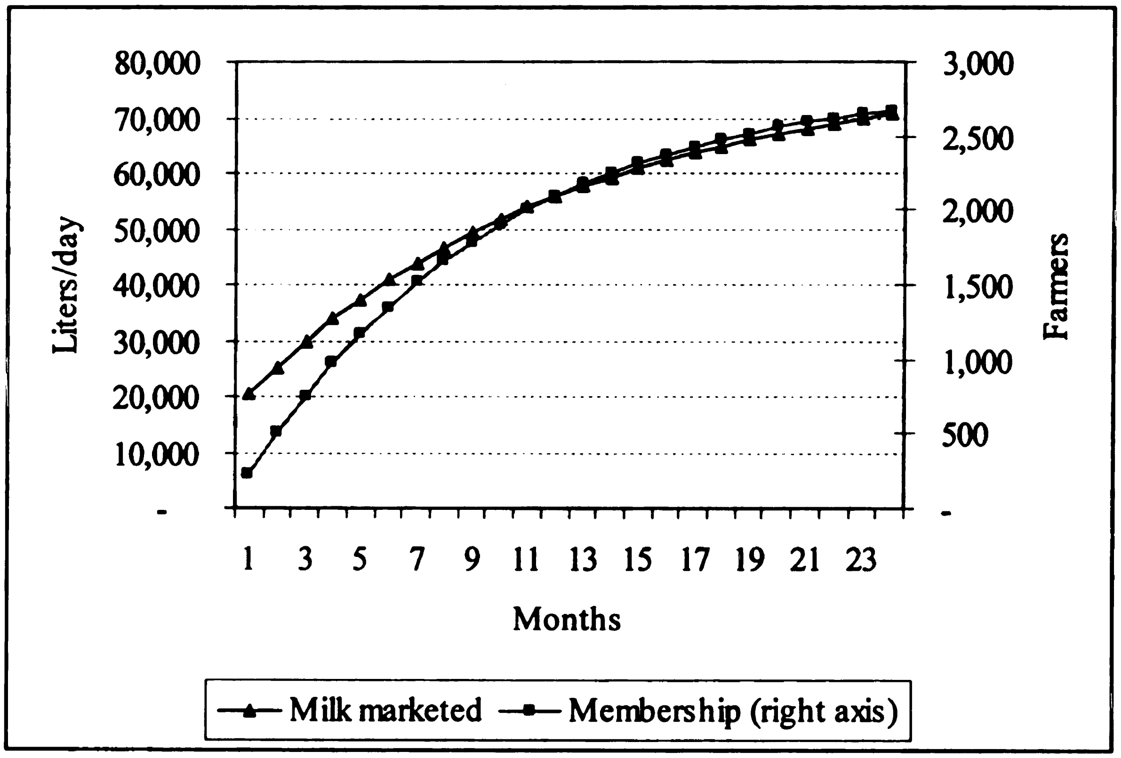
| | YEARS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| **Small farms** | | | | | | | | | | | | | | |
| Number of farms | 2,563 | 2,563 | 2,563 | 2,563 | 2,563 | 2,563 | 2,563 | 2,563 | 2,563 | 2,563 | 2,563 | 2,563 | 2,563 | 2,563 |
| Total milk marketed | 30,951 | 30,951 | 30,951 | 30,951 | 30,951 | 30,951 | 30,951 | 30,951 | 30,951 | 30,951 | 30,951 | 30,951 | 30,951 | 30,951 |
| Number of centralized cooling tanks | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| **Medium farms** | | | | | | | | | | | | | | |
| Number of farms | 79 | 79 | 79 | 79 | 79 | 79 | 79 | 79 | 79 | 79 | 79 | 79 | 79 | 79 |
| Increase rate in milking cows | 2.3% | 2.2% | 2.2% | 2.1% | 2.1% | 2.0% | 2.0% | 2.0% | 1.9% | 1.9% | 1.9% | 1.8% | 1.8% | 1.8% |
| Increase rate in milk yield | 0.59% | 0.58% | 0.58% | 0.57% | 0.57% | 0.57% | 0.57% | 0.56% | 0.56% | 0.56% | 0.55% | 0.55% | 0.55% | 0.54% |
| Average production per farm | 107 | 110 | 113 | 116 | 119 | 122 | 125 | 129 | 132 | 135 | 138 | 142 | 145 | 148 |
| Total milk marketed | 8,444 | 8,682 | 8,922 | 9,165 | 9,410 | 9,657 | 9,906 | 10,157 | 10,410 | 10,666 | 10,924 | 11,184 | 11,446 | 11,711 |
| **Large farms** | | | | | | | | | | | | | | |
| Number of farmers | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 |
| Increase rate in milking cows | 2.3% | 2.2% | 2.2% | 2.1% | 2.1% | 2.0% | 2.0% | 2.0% | 1.9% | 1.9% | 1.9% | 1.8% | 1.8% | 1.8% |
| Increase rate in milk yield | 0.59% | 0.58% | 0.58% | 0.57% | 0.57% | 0.57% | 0.57% | 0.56% | 0.56% | 0.56% | 0.55% | 0.55% | 0.55% | 0.54% |
| Average production per farm | 983 | 1,010 | 1,038 | 1,067 | 1,095 | 1,124 | 1,153 | 1,182 | 1,212 | 1,241 | 1,271 | 1,302 | 1,332 | 1,363 |
| Total milk marketed | 32,431 | 33,346 | 34,269 | 35,200 | 36,140 | 37,089 | 38,045 | 39,010 | 39,984 | 40,966 | 41,956 | 42,955 | 43,962 | 44,977 |
| **Total** | | | | | | | | | | | | | | |
| Total milk marketed | 71,826 | 72,979 | 74,142 | 75,316 | 76,501 | 77,696 | 78,902 | 80,118 | 81,345 | 82,583 | 83,831 | 85,090 | 86,359 | 87,639 |
| Number of members | 2,675 | 2,675 | 2,675 | 2,675 | 2,675 | 2,675 | 2,675 | 2,675 | 2,675 | 2,675 | 2,675 | 2,675 | 2,675 | 2,675 |
| Number of milk truck stops | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |

**Table 42 (Cont'd)**

| | 17 | 18 | 19 | 20 |
|---|---|---|---|---|
| **Small farms** | | | | |
| Number of farms | 2,563 | 2,563 | 2,563 | 2,563 |
| Total milk marketed | 30,951 | 30,951 | 30,951 | 30,951 |
| Number of centralized cooling tanks | 20 | 20 | 20 | 20 |
| **Medium farms** | | | | |
| Number of farms | 79 | 79 | 79 | 79 |
| Increase rate in milking cows | 1.7% | 1.7% | 1.7% | 1.6% |
| Increase rate in milk yield | 0.54% | 0.54% | 0.53% | 0.53% |
| Average production per farm | 152 | 155 | 158 | 162 |
| Total milk marketed | 11,977 | 12,246 | 12,517 | 12,790 |
| **Large farms** | | | | |
| Number of farmers | 33 | 33 | 33 | 33 |
| Increase rate in milking cows | 1.7% | 1.7% | 1.7% | 1.6% |
| Increase rate in milk yield | 0.54% | 0.54% | 0.53% | 0.53% |
| Average production per farm | 1,394 | 1,425 | 1,457 | 1,489 |
| Total milk marketed | 46,001 | 47,033 | 48,074 | 49,123 |
| **Total** | | | | |
| Total milk marketed | 88,929 | 90,230 | 91,542 | 92,864 |
| Number of members | 2,675 | 2,675 | 2,675 | 2,675 |
| Number of milk truck stops | 132 | 132 | 132 | 132 |

The volume of milk marketed by small farms would remain constant due to the fact that they would keep the same herd size and sell the older cattle to be replaced by the younger cattle whereas the volume of milk marketed by medium and large farms would increase every year. Starting on the third year the milk volume marketed by medium and large farms would increase due to the facts that the number of milking cows increase in the herd and the average milk yield per cow also increases over time (see Table 42).

**Figure 5: Cooperative membership and volume of milk marketed**




In order to estimate the increase rate of milking cows and milk yield per cow for medium and large farms, the national trend statistics of these two variables were the basis to run two regressions and forecast the number of milking cows and milk yield per cow for the next 20 years. (See Appendix B for results of the regressions) The increase rate for these two variables over the 20 years was used to compute the volume of milk available for the medium and large cooperative's members. The evolution of the cooperative's membership and the volume of milk marketed for the first 24 months are displayed in Figure 5.

### 6.6.2. Bargaining cooperative

The bargaining cooperative comprises three scenarios for a life span analysis of 20 years as well as the first phase of the fourth scenario for a life span of two years. The first three scenarios reflect the fact of taking steps in horizontal and vertical integration to enhance the quality of milk marketed by dairy farmers in Cayambe while the first phase of the fourth scenario is the same as for the first two years of the third scenario.

The first scenario consists of forming a bargaining cooperative that markets raw milk as a group among members to the milk buyer. This scenario is based on the current situation but the milk buyer would have to negotiate with the cooperative to acquire raw milk produced by members.

The second scenario consists of a bargaining cooperative that has invested in cooling tanks to collect milk among small indigenous farmers and markets milk to the milk buyer. This scenario provides an improved milk handling alternative for small farms and takes advantage of the current capital (non-refrigerated trucks) invested by processors or middleman for the procurement of raw milk.

Within this scenario, Cattlemen's Association has developed a project[13] to install five centralized cooling tanks that would collect 5,500 liters of milk from 200 small farmers in Cayambe. The capacity of each tank would be 1,920 liters and it would be

[13] The information was provided by Eng. John Campuzano, who developed the project for installing the cooling tanks for Cattlemen's Association.

assumed that the capacity would be 25% in excess for the tanks that would gradually be installed to collect the milk from the potential small farmers.

The third scenario consists of a bargaining cooperative that invests in cooling tanks to collect milk among small indigenous farmers, milk trucks to transport milk to the processors and a milk testing laboratory for raw milk. This scenario results in an alternative for dairy farmers to integrate forward in the supply chain and offer high quality raw milk to the processors.

### 6.6.3. Processing cooperative

The processing cooperative is the second phase of the fourth scenario. The processing phase would start only if the dairy cooperative had been successful at the end of the second year of the third scenario. This assumption does not neglect the possibility that the cooperative may go through the first and/or second scenarios of the bargaining phase before reaching the third scenario.

The members of the cooperative would consider integrating forward in the supply chain when the volume of milk procured reaches 65,000 liters per day, which is the volume of milk required to install a mid-size processing facility[14]. This size of plant is suggested since it will have the capacity to process milk according to the procurement and membership assumptions. The volume of 65,000 liters per day is reached at the beginning of the third quarter of the second year for the third scenario. By that time about 94% of the potential members have joined the cooperative and would plan to invest in the

[14] Information provided by Dr. John Partridge, Associate Professor in the Department of Food Science and Human Nutrition at Michigan State University.

processing plant during the second half of the second year thus the facility would start to operate by the beginning of the third year.

The facility will process pasteurized milk, fresh cheese and butter. Recall from Chapter V, the dairy products most sold in milk equivalents were powdered milk, which substitute is pasteurized milk, and fresh cheese. Thus, the cooperative will process 2% fat reduced pasteurized milk and 20% fat fresh cheese. The process will yield an excess of fat so that butter would also be produced.

The proposed collective action outcomes are a core element for the strategic analysis and plan as well as for the feasibility analysis of the start-up cooperative.

# CHAPTER VII

# STRATEGIC ANALYSIS AND PLAN FOR A START-UP DAIRY COOPERATIVE

## 7.1. INTRODUCTION

This chapter presents the strategic analysis and plan for the start-up of a dairy cooperative in Cayambe region of Ecuador. The strategic analysis lays out the critical issues, which derive from the specification of key success factors that will enable the business to be successful in the future. The strategic plan lays out the action strategies that should be implemented in order to fulfill the resource needs and address the critical issues.

The strategic analysis and plan for the start-up cooperative takes into account the four scenarios that were described in the previous chapter. The first through third scenarios refer to a bargaining cooperative while the fourth scenario consists of two phases, which are a bargaining phase for the first two years and a processing phase for the third through twentieth year.

The start-up of the second phase two years after the first phase is a critical decision point for the cooperative. Assuming success of the third scenario, the cooperative should evaluate to whether integrate forward and install a processing facility. Chapter VIII assesses the economic viability of the processing cooperative; however, the decision to engage in processing activities is subject to develop a thorough market analysis at that point in time.

### 7.2. SWOT ANALYSIS

This section addresses the internal strengths and weaknesses as well as the external opportunities and threats that are the basis for the formulation of the strategic issues synthesis. The focus of this analysis is to identify the strengths that the cooperative should rely on, the weaknesses that should be avoided and the opportunities and threats that it would face in order to frame a suitable plan for the firm. Figure 6 presents a summary of the strengths, weaknesses, opportunities and threats.

**Figure 6: Strengths, Weaknesses, Opportunities and Threats**

| **Strengths** | **Opportunities** |
|---|---|
| Horizontal/downstream integration<br>Handle sufficient business volume<br>Effective pricing structure<br>Effective leadership of steering committee<br>High customer satisfaction<br>Effective management information systems<br>Negotiating and operational efficiency skills<br>Having the required assets and resources | Stability and growth of economy<br>High barriers to entry<br>Low bargaining power of small processors<br>Few substitutes for dairy products<br>Eligibility for international funds |
| **Weaknesses** | **Threats** |
| Lack of experience in the management of a cooperative<br>Secure insufficient capital<br>Lack of commitment among members<br>Heterogeneity of potential members | Rivalry with direct competitors<br><br>Milk powder as a substitute for fresh milk<br>High supplier power of large dairy farmers<br>High bargaining power of large processors |

The opportunities and threats draw from Porter's five forces and Peterson's eight change forces.

#### 7.2.1. Strengths

The following analysis of strengths constitutes the key success factors that will enable the firm to build competitive advantages and core competencies in order to put the firm in an offensive position. The key success factors derive from the three basic principles of a cooperative (user-owned, user-controlled and user-benefited), which would allow dairy farmers to exploit the benefits of this organizational structure (Rapp and Ely, 1996). The steps that should be followed to put the firm in a successful position are described in the strategic plan.

***Horizontal/downstream integration***

One of the major strengths that the business should rely on to build a competitive advantage is horizontal integration in the first and second scenarios of the bargaining phase, and the combination of horizontal and downstream integration in the third scenario of the bargaining phase and in the fourth scenario. Each of these types of integration, first horizontal integration and then downstream integration, incorporates benefits for the cooperative.

First, horizontal integration in the three scenarios of the bargaining phase will result in reducing overall transaction costs by the fact that the negotiation of milk would be only between each milk buyer and the cooperative. Further, for the third scenario of the bargaining phase, the cooperative would offer high quality milk to processors, which will increase its competitiveness as a supplier. Currently, dairy processors have a proprietary structure and 35% of milk is not transported in refrigerated milk trucks.

Second, the essence of downstream integration by providing milk hauling in the third scenario of the bargaining phase and installing a processing facility in the second phase of the fourth scenario will enable the cooperative to reduce transaction costs. The cost of monitoring dairy farmers will be given by the quality testing cost of raw milk and will be lower by the fact that the cooperative will have economies of scale in testing large number of milk samples. On the other hand, the marketing cost of milk procurement will be lower by the fact that groups of members located in an area will be close to each other and the average stopping cost to procure milk may be lower for the cooperative than for private processors. Private processors procure milk from individual farmers who are not always located close to each other in the same area.

### *Handle sufficient business volume*

The cooperative's ability to incorporate dairy farmers as members and handle sufficient business volume results in a key success factor that would increase its bargaining power as well as the volume of milk it can sell. The cooperative's management should be able to offer greater benefits to dairy farmers compared to the current marketing structure. The foundation of a cooperative is its membership; therefore, it is crucial for success to promote effectively the benefits that farmers would gain from acting collectively.

For the four scenarios the cooperative should create incentives especially for large farmers in order to minimize free-riders, who may receive incentives from private processors to market the milk to them. The incentives developed by the cooperative should rely on a premium for high volume to assure sufficient procurement volume.

### *Effective pricing structure*

The cooperative should develop a pricing structure as a key success factor that takes advantage of the built-in pricing flexibility of cooperatives (Siebert et.al., 1999) and creates incentives for farmers to maintain their membership and minimize the free-rider problem. The pricing structure would be the same between the first and second scenarios of the bargaining phase, and the third scenario of the bargaining phase and the processing phase.

For the first and second scenarios of the bargaining phase the pricing structure should include premiums for volume of milk, whereas it must include also a premium for quality for the third scenario of the bargaining phase and the processing phase. The premiums should aim to encourage the production of high quality milk and the marketing of large volumes. The pricing structure will also minimize the free-rider problem by defining volume premiums for large farmers as well as for the bulk collection of raw milk among small farms.

***Effective leadership of steering committee***

The selection of members with leadership characteristics for the steering committee is a key success factor for the start-up cooperative. Members of the committee must be recognized and respected leaders in the area and their qualifications might be as follows: 1) good farmer with independent judgment and good faith; 2) able to work in harmony with other members of the committee; 3) have experience in business and financial affairs; 4) known as a person of integrity, capable of making decisions to benefit the association and not the personal gain; 5) have a grasp of the marketing programs associated with the commodity; and 6) prepared to give the necessary time and effort to the affairs of the association. The committee will have the responsibility of developing the initial organizing plans, which include developing a form of membership agreement, and going through the legal steps of incorporating the cooperative (Bunje, 1980).

### *High customer satisfaction*

The business should rely on high customer satisfaction as a key success factor for the four scenarios of the cooperative. The bargaining cooperative must deliver high quality raw milk to processors, and for the processing cooperative must provide distributors consistent quality pasteurized milk, fresh cheese and butter. As a result the business would promote competitiveness in the market place and incentives for customers to become loyal to its products.

### *Effective management information systems*

The cooperative must build effective management information systems with the goal to have accurate control systems for the operation of the cooperative. The control systems for the first and second scenarios of the bargaining phase will include keeping accurate records of the volume of milk marketed through the cooperative by each member as well as the information to prepare the financial statements. On the other hand, for the third and fourth scenario the control systems will include the same as in the first two scenarios and also to track and preserve the quality of raw milk and dairy products.

The control systems should aim to provide information for a continuous communication among the management team, which includes the manager and the board of directors, as well as between the management team and the farmers members. Accurate financial statements need to be prepared and distributed on a timely basis to the management team, which includes the manager and the board of directors, thus reach appropriate resolutions that will result in building a strong financial position and distribute increasing returns to members. Also, a periodical newsletter should be distributed among members to communicate resolutions and achievements of the cooperative in order to keep or increase the support that the cooperative receives from its members. These factors are essential for the management team to effectively manage the emerging cooperative.

*Negotiating and operational efficiency skills*

A key success factor for the start-up cooperative is to have negotiating skills for the four scenarios, while operational efficiency skills will be important for the third and fourth scenarios. These factors are components of an effective management that the cooperative must have.

A skilled and knowledgeable negotiator is an important asset in any negotiation. The negotiator must have an intimate knowledge of the marketing profile for the commodity as well as almost a daily contact with the market in addition to the following skills: open-minded and flexible; aware of the needs of the other side as well as one's own; identifies mutual goals and interests quickly; never accuse the other side of being wrong; seldom manipulates people; creative and imaginative; has a cooperative attitude; good competitor, achiever and has high aspirations; never sees a deal as irrevocably closed; thinks clearly under stress; analytical ability; has general practical intelligence; personal integrity; good communicator; and has perseverance and stamina (Bunje, 1980).

The operational efficiency skills will be a key element of the management for the third scenario of the bargaining phase and the second phase because the cooperative will be involved in milk quality testing, transportation of raw milk (third scenario of bargaining phase and second phase), and processing and marketing dairy products (second phase). These skills will include the following (Bunje, 1980): 1) have proficiency in managing all aspects of human relations, 2) be able to communicate ideas and concepts equally well to a food company president and a farm operator, 3) have superior knowledge of the economics of production, processing and handling of the commodity as well as a comprehensive knowledge of the economics of the marketplace, 4) have the ability to deal with criticism, complaints, and problems in an even-handed unemotional way, 5) creativity, innovativeness, and perseverance, and 6) integrity and the confidence of the association's members and customers. Most of these characteristics would be likely to have the manager of the private processors; however the fourth point (ability to deal with criticism, complaints and problems) will be a key quality that few managers have.

***Having the required assets and resources***

For each of the four scenarios that are analyzed for the start-up cooperative, it is a key success factor to have the needed resources to invest in the required assets for the operation of the cooperative. The first scenario of the bargaining phase will require the least amount of capital to operate the cooperative while the processing phase would require the largest amount of capital. Besides capital, other resources that would be needed to start the cooperative are addressed further in this chapter.

The amount of equity capital that members will be able to invest in the cooperative is addressed in detail on the next chapter that deals with the feasibility analysis of the cooperative. The total capital that may be raised among potential members reaches about $500,000 dollars and represents 21% of the total capital required for the processing phase.

### 7.2.2. Weaknesses

A start-up business is by definition highly risky because it has a major weakness - no operating assets or experience to begin with. Nevertheless, likely weaknesses that must be managed or avoided are addressed below.

***Lack of experience in the management of a cooperative***

The lack of experience in cooperative management is a weakness for the start-up cooperative. The availability of managers in Ecuador with experience in dairy cooperatives is scarce since there is only one dairy cooperative that processes cheese. Therefore, the hired manager should rely on management information systems experience and on external advising in order to implement effective managerial actions that will result in minimizing the free-rider problem and concentrating the cooperative's efforts in generating profits to be distributed among members as patronage refunds in an equitable way.

### *Secure insufficient capital*

For a start-up cooperative, it is a likely weakness to secure insufficient capital prior to the initial operation of the cooperative. The critical level of capital needed should be identified during the planning process as well as the sources for obtaining the resources. The cooperative's members would invest resources in relation to the volume of milk marketed through the cooperative and the steering committee should define the investment per liter of milk in the membership agreement. Also, the task to search for financial institutions or agencies to obtain resources under preferred conditions is a tough challenge for the management team.

### *Lack of commitment among members*

A lack of commitment among members is a weakness in the start-up cooperative because dairy farmers in Cayambe have not previously engaged in collective action activities in order to be better off by pursuing common actions under clear and doable objectives. Nonetheless, the communities of small indigenous farms in Cayambe are organized under a common framework, which consists in developing common tasks under the guidance of leader members. These previous experiences would provide them with incentives to act collectively among them and with other farmers in the supply chain. Trust and confidence among members is an element of human relations that must be strongly encouraged in order to uphold members' commitment.

A common problem that arises with lack of commitment among members is the free-rider problem. This problem exists when non-members perceive opportunities to benefit from increased prices resulting from collective bargaining, without participating in the cooperative. Furthermore, the free-rider may contract directly with the buyer and receive a higher price as a result of not carrying the operation costs of the cooperative. This potential opportunistic behavior on the part of farmers can weaken farmers' commitment to the cooperative.

***Heterogeneity of potential members***

The farms in Cayambe are categorized in small, medium and large size, being the average volume of milk marketed by large farms (955 liters per day) about 80 times the average volume marketed by small farms (12 liters per day). Therefore, small dairy farmers would potentially receive larger benefits when joining large farms to market together. This constitutes a weakness that would not provide incentives for large farmers to join with smaller farms.

This weakness should be avoided by creating a pricing mechanism that makes financial returns to individual farms proportionate to the volume of milk contributed. In this way, the large farmer would also be better off by receiving a higher price as a result of joining the small farmers. This constitutes a core element of the membership agreement and would be the result of effective working relations among members of the steering committee or future board of directors.

### 7.2.3. Opportunities

The following analysis of opportunities constitutes the factors from the external environment of the firm that offer promise or potential for moving closer or more quickly to the firm's goals. For the start-up dairy cooperative they are the following:

***Stability and growth of economy***

The Ecuadorian economy has been characterized as unstable with no major incentives for investment and growth. Nevertheless, since the adoption of the U.S. dollar as the domestic currency, the inflation has dropped and structural changes in the economy are taking place in order to promote sustained economic growth and increase per-capita income. Therefore, the potential growth of internal demand turns into an opportunity for the start-up of a business.

***High barriers to entry***

There are barriers to entry for both phases of the start-up cooperative. For milk bargaining, the fact that a bargaining cooperative emerges only as a result of horizontal integration of farmers results in a natural barrier for having another bargaining organization in the same region. Also, the fact that a bargaining cooperative is owned, controlled, and provides services to members constitutes a barrier for a new bargaining organization in the region.

For the phase of milk processing, the fact that members supply the milk exclusively to the cooperative's processing plant because they own it, is a barrier to entry for new investor-owned firms that will procure milk from farmers in Cayambe. Also, the processing of dairy products requires raising resources in order to build the processing facility and the capital that would be invested by farmers' members would mean a significant contribution for the required capital. . In this way, it is not likely for new firms to enter into milk processing.

*Low bargaining power of small processors*

The bargaining power of small dairy processors is low in Cayambe region because there are more than 40 small processors that acquire a volume of raw milk in the range between 100 to 2,500 liters per day. Small processors produce mainly yogurt, cheese and butter and there is high rivalry among them. Therefore, marketing raw milk to small processors offers promise for increasing the value of milk for the cooperative's members.

Small processors target their production for niche markets which demand high quality products. In this way, they would be willing to pay a higher price for high quality raw milk. Among the industry expert interviews to processors, two of them processed yogurt and for one the niche market was a high school in the capital city (80 km from Cayambe) and for the other one was a distributor of dairy products for the coastal region of Ecuador.

*Few substitutes for dairy products*

Pasteurized milk and fresh cheese are products that have few substitutes because the end-consumer has preferences for dairy products with flavor and freshness attributes. This situation offers promise to the cooperative for increasing the value of its members because dairy products are staple goods for most population offering high nutritional value, especially calcium for bones strengthening[15]. Unlike the U.S. market, in Ecuador the substitute products that provide calcium, like added calcium juices, are not available in grocery markets.

[15] Recommended by Dr. Margarita Nagy, member of the American Dietitian Association.

*Eligibility for international development funds*

The capital constraints to start the cooperative in the two phases should also be realized by dairy farmers. The act of forming a cooperative to bargain for prices in the first phase and process milk in the second phase would make the cooperative eligible for resources from international development agencies, providing it an advantage over a private firm.

### 7.2.4. Threats

The threats that the cooperative would face are given by external factors or situations that may limit, restrict, or impede the business in the pursuit of its goals. For the dairy cooperative the threats are the following:

*Rivalry with competitors*

The rivalry between the cooperative and competitors is characterized as high for the four scenarios of the start-up cooperative. For the three scenarios of the bargaining cooperative, the competitors are the current private processors and the middlemen. However, the intensity in rivalry will be higher for the first scenario because the cooperative will supply the same quality of raw milk so processors and middlemen would not gain any additional benefit. Conversely, for the third scenario, the level of rivalry will diminish since the quality of milk would be enhanced by the cooperative and processors would gain additional benefits.

For the processing cooperative, the market for dairy products exhibits high rivalry between dairy farmers and both the importers and processors of milk powder. Intensity in the rivalry between the cooperative and competitors in the market for pasteurized milk and fresh cheese would be high. Nevertheless, the competitors in pasteurized milk are stronger than in fresh cheese because they process larger volumes of milk.

### *Milk powder imports as a substitute for fresh milk*

Milk powder imports are used partly to process UHT milk by the largest dairy company in Ecuador and represent a threat for both phases of the cooperative. This company has a facility in the coastal region of Ecuador that processes UHT milk and uses imported milk powder. The direct substitute for pasteurized milk is milk powder therefore the subsidized imports of milk powder would impede the cooperative from pursuing its goal of optimizing the value to its members. The cooperative would have to produce high quality pasteurized milk to gain market share in fluid milk markets.

### *High supplier power of large dairy farmers*

Large dairy farmers historically demand high prices for raw milk. This results in a threat for the success of the business because large dairy farmers may join together to have high market power in raw milk thus increase their profits. The organization of the business as a cooperative should countervail the supplier power of large dairy farmers by introducing a pooling payment system that includes a premium for volume.

### *High bargaining power of large processors*

The bargaining power of large dairy processors is high in Cayambe region because, as mentioned above, four processors process 69% of milk marketed by the interviewed farmers. Therefore, the cooperative's marketing of raw milk to large processors would counterbalance the processor's market power thus the pricing formula negotiated would aim to reach higher farm prices.

This threat would be relevant for the four scenarios of the cooperative. Nevertheless, large processors would excise their bargaining power with greater intensity during the bargaining phase of the cooperative due to the fact that the cooperative would be seeking to gain market power. The processing cooperative will market the excess raw milk to private processors from other regions, being one of the likely customers the powdered milk plant owned by members of CA. The bargaining power of these processors would be counterbalanced by the large volume and high quality milk offered by the cooperative.

## 7.3. STRATEGIC ISSUES SYNTHESIS

The strategic issues synthesis is a component of the strategic analysis of the firm and comprises four elements. First, the competitive advantages and core competencies are described in order to identify specific strengths that will position the cooperative ahead of its competition. Then, the scenario analysis explores how changes in the external analysis combined with the firm's strengths and weaknesses, could lead to either remarkable decline or improvements in the firm's performance. Lastly, the critical issues are presented to lay out the relevant challenges that the firm should face to succeed in the future.

### 7.3.1. Competitive Advantages

The competitive advantages that the firm should rely on to assure a successful future are the following:

***High quality raw milk***

This refers to the second through fourth scenarios of the start-up cooperative. The cooperative will be the leader in supplying large volumes of high quality milk to processors. The cold chain from the farm to the processor would be the pioneer initiative among farmers of Cayambe region.

***Capability to integrate vertically***

This competitive advantage refers to the processing phase of the cooperative. The capability of the business to integrate vertically by downstream integration is a strength that will clearly place the firm ahead of its competitors. The firm will be the first experience of farmers in undertaking downstream integration and this enables the supplying of high quality dairy products to gain competitiveness in the marketplace.

### 7.3.2 Core Competencies

The core competency for the success of the dairy cooperative is the ability to create expertise in management of a dairy cooperative in a developing country where dairy cooperatives have not emerged in a widespread manner. The challenge for management in the first through third scenarios is bargaining large volumes of high quality milk, which will enable paying a competitive price for raw milk and returning patronage refunds to members.

For the processing phase of the cooperative, the core competency is coordination of the dairy supply chain in Cayambe by developing operational tasks to provide high customer satisfaction through supplying high quality dairy products (pasteurized milk, fresh cheese and butter) and paying dairy farmers for milk according to quality and volume as well as patronage refunds.

### 7.3.3. Scenario Analysis

For a start-up business, scenario analysis is twofold. First, the decline scenario is one in which the cooperative starts but in a period of less than two years has to exit the market. On the other hand, the fundamental change scenario refers to the fact that the cooperative is able to develop the strengths, correct the weaknesses, and internalize opportunities to overcome the threats, leading to success in the future.

#### *Decline Scenario*

The combination of the following conditions would likely lead to a dramatic decline of the start-up cooperative:

*Failure to achieve horizontal/downstream integration:* For the first through third scenarios, horizontal integration of farmers is the most relevant factor that will allow reducing transaction costs in the marketing of raw milk. For the processing phase, downstream integration is the most important factor that would allow the cooperative to reduce raw milk marketing costs and thus the cost of pasteurized milk and fresh cheese would be competitive in the marketplace. The inability to successfully integrate horizontally and downstream would lead to a decline in the cooperative's performance.

*Low customer satisfaction:* A failure to satisfy customers would lead to a decline in performance of the cooperative. This condition applies to both phases of the cooperative. For the bargaining phase, if the quality of milk does not reach the set standards then the processors will not be satisfied with the raw milk supplied. Likewise, for the processing phase, if the quality of dairy products is not desirable, then end-consumers will not incorporate the cooperative's products to their purchasing patterns.

*Lack of experience to manage a cooperative:* If the cooperative is unable to hire a manager with experience in cooperatives or ability to develop the skills required, then ineffective management of the cooperative would be expected to cause a dramatic decline in the cooperative's performance.

*High bargaining power of large processors:* If the cooperative is unable to develop marketing strategies that enable it to bargain large volumes of milk with large processors and achieve higher prices, this could prohibit it from pursuing into the milk processing phase of the cooperative.

***Fundamental Change Scenario***

This scenario explores factors that would be expected to contribute to the success of the start-up cooperative. The main conditions under which success can be achieved are the following:

*Effective horizontal/downstream integration:* For the four scenarios of the start-up cooperative, the fulfillment of this strength will allow the cooperative to gain competitiveness in the market place. In the phase of milk bargaining, horizontal integration of farmers will result in reduction of transaction costs for the milk buyer related to marketing raw milk to processors or middlemen because milk buyers would have to negotiate only with the cooperative, rather than individually with each farmer. For the processing phase, downstream integration will result in lower transaction costs for procurement than for the proprietary processors.

*Having the required assets and resources:* For both stages of the cooperative, the fulfillment of this strength will be a key factor for the start-up. The sources of capital to acquire the needed assets and resources must be identified and are determinant elements for the start-up of a business. The needed resources are described under the action strategies further in this chapter.

*Experienced management for the cooperative:* A key factor for the cooperative to succeed is to hire a manager with strong management skills, which will enhance the performance of the cooperative by 1) enabling appropriate implementation of the resolutions brought out by the general assembly and the board of directors, and 2) developing strategic marketing techniques to take advantage of supplying large volume and high quality of raw milk in the first phase and high quality dairy products in the second phase.

*Strong members' commitment:* The possibility that dairy farmers would not be committed to the cooperative should be corrected and would result in a core element for the success of the cooperative. The cooperative's success would depend on the rate that dairy farmers would join the cooperative; therefore, the continuous promotion and realization of collective action benefits among current and potential members would boost the membership as well as reinforce members' commitment to the cooperative.

*Stabilization and growth of economy:* The Ecuadorian economy is reaching economic stabilization and sustained growth that will be reflected in per-capita income growth and increase in demand for dairy products. Also, it will be more promising and less risky to start a cooperative in a more stable economic environment.

*High barriers to entry:* The cooperative members should realize that they are the first participants of the supply chain and have the choice to decide the marketing of raw milk. Therefore, dairy farmers should recognize that they should market milk as a group to processors in the region, and thus capitalize on the advantage of being the closest and unique suppliers of milk produced in Cayambe.

### 7.3.4. Critical Issues

The critical strategic issues that must be addressed to assure a successful future are the following:

**How will we create and capitalize on horizontal/downstream integration?** The ability to reduce transaction costs and internalize synergies across horizontal integration for the bargaining phase and downstream integration for the processing phase would result in gaining competitiveness and attaining a reasonable profitability level.

**How will we achieve member commitment to join and function as a cooperative?** The commitment of members to join the cooperative for both phases is a tough task to achieve and also a core element to assure future success thus critical for the start-up cooperative.

**How will we assure effective managerial expertise?** The ability to manage the start-up business in an effective way will lead to building the strengths in order to assure a successful future.

**How will we capitalize, purchase and manage all needed resources?** For both phases of the start-up cooperative, the definition of sources to acquire the needed resources as well as an effective management of them are core elements to assure future success.

**How will we build high customer satisfaction?** High quality raw milk for the bargaining phase and high quality dairy products for the processing phase will enable the cooperative to gain competitiveness in the market place.

## 7.4. STRATEGIC PLAN

The strategic plan for the start-up cooperative consists of four elements. First, the vision/mission statement drives the actions to be implemented. Second, the strategic objectives specify goals for the firm in the near future. Then, the core strategy presents the elements of the strategy within the components of customer value, strategic initiative, strategic scope, industry role and vertical coordination. Lastly, the action strategies are discussed in order to acquire the resource needs for a promising successful future.

### 7.4.1. Vision/Mission

The vision/mission statement for the business is the following:

*Be the pioneer dairy cooperative of Ecuador committed to optimize the value of milk for its members by 1) providing increased returns to members, and 2) marketing high quality raw milk and dairy products to processors and distributors.*

This statement incorporates the fact that the cooperative will provide larger returns to members, be the leading marketer of high quality raw milk in Cayambe region through small farmers joining medium and large farmers (bargaining phase), and one of the largest processors in the region (processing phase). The benefits that farmers will receive from milk bargaining and dairy processing would have an impact on farm income and thus the distribution of patronage refunds among dairy farmers would enhance wealth.

### 7.4.2. Strategic Objectives

The strategic objectives are defined for each of the three scenarios of the bargaining cooperative and for the processing cooperative. However, the following objective is common for the four scenarios:

- Reach a membership that would include 88% of small farms (2,563 farms), 80% of medium farms (79 farms) and 67% of large farms (33 farms) by the end of the second year. These estimations are the results from the collective action section of the interview to the 28 farmers. In this way, the cooperative would comprise 2,675 members and would market 70,695 liters per day, which represent 75.8% of raw milk marketed in Cayambe.

For the first scenario the strategic objective is the following:

- Establish contracts with the milk buyer including price premiums for volume. The cooperative will aim to pay the highest prices to members and cover the operational costs.

For the second and third scenarios the strategic objective is the following:

- Generate profitability to cover the operational costs as well as the cost of intermediate assets. Intermediate assets would consist in the centralized cooling tanks for the second scenario and also the milk trucks for the third scenario.

The strategic objectives for the processing phase consist in defining the point in time of the third scenario to start the processing phase as well as key financial ratios to assure an effective performance of the cooperative:

- Reach a volume of milk procured of 65,000 liters per day and a membership of about 94% of potential members by the beginning of the third quarter of the second year. The fulfillment of this objective will be a key element for the decision to whether proceed with the processing phase of the cooperative.
- Reach the level for return on equity (ROE) of 22%. The return on equity should be equal to the cost of corporate debt (14%) plus a premium for risk (8%). The cost of corporate debt is the average for 2002 according to the Central Bank of Ecuador. The 8% risk premium is an estimate consistent with the risky nature of equity for a start-up operation.
- Reach the Profit Margin (PM) level of 1.3. This level of profit margin derives from the average for dairy products industry according to Dunn & Bradstreet . This ratio shows the proportion of net income in total sales (or total revenue). When this ratio increases across time it is a sign that operating management is going well.
- Reach the level for Total Asset Turnover (TAT) of 5.3 for the processing phase. This ratio corresponds to the upper quartile for the dairy industry according to Dun & Bradstreet, which uses data from the Internal Revenue Service. The cooperative will have to develop a higher asset turnover in order to meet ROE goals.
- The level for the Equity Multiplier (EM) derive from the Dupont Analysis Formula (ROE= PM x TAT x EM) and for the processing phase is 2.7. The high EM relies on

the fact that for a start-up operation a high proportion of assets will be financed by debt.

### 7.4.3. Core Strategy

An element of the strategic plan is the definition of the core strategy that the business should follow. Core strategy defines high-level decisions about how to create value, compete and perform. It also addresses the strategic issues by capitalizing on strengths and taking advantage of the opportunities.

**Figure 7: Core Strategy Elements**

| **Element of Strategy** | | **Bargaining Phase** | **Processing Phase** |
|---|---|---|---|
| **Customer Value/ Competitive Advantage** | | Differentiation (Quality Features) | Differentiation (Quality Features) |
| **Strategic Initiative** | | Grow | Grow |
| **Strategic Scope** | **Product/ Industry** | Single business (Product) | Single-dominant business (Product) |
| | **Geographic Scope** | Domestic (Regional) | Domestic (Regional) |
| | **Resource Development** | Internal | Internal |
| **Industry Role** | | Challenger | Challenger |
| **Vertical Coordination** | **Backward** | Equity-based Alliance | Equity-based Alliance |
| | **Forward** | Contracts | Relationship-based Alliance |

Figure 7 presents the strategy that the dairy cooperative should follow in order to focus the actions that should be implemented.

#### *7.4.3.1. Customer Value/Competitive Advantage*

For the bargaining phase, the cooperative should create customer value by adopting a product differentiation strategy based on quality features. To compete in an oligopsonistic market with low bargaining power of small processors and high bargaining power of large processors, the cooperative must rely in providing high quality raw milk in order to gain competitiveness in the raw milk market. This strategy is compatible with the development of horizontal integration and high customer satisfaction as key success factors that will enable it to provide high quality raw milk to processors.

For the processing phase, the cooperative will adopt a product differentiation strategy to satisfy customers and gain competitiveness to beat the competition. This strategy will help attain vision/mission statements by supplying high quality dairy products to distributors thus promote the enhancement of dairy products quality in the supply chain. This strategy will be based on the strengths of downstream integration, handling sufficient volume, and high customer satisfaction. Being the provider of high quality pasteurized milk, fresh cheese, and butter, the cooperative will build a competitive advantage that will help to seize the fact that pasteurized milk and fresh cheese have few substitutes.

*7.4.3.2.Strategic Initiative*

Since the cooperative is a start-up business, the approach will be first to enter in milk bargaining and then grow. In order to become the leading dairy cooperative in Cayambe region, the membership will be open to all farmers of the region. Nonetheless, the starting members would be the 14 interviewed dairy farmers willing to join other farmers to market milk as a group plus 200 small farmers of indigenous communities. The strategy to grow relies mostly on the strengths of horizontal/downstream integration, handling sufficient business volume, and the leadership of the steering committee. The bargaining cooperative will operate for two years with a continuous growth in the number of members. As mentioned above, for the third year the board of directors of the cooperative would have to evaluate whether to engage in processing dairy products. This strategic initiative will seize the opportunity that the Ecuadorian economy is growing.

A major element of consideration of the initiative to grow is to analyze how to overcome the threats and retaliation from existing processors. Although the actions that would take the competitors are uncertain, the most likely situations would be the following:

1. For the bargaining phase, the processors may refuse to acquire milk from dairy farmers in Cayambe and seek for milk procurement in nearby regions. On the other hand, representatives of dairy farmers and processors are willing to define the quality standards in order to have guidelines for raw milk pricing nationwide. Therefore, the cooperative would stress in promoting milking techniques in order to assure high quality raw milk

from the farm to the processor and thus offer incentives to the processors to acquire milk from the cooperative.

2. For the processing phase, relying on the assumption that the volume of milk procured will increase continuously, the volume of raw milk procured will exceed the processing volume. Therefore, the cooperative would market raw milk to local processors or processors of other regions. Although the incumbent processors may be reluctant to negotiate with the cooperative as a retaliation strategy while the processing facility is built, the quality and price of raw milk would be incentives for processors to acquire raw milk from the dairy cooperative. This situation will be encouraged by the fact that milk standards had been defined and the cooperative is the leader in providing high quality raw milk. Furthermore, the processing cooperative would have the option to market excess raw milk to a powdered milk processor owned by dairy farmers in a nearby region.

3. Under the assumption that milk standards are not defined among processors and dairy farmers, private processors would not have incentives to procure milk from the cooperative while the processing plant is built. Consequently, the cooperative may establish alliances or a joint venture with the private processors with the goal to innovate the dairy products processed and offer high quality products to the end-consumer. In this way, both the dairy farmers and the processors would share the benefits of the processing phase.

*7.4.3.3. Strategic Scope*

Product/Industry: The cooperative's strategic product scope for the first phase is *single business* as evidenced by the fact it will market solely raw milk to processors or middlemen. The cooperative assumes the role to promote marketing high quality raw milk from farms to processors; therefore, it follows the vision statement of enhancing the quality of milk in the supply chain thus building the strength of high customer satisfaction. For the second phase the scope will be *single-dominant business* because the cooperative will process a product line of dairy products, which are pasteurized milk, fresh cheese and butter, and pasteurized milk would represent 90% of the processed milk volume.

Geographic scope: For the bargaining phase, the geographic scope is *domestic* with emphasis in the regional market of the province of Pichincha. The cooperative will market raw milk to middlemen or processors located in Cayambe region or to other processors located in the province of Pichincha or in nearby provinces of Imbabura, Carchi, and Cotopaxi. For the processing phase, the geographic scope is also *domestic* since dairy products would be marketed mainly to distributors in Quito, which is the capital city and located in the province of Pichincha. This strategy will rely in high customer satisfaction and seize the opportunity of stabilization and growth of the Ecuadorian economy.

Resource Development: The cooperative's resource development for both phases is internal, basically by developing the key success factors in order to build the competitive advantages and core competency thus creating competitiveness. This strategy uses the strengths of handling sufficient business volume, leadership of steering committee, and effective management information systems as internal resource development factors that would contribute for the success of the firm.

### *7.4.3.4. Industry Role*

The cooperative would play the role of a *challenger* in the dairy industry for both phases of the start-up. For the bargaining phase, the cooperative will be the first one to undergo horizontal integration by marketing large volume of milk in the first and second scenarios as well as high quality raw milk and large volumes in the third scenario. The cooperative will rely on the strengths of horizontal integration, effective pricing structure, and high customer satisfaction, which will enable it to create the conditions to gain competitiveness thus building the basis for a strong financial position.

For the processing phase, the cooperative will process innovative products to be marketed to distributors. The innovation would be in the packaging for pasteurized milk and fresh cheese. Pasteurized milk would be filled in two-liter containers and fresh cheese would have a vacuum packing. This strategy relies on the strengths of leadership of steering committee and high customer satisfaction. It also captures the opportunity of stability and growth of Ecuadorian economy, which creates the conditions for the increase in per-capita income thus is suitable to bring innovative products to the dairy market. In this way, the role of an innovator will position the cooperative ahead of its competition.

### *7.4.3.5. Vertical Coordination*

The cooperative will emerge from an *equity-based alliance* among dairy farmers. In the first through third scenarios and the first phase of the fourth scenario, the output will be a bargaining cooperative, which buys the milk from farmers and pays a price according to a pooling system. Nevertheless, the farm price will include premiums for volume and quality for milk procured from medium and large farms for the first through third scenarios, while for small farms the premiums for volume and quality will be implemented on the second and third scenarios. The cooperative would also aim to establish *contracts* with the processors, which is based on having an effective pricing structure and will also help the cooperative seize the opportunity that small processors have low bargaining power. This strategy will help to capitalize horizontal integration and build competitiveness by the fact that dairy farmers join together in the supply chain thus reduce transaction costs.

For the processing phase, the cooperative would maintain the *equity-based alliance* between dairy farmers. In this phase, the farm price will include premium for volume and quality for the three categories of farms. The cooperative would also aim to establish relationship-based alliances forward in the supply chain with distributors and retailers to foster consumer satisfaction. As a result, product quality will be assured in the distribution of dairy products until they reach the end-consumer thus help attain the vision statement.

*7.4.3.6. Evaluation of Core Strategy*

The evaluation of core strategy includes the analysis of the overall pros and cons for the entire strategy. In the next paragraphs, the pros and cons for each element of core strategy are addressed.

Regarding costumer value, the cooperative will satisfy customers and beat the competition with a differentiation strategy, which will enable to gain competitiveness by offering high quality raw milk and dairy products. However, the constraints for this strategy would be that small farmers and most medium farms milk the cows by hand, which is a limitation to enhance the quality of milk.

The strategic initiative to grow will enable the cooperative to increase the membership and handle sufficient business volume to gain market power. Profits will increase as well as sales, but the disadvantage would be that the cooperative loses focus.

Within the strategic scope, the product/industry scope of single business for the first phase and single-dominant business for the second phase has the advantage of a clear focus, but on the other hand, it limits opportunities and maximizes threats. The cooperative will focus on enhancing the quality of raw milk for the first phase, and the quality of dairy products for the second phase.

For the geographic scope, which is the second element of the strategic scope, the cooperative will be domestic rather than global. The advantage of been domestic is that the cooperative will have a clear market focus, but on the other hand, the disadvantages are that opportunities will be limited and threats maximized. In addition, for the resource development scope, the cooperative will develop resources internally rather than externally. The advantages of this resource development scope would be to have control of the resources as well as learning to build the resources.

Regarding the role of the cooperative in the industry, it will be a challenger in both phases. The advantages will be that the cooperative will be the first mover in horizontal integration to enhance the quality of milk and will have great flexibility. On the other hand, the disadvantages are the uncertainty of being the first mover with few resources and the retaliation from private processors.

Lastly, vertical coordination will be the same for the two phases on the relationship between the cooperative and the suppliers (dairy farmers), which will be an equity-based alliance that has the advantage to encourage the commitment of dairy farmers to the cooperative. Also, for the first phase, the relationship with milk buyers will be specification contracts, which have the advantage of clear terms of the negotiation that will contribute to an effective pricing structure, but have the disadvantage of less flexibility for future negotiations. In contrast, for the second phase, the relationship with milk distributors will be a relation-based alliance, which has the advantage of sharing information and joint development of strategy, but has the disadvantage that there are no jointly invested assets that will compromise both parties on the relationship.

The components of core strategy rely in supplying large volumes of milk in the first and second scenarios and also high quality milk in the third and fourth scenarios. This has the advantage to create competitiveness in the marketplace. In contrast, core strategy has the disadvantage to rely on the definition of quality standards for raw milk in the bargaining scenarios and dairy products in the processing phase of the fourth scenario. However, quality standards are likely to be constrained by sponsorship of the government for the processors and dairy farmers to reach an agreement.

### 7.4.4. Action Strategies and Resource Needs

Based on the strategy proposed, action strategies are presented which are crucial for the cooperative's start-up and future success. The action strategies are the steps that should be carried out to start building the key success factors that will enable the firm to enter the market and supply high quality raw milk to processors in the first phase and high quality dairy products to distributors in the second phase.

**1. Start a dairy cooperative**

The main resource needed for the start-up of the dairy cooperative is to have the appropriate organizational framework that will drive the future actions of the cooperative. For this action the resources needed are guidelines defined by research institutions (e.g. Center for Cooperatives, University of California - Davis) and research in domestic legislation about cooperatives.

Dairy cooperatives have emerged across the world and the steps taken to start cooperatives in developed and developing countries should be considered in order to conceive a concise and appropriate framework for the start-up. Since dairy cooperatives have not emerged extensively in Ecuador, the necessity for an innovation in laws might be a requirement in order to start the business under a suitable governance structure.

**2. Define quality standards for raw milk**

For the start-up cooperative, it is a necessity to define private standards that will assure the quality of raw milk from the farm to the processor and of dairy products from the processor to the end-consumer. Consequently, the cooperative would be able to lead and enforce high quality standards among dairy farmers and throughout the processing process.

The resource needed is the sponsorship from the Government to define the standards for raw milk with the participation of dairy farmers, processors and representatives from the end-consumer. Cattlemen's Association would be the leading organization to represent dairy farmers to reach an agreement with the representatives of dairy processors. The standards should include the percentage of fat, total solids and protein as well as the count of somatic cells and bacteria that raw milk should comply to be graded as high quality.

**3. Develop feasibility study for the start-up cooperative**

The development of a feasibility study for the cooperative is a strategic action in order to obtain key financial performance indicators as well as an assessment of the benefits for dairy farmers for the scenarios that are proposed. This strategic action would be determinant to advice farmers about the most likely scenario that should be implemented to start the cooperative. A key component of the feasibility study is the definition of the incentives plan for members that will include premiums for quality and volume.

The resources needed are hiring an external consultant to develop the feasibility study for the cooperative as well as key data from the Census of Agriculture for Cayambe region. The consultant must have the expertise for investment analysis of projects as well as to develop a pricing plan that would make better off to all categories of farms thus minimize the free-rider problem.

**4. Hire experienced manager from current industry**

This action strategy derives from the fact that the management of the cooperative is a key success factor for the start-up and there is only one previous experience of dairy cooperatives in Ecuador. A core characteristic of the manager is advocacy to benefit dairy farmers. The resources needed are advising about the expertise that the manager should posses, information about the background of current managers of dairy processors, and financial resources.

**5. Control of production line**

The establishment of an internal product-line evaluation unit is a strategic action that derives from the core competencies for the bargaining and processing phases. The resource needed for the bargaining phase is advice from a consulting company to develop a quality control program for dairy farmers that will include hiring quality control personnel for the field. For the processing phase of the cooperative the resource need is hiring a dairy processing expert. The dairy-processing expert would be responsible for the accomplishment of production standards, which will contribute to achieve a high-quality product. In addition, hiring adequate human resources will be the key element to develop an internal human resource base to contribute for an effective firm's management.

### 6. Effective Product Promotion

The developing of a marketing division draws from the core competency for the processing phase of the cooperative. It will consist in establishing a marketing unit that will develop relations with distributors and retailers in the processing phase. This division will be responsible to create effective marketing logistics to attain high customer satisfaction thus build competitiveness.

The resources needed are superior managerial ability and financial resources.

### 7. Raise sufficient capital

All the action strategies suggested in this section require financial resources, without which, it would not be possible to implement these plans. Hence, this analysis would be incomplete without a discussion of the financial aspect.

The start-up cooperative would rely in capital raised among dairy farmers and also on external funds. The interviews to the 28 dairy farmers showed that they would be willing to invest about $81,000 to install a processing plant. However, an estimation of the capital that could be raised in Cayambe region is presented in Chapter VIII. Regarding the external funds, the cooperative may have access to financing from the PL-480 food aid program, or may also obtain funds from international agencies.

## 7.5. CONCLUSION

The adoption of the proposed strategic plan creates the base for the start-up of a dairy cooperative in Ecuador, which ultimately relies in developing core competencies and key competitive advantages in order to assure a successful future.

The strategic analysis draws the critical issues that are addressed in the strategic plan by laying down specific action strategies geared towards the implementation of the proposed strategy. Figure 8 presents a summary of the action strategies to answer the critical issues that are addressed by the core strategy.

**Figure 8: Critical Issues and Action Strategies**

| Critical Issue | Action Strategy |
|---|---|
| *How will we create and capitalize on horizontal/downstream integration?* | Start a dairy cooperative<br>Develop feasibility study for the cooperative |
| *How will we achieve member commitment to join and function as a cooperative?* | Hire experienced manager<br>Develop feasibility study for the cooperative |
| *How will we assure effective managerial expertise?* | Hire experienced manager<br>Define quality standards for raw milk |
| *How will we capitalize, purchase and manage all needed resources?* | Raise sufficient capital<br>Develop feasibility study for the cooperative |
| *How will we build high customer satisfaction?* | Control of product line<br>Effective product promotion |

The implementation of these action strategies is critical for the future success of the cooperative. The action strategy of developing the feasibility study for the cooperative has three main components, i.e. financial analysis, incentives plan for members and acquisition plan of needed resources. The financial analysis is a core action strategy to assess the viability of the cooperative thus is presented in Chapter VIII.

# CHAPTER VIII

# FINANCIAL ANALYSIS FOR THE START-UP DAIRY COOPERATIVE

Financial analysis of the proposed dairy cooperative is critical to determine whether dairy farmers in Cayambe would benefit from joining together to market or process raw milk. Previously, a strategic plan was presented to bring about the strategic actions that should be implemented to assure success of the cooperative. One of these actions was the development of a financial feasibility analysis for the four scenarios of the start-up cooperative.

The analysis presented in this chapter incorporates a set of assumptions in order to determine the feasibility of the start-up cooperative. Therefore, the results presented constitute an exercise of the cooperative's estimated financial viability and benefits that dairy farmers may gain by either marketing milk together or processing dairy products. The dairy farmers or the Government may not agree with the assumptions considered for the analysis thus sensitivity analysis will be required before implementing the start-up of the cooperative.

This chapter pulls elements from the previous chapters in order to analyze the feasibility of the proposed dairy cooperative in Cayambe. First, capital sources including farmers, loans and government aid are discussed. Second, the capital required for each of the two phases is calculated. Third, investment analysis is used to assess whether or not each of the four scenarios is financially feasible. The analysis includes the estimation of performance financial indicators and the captured benefits from integrating forward in the supply chain compared to the current situation. This section includes a break-even analysis for core variables that are included in the investment analysis. Lastly, distribution of cooperative benefits is assessed from the societal and farm perspectives.

## 8.1 CAPITAL AVAILABLE

This section estimates the capital that may be available from dairy farmers to invest in the start-up cooperative. The data for the estimation of the capital is estimated from the results of the interviews to dairy farmers in Cayambe and using population data from the 2000 Census of Agriculture.

The dairy farmer interview collected data to estimate the capital that may be available to start a dairy processing facility. The question asked to the dairy farmers was: *Are you willing to invest in a dairy processing facility? If Yes, what amount range amount you will be willing to invest?* Although this question was specific regarding investing in a processing facility, here it is assumed that the capital may also be used to start a bargaining cooperative. The expansion factors for the categories of farms that were calculated in Chapter II are used in order to obtain the total capital that may be available from dairy farmers in Cayambe region.

Since the cooperative members would not include all dairy farmers in Cayambe, the capital available for the start-up cooperative includes only the resources available for investment by members. Therefore, the total capital available in the region according to farm size is adjusted by the assumed percentages of dairy farms that join the cooperative.

### 8.1.1 Capital estimation

The estimation of capital available from members of the cooperative includes two major calculations. First, the total capital that may available from potential members is estimated, and second, on the basis of this estimation, the capital to be invested by members is estimated. The amount of capital that will be raised among potential members of the cooperative is presented in Table 43.

**Table 43. Summary statistics for capital available in Cayambe region**

| Farm size | Interviewed farms | | Expan-sion Factor | Population farms | | | |
|---|---|---|---|---|---|---|---|
| | Farms | Capital willing to invest | | Farms | | Capital to invest | |
| | # | USD | | # | % members | USD | % |
| 1 – 10 cows | 8 | 650 | 364.12 | 2,913 | 88.0 | 208,276 | 42.6 |
| 11 – 30 cows | 5 | 7,500 | 19.8 | 99 | 80.0 | 118,800 | 24.3 |
| 31 – + cows | 15 | 72,500 | 3.33 | 50 | 67.0 | 161,754 | 33.1 |
| Total | 28 | 80,650 | 6.06 | 3,062 | 87.4 | 488,830 | 100 |

In this way, dairy farmers in Cayambe region are willing to invest $488,830 dollars in the dairy cooperative. Small farms are willing to contribute with 42.6% of the total capital; medium farms will contribute with 24.3%, and large farms with 33.1%. When considering the average milk volume marketed by each category of farm, the investment per liter of milk marketed differs among the three categories. Recall from Chapter II, the volume of milk marketed by small farms totaled 30,951 liters, milk marketed by medium farms totaled 8,209 liters, milk marketed by large farms totaled 31,535 liters, and the total volume of milk will reach 70,695 liters. Thus, the investment per liter will be $6.70 for small farms, $14.50 for medium farms, $5.10 for large farms, and $6.90 the average.

The investment of dairy farmers is assumed to be in proportion to the volume of milk marketed through the cooperative, therefore an average investment of $6.90 per liter is assumed in order to estimate the average investment per category of farm. Table 44 shows the capital to be invested on average by each category of farms and by all the farms in the category.

**Table 44. Capital available for investment by dairy farmers in Cayambe**

| Farm size | Investment | Production per farm | Capital per farm | Farms | Total Capital* | |
|---|---|---|---|---|---|---|
| | USD / liter | Liters/day | USD | # | USD | % |
| 1 – 10 cows | 6.9 | 12 | 84 | 2,563 | 215,292 | 43.9 |
| 11 – 30 cows | 6.9 | 104 | 719 | 79 | 56,801 | 11.6 |
| 31 – + cows | 6.9 | 955 | 6,608 | 33 | 218,064 | 44.5 |
| Total | 6.9 | 26.35 | 108.24 | 2,675 | 490,157 | 100 |

* The total capital differs from the amount in Table 43 due to rounding.

In this way, small farms are assumed to invest on average $84, medium farms $719 and large farms $6,608. The maximum total capital invested is $490,157, in which small and large farms participate each with about 44% and medium farms with about 12%.

Although the data from dairy farmer interviews did not include the capital available for investing in a bargaining cooperative, the analysis includes assumptions for bargaining with middlemen and processors (first scenario), bargaining with middlemen and processors bulk volumes of milk (second scenario), and bargaining with processors while enhancing the quality of milk (third scenario). For the first scenario, farmers will invest $1.60 per liter, which results from dividing the investment required ($113,000) by the volume of milk marketed (70,695 liters). For the second scenario, only small farms increase their investment to $6.9 dollars per liters since centralized cooling tanks are installed specifically to benefit small farms. For the third scenario, it is assumed that 40% of financial resources are raised among medium and large farms ($2.76 dollars per liter) for the processing cooperative will be invested while the investment of small farms is the same as in the second scenario.

For the fourth scenario (two-phases scenario), the capital invested by farmers is the same as for the start-up and the first year of the third scenario of the bargaining phase, while for the second year the investment of medium and large farmers increase to $6.9 dollars per liter.

### 8.1.2. Other sources of capital

Another source of capital that will be available for dairy farmers to start a cooperative is funding from the PL-480 food aid program. The dairy farmers associations of Ecuador are eligible to participate in the funding of projects by PL-480. The financial resources from this source are available for dairy farmers associations through the financial system at a commercial bank interest rate. However, the resources may become non-reimbursable once the project resulted successful and has reached the expected benefits.

The Title I[16] of PL-480 food aid program provides for government-to-government sales of agricultural commodities to developing countries under long-term credit arrangements. Repayments for agricultural commodities sold under this title may be made either in U.S. dollars or in local currencies on credit terms of up to 30 years, with a grace period of up to seven years. Local currencies received under Title I sales agreements may be used in carrying out activities under section 104 of the Agricultural Trade Development and Assistance Act of 1954, as amended. Activities in the recipient

[16] Information obtained from the Foreign Agricultural Service - USDA
http://www.fas.usda.gov/excredits/pl480/pl480ofst.html

country for which these local currencies may be used include developing new markets for U.S. agricultural commodities on a mutually beneficial basis, paying U.S. obligations, and supporting agricultural development or research. In this way, Cattlemen's Association has been promoting development projects within the dairy sector with the purpose of being recipients of funds from PL-480. (See Public Law 480 Press Releases 0242-02 and 0166-02) [17]

## 8.2. CAPITAL REQUIRED

The capital required for the dairy cooperative is presented for each of the three scenarios of the bargaining phase and for the two-phases scenario fourth scenario, which has two phases. Each scenario represents a step further in downstream integration; therefore, the required investment increases as the cooperative engages in more activities. Also, the capital needs for investment depend on the assumption about the rate that the three categories of dairy farmers join the cooperative.

### 8.2.1. Capital for the bargaining cooperative

The capital required for each of the three scenarios of the bargaining phase is estimated. The required investment for the first scenario are part of the investment for the second scenario and in a similar way for the third scenario. Thus, the incremental investment for each scenario is explained in detail.

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[17] The source is http://www.fas.usda.gov/excredits/pl480/FOOD-AID.asp

#### 8.2.1.1. Scenario 1 – Bargaining with processors and middlemen

This scenario of the bargaining phase is the most basic among the three scenarios because the milk buyer will have to negotiate with the cooperative the terms for acquiring milk from dairy farmers in Cayambe. The milk buyer will collect the milk from members of the cooperative. Transaction costs will be reduced because the milk buyer will negotiate with the cooperative, and not individually with each farmer, to define the price.

The investment for this scenario consists in installing an office for the cooperative and vehicles for transportation of the field staff. The total investment during the first two years will reach $113,000 and will include $56,000[18] to build and set up an office of 200 square meters, $48,000 to purchase four vehicles for transportation, $5,200 for six computers and software[19] (Office 2000), and $3,800 for furniture. The investment will be gradual and will reach $72,400 for the start-up, $39,000 during the first year, and $1,000 in the second year. The investment in computers will follow the number of hired secretary/assistants while the furniture will follow the number of hired secretary/assistants and field staff, and the latter will determine the investment in vehicles. The total number of employees will increase gradually according to the members of the cooperative to reach five secretaries and four field staff at the end of the second year.

The field staff will advice and assist dairy farmers in the production practices that will assure high quality milk. For example, washing and drying of teats before milking the cow and dipping the teats after milking.

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[18] The cost per $m^2$ is $280 according to direct communication with Architecture and Consulting-Ecuador on October 15, 2002.
[19] Quote obtained indirectly from Akros Cia. Ltda, which is a distributor of Compaq in Ecuador.

### 8.2.1.2. Scenario 2 – Bargaining with processors and middlemen while bulk handling small farms production

For this scenario of the bargaining phase dairy farmers will invest in centralized cooling tanks, which will be installed in the communities of small indigenous farmers, and a management office for the cooperative. The investment in the management office will be the same as in the first scenario and the investment in centralized cooling tanks will be consistent with the number of small indigenous farmers that join the cooperative.

The capital required for this scenario is $713,000 and will be invested during the first two years. Table 45 lays out the required investment for the start-up (Year 0) and the first two years of operation. Compared to the investment of the first scenario, for the second scenario the additional investment are the centralized cooling tanks that represent 84.2% of the total investment.

**Table 45. Investment for the bargaining phase of the cooperative – second scenario**

| Investment | Year 0 USD | Year 1 USD | Year 2 USD | Total | % |
|---|---|---|---|---|---|
| Centralized cooling tanks | 150,000 | 360,000 | 90,000 | 600,000 | 84.2 |
| Office infrastructure | 56,000 | - | - | 56,000 | 7.9 |
| Vehicles | 12,000 | 36,000 | - | 48,000 | 6.7 |
| Computers/software | 2,000 | 2,400 | 800 | 5,200 | 0.7 |
| Furniture | 2,400 | 1,200 | 200 | 3,800 | 0.5 |
| Total | 222,400 | 399,600 | 91,000 | 713,000 | 100.0 |

The investment to start the cooperative will be $222,400 and includes $150,000 for installing five centralized cooling tanks in the communities of small farms. The estimated investment per cooling is $30,000[20], which includes infrastructure, cooling tank and the equipment for collecting and maintaining refrigerated the samples of milk. The cooling tanks have a capacity of 1,920 liters each. This information is used to estimate

[20] Information provided by Eng. John Campuzano in behalf of Cattlemen's Association.

the capital required for the 15 additional centralized cooling tanks to be installed and collect the 30,956 liters of milk produced by 2,563 small farms.

During the first year of operations an investment of about $400,000 will be required to install 12 additional centralized cooling tanks, acquire three vehicles, purchase three computers, and install six working stations for the additional employees. For the second year $91,000 will be invested in installing other three cooling tanks and to purchase one computer and desk for one additional assistant. A total of $600,000 (91.7%) will de dedicated to install 20 centralized cooling tanks, which will be financed by capital provided by small farms and a loan from PL-480.

#### 8.2.1.3. Scenario 3: Bargaining with processors and enhancing the quality of milk

For this scenario of the bargaining phase the cooperative will require additional capital to purchase milk trucks, equipment for milk testing laboratory and build the infrastructure for the laboratory.

**Table 46. Investment for the bargaining phase of the cooperative – third scenario**

| Investment | Year 0 USD | Year 1 USD | Year 2 USD | Total | % |
|---|---|---|---|---|---|
| Centralized cooling tanks | 150,000 | 360,000 | 90,000 | 600,000 | 51.3 |
| Milk trucks | 71,425 | 166,658 | 47,617 | 285,700 | 24.4 |
| Milk testing equipment | 100,000 | - | - | 100,000 | 8.6 |
| Laboratory | 70,000 | - | - | 70,000 | 6.0 |
| Office infrastructure | 56,000 | - | - | 56,000 | 4.8 |
| Vehicles | 12,000 | 36,000 | - | 48,000 | 4.1 |
| Computers/software | 2,000 | 2,400 | 800 | 5,200 | 0.4 |
| Furniture | 2,400 | 1,200 | 200 | 3,800 | 0.3 |
| Total | 463,825 | 566,258 | 138,617 | 1,168,700 | 100.0 |

The total investment needed for the firs two years of this scenario reaches $1,168,700. Table 46 lays out the investments required for the start-up year (Year 0) and the first two years of operation. The largest investment is still in centralized cooling tanks (51.3%), followed by the milk trucks (24.4%), the milk testing equipment for the laboratory (8.6%), the infrastructure for the laboratory (6.0%), the office infrastructure, computers/software for management and the furniture.

The investment for centralized cooling tanks is the same as in the second scenario of the bargaining phase whereas the investment in milk trucks is consistent with the expected volume of milk produced by the members according to the membership growth assumption. Table 47 shows the investment required for the first two years to acquire the trucks to collect the milk from the 79 medium farms, 33 large dairy farms and the 20 centralized cooling tanks installed for the 2,563 small indigenous farmers. Recall from Chapter II, milk marketed in Cayambe is 93,229 liters per day. However, the volume that represent the potential members of the cooperative is 70,695 liters per day by the end of the second year. The capacity of each truck will be 2,000 gallons (7,570 liters) in order to be able to run on rocky roads, which are common in the region.

**Table 47. Investment in milk trucks**

| Variable | Year 0 | Year 1 | Year 2 | Total |
|---|---|---|---|---|
| Volume of milk[1] (liters/day) | 16,556 | 54,828 | 70,695 | 70,795 |
| Number of additional trucks | 3 | 7 | 2 | 12 |
| Cost per truck[2] (USD) | 23,808 | 23,808 | 23,808 | 23,808 |
| Total (USD) | 71,425 | 166,658 | 47,617 | 285,700 |

/1 Average volume per day for the last month of the year.
/2 The cost per truck in the U.S. was obtained from a dairy equipment provider and includes the import costs.

Since the volume of milk marketed by the cooperative is assumed to increase from the third year until the 20$^{th}$ year, the cooperative will have to gradually invest in one additional milk truck in the nineteenth year. The resources to purchase the truck are assumed to come from the retained earnings and patronage funds. Also, the analysis considers that the useful life of the trucks was 10 years. Therefore, starting on the 11th year the trucks are gradually replaced.

**Table 48. Equipment for milk testing laboratory**

| Milk test | Equipment | USD |
|---|---|---|
| Somatic Cell Count | Hood | NA |
| | Microscope | 1,500* |
| | Slide warmer | 400 |
| | 10 – 0.01 ml syringe | 900 |
| | Thermometers, staining jar, microscope slides | 500* |
| Bacterial Count | Circulating water bath | 1,600 |
| | Balance for weighing media | NA |
| | Incubator | 4,200 |
| | Autoclave for making media | 35,000 |
| | Refrigerator to hold and maintain samples and media | 6,000* |
| | Hot plate | NA |
| | pH meter | 1,000* |
| | Dishwasher | NA |
| | Plate reader | 700 |
| | Steam bath | NA |
| | Miscellaneous supplies | NA |
| Fat determination (Babcock method) | Milk testing bottles – 2 cases of 12 | 440 |
| | Centrifuge | 1,800 |
| | Acid dispensing bottles and burette | 450 |
| | Water bath to accommodate test bottles with thermometer | 628* |
| | Reading light | 55* |
| | Bottle shaker | 1,000 |
| | Hot plate and container to deliver water to bottles | 500 |
| | Balance top loading | 1,000 |
| Total solids | AOAC Official Method 990.20 Solids (Total) in Milk By Direct Forced Air Oven Drying | NA |
| TOTAL | | 57,673 |

The list of items and some estimated costs were provided by Steve Reh, Laboratory Division of the Michigan Department of Agriculture.
* The source is VWR Scientific (www.vwrsp.com)

It is an assumption that the collecting volume of the trucks will be 25% in excess until the end of the third year in order to provide enough capacity to collect milk from the largest number of farms along the route. Starting on the fourth year the excess capacity of the truck will reduce since the volume of milk collected from medium and large farms will increase. Also, it is assumed that the cooperative will acquire used milk trucks imported from the U.S. Milk trucks may be assembled in Ecuador by importing the necessary parts and this alternative may require less capital.

The investment in the infrastructure for the milk-testing laboratory is estimated in $70,000 and for the equipment is $ 100,000. The items needed to test for somatic cell count, bacteria count, fat content, and total solids were identified by the Laboratory Division of the Michigan Department of Agriculture. The cost of some items was obtained from VWR Scientific. Table 48 lays out the items required for the laboratory and the cost for some of them.

### 8.2.2. Capital for the two-phase cooperative

The capital required for the two-phase cooperative (fourth scenario) includes the capital required for the third scenario of the bargaining cooperative (first phase) and the capital for the processing phase (second phase).

The capital required for the processing phase is difficult to estimate since it must include the necessary equipment to process the dairy products as well as the infrastructure on which to install the equipment. In order to have a precise estimation of the capital required it will be essential to hire an engineer to develop a technical design of the processing facility and have the detailed specifications for each of the equipment required. Since this goes beyond the scope of this research, the alternative undertaken is to estimate the investment required for the most relevant equipment and infrastructure based on general characteristics like size and processing capacity.

Table 49 shows the major split up of the capital that is required for the processing phase of the cooperative. Although the processing phase starts on the third year of the fourth scenario, the required investments occur after the first quarter of the second year (see Chapter VI). Therefore, the capital required in years zero through two is the same as for the third scenario, except for the investment in dairy processing equipment, dairy plant infrastructure, land, office infrastructure ($28,000), 75% ($2,400) of computers/software and 93.0% ($2,600) of furniture which relates solely to the processing phase. The largest capital required is for dairy processing equipment (34.3 %), centralized cooling tanks (26.1%), milk trucks (12.4%) and dairy plant infrastructure (11.7%).

**Table 49. Investment for the two-phase cooperative**

| Investment | Year 0 USD | Year 1 USD | Year 2 USD | Total | % |
|---|---|---|---|---|---|
| Dairy processing equip. | - | - | 789,877 | 789,877 | 34.3 |
| Centralized cooling tanks | 150,000 | 360,000 | 90,000 | 600,000 | 26.1 |
| Milk trucks | 71,425 | 166,658 | 47,617 | 285,700 | 12.4 |
| Dairy plant infrastructure | - | - | 270,000 | 270,000 | 11.7 |
| Milk testing equipment | 100,000 | - | - | 100,000 | 4.3 |
| Laboratory infrastructure | 70,000 | - | - | 70,000 | 3.0 |
| Office infrastructure | 56,000 | - | 28,000 | 84,000 | 3.6 |
| Vehicles | 12,000 | 36,000 | - | 48,000 | 2.1 |
| Land | - | - | 40,000 | 40,000 | 1.7 |
| Computers/software | 2,000 | 2,400 | 3,200 | 5,200 | 0.3 |
| Furniture | 2,400 | 1,200 | 2,800 | 3,800 | 0.3 |
| Total | 463,825 | 566,258 | 1,271,493 | 2,301,576 | 100.0 |

The investment in land refers to the purchase of two hectares in Cayambe where the dairy processing plant will be installed. The price of land in Cayambe has an approximate cost of $20,000 per hectare (Cattlemen's Association, 2001).

Although the analysis of the retailers' sales on Chapter V suggests that the dairy plant should process pasteurized milk and fresh cheese, butter will also be processed as there will be excess cream available. Pasteurized milk will be 2% reduced fat while fresh cheese will be 20% fat. Since the average fat content of raw milk is assumed to be 3.7%, the excess fat will be processed into butter.

**Table 50. Cost of equipment for dairy processing facility**

| Equipment | U.S. dollars | % |
|---|---|---|
| Receiving bulk tanks | 35,984 | 4.5 |
| Tanks for pasteurization | 42,660 | 5.4 |
| Boiler for sanitation | 14,654 | 1.8 |
| Separator | 34,683 | 4.4 |
| HTST pasteurization system | 178,141 | 22.6 |
| Homogenizer | 28,657 | 3.6 |
| Milk bottle filler | 281,033 | 35.6 |
| Cheese vats | 43,311 | 5.4 |
| Cheese hoops | 13,678 | 1.7 |
| Cheese press | 21,005 | 2.7 |
| Cheese packing | 40,384 | 5.1 |
| Butter churning | 34,683 | 4.4 |
| Butter packing | 21,005 | 2.7 |
| Total | 789,877 | 100 |

The dairy equipment for the processing facility includes 13 items. The equipment cost was obtained from a U.S. distributor[21] of dairy equipment for overseas and the prices given were adjusted to include import costs. Table 50 shows in detail the cost of the equipment for the processing plant. The most costly equipment is the milk bottle filler for the pasteurized milk. This equipment is the most expensive because it corresponds to new equipment whereas the other equipment is used.

This plant will market pasteurized milk in 2-liter plastic bottles. Thus, this processing plant will have no other competitor for the pasteurized milk in this type of container. In addition, the fresh cheese will be packed in 500 gram units as well as the butter.

[21] Data obtained by direct communication with Mr. Max Badertscher from Heritage Equipment and a quote from Fogg Filler Company.

On the other hand, the additional investment in office infrastructure is based on expanding 100 $m^2$ ($28,000) the office that was built for the bargaining cooperative and the cost per $m^2$ is the same as for the first phase. In addition, an investment of $5,000 will be required for furniture and computers to accommodate the additional administration employees for the processing plant.

Finally, the investment in buildings is estimated in $270.000. This value is based on the estimation made by Cattlemen's Association for the buildings of a milk powder processing plant. This plant had a processing capacity of 100,000 liters per day and the investment in buildings was $186,000. The processing plant of the cooperative will procure 65,000 liters per day but will require refrigerated rooms to store the dairy products; therefore, the investment in buildings is estimated to be 1.5 times the investment of the milk powder facility.

## 8.3. INVESTMENT ANALYSIS

The investment analysis includes three scenarios for the bargaining cooperative and one scenario for the two-phase cooperative. For each of the four scenarios the life span is 20 years because that is considered the useful life of the dairy processing equipment, which is the major investment. This assumption is based on the fact that in making investment decision the useful life of the investment must be determined and for used dairy equipment the period of 20 years will assure an acceptable performance of the equipment under regular maintenance conditions. In this way, the investment analysis for the three scenarios of the bargaining cooperative will also consider a useful life span of 20 years thus the results of financial performance will be comparable.

### 8.3.1. Investment analysis for the bargaining cooperative

The following section analyzes the economic feasibility of the three scenarios for the bargaining cooperative. First, milk procurement and revenues are estimated; second, the operating costs are described; and third, the key financial ratios are calculated.

#### 8.3.1.1. Milk procurement and revenue

The cooperative will bargain with milk buyers (middlemen and/or processors in first and second scenarios and only processors in third scenario) the milk produced by 2,563 small farms, 79 medium farms and 33 large farms that will gradually join the cooperative. The starting volume for bargaining will be about 16,500 liters per day and will reach 54,828 and 70,695 liters per day by the end of the first and second years, respectively.

For the NPV calculations in every scenario, the cash-inflow price is the price paid by the buyer with the cooperative and the cash-outflow price for milk procurement is the current farm price without the cooperative. Nevertheless, for the distribution of benefits the earnings that the cooperative will gain are returned to farmers by higher milk prices, patronage refunds, or both. For the current analysis, the current price (without the cooperative) for small farms will be paid on average 22.63 cents, medium farms 24.80 cents and large farms 26.35cents. Since the volume of milk marketed by medium and large farms will increase across the years, the average weighted farm price will also increase. For the first year the average weighted farm price will be 24.55 cents, for the twentieth year will increase to 24.89 cents, and the average price for the twenty years will be 24.72 cents.

Table 51 lays out the prices that the categories of farmers will receive and the price paid by middlemen or processors for the first year of operations.

**Table 51. Farm price and milk buyer price for three scenarios of bargaining phase**

| Price | Farm size | Milk Production For Year 1 Avg. liters/ day | First Scenario Year 1 Cents/liter | Second Scenario Year 1 Cents/liter | Third Scenario Year 1 Cents/liter |
|---|---|---|---|---|---|
| Farm Price (Current price) | Small | 16,949 | 22.63 | 22.63 | 22.63 |
| | Medium | 4,369 | 24.80 | 24.80 | 24.80 |
| | Large | 17,442 | 26.35 | 26.35 | 26.35 |
| | Average | | 24.55 | 24.55 | 24.55 |
| Buyer Price (With Coop) | Small | 16,949 | 23.55 | 25.55 | 28.60 |
| | Medium | 4,369 | 25.00 | 25.00 | 28.60 |
| | Large | 17,442 | 27.00 | 27.00 | 28.60 |
| | Average | | 25.27 | 26.14 | 28.60 |

The milk buyer price for the first scenario will average 25.27 cents for the first year. Dairy processors and middlemen will collect the milk from the farms but they will negotiate the price for the volume of milk procured with the cooperative and will depend on the size of the farm. Middlemen will pay for milk procured from small farms a price of 23.55 cents per liter, which results from subtracting 50% of the margin captured by the middlemen (1.45 cents), under the current conditions, from the farm price without premiums (25 cents), which was estimated in Chapter IV. The resulting price derives from the assumption that the cooperative is able to reduce the margin captured by the middlemen by fifty percent as a consequence of the bargaining process. Milk buyers that procure milk from medium farms will pay an average price of 25 cents, which is the price without premiums. Furthermore, buyers that acquire milk from large farms will pay an average price of 27 cents per liter. This price results from adding the premium for volume (1.3 cents) and 25% of the premium for high quality (0.7 cents) to the price without premiums (25 cents).

For the second scenario, the average milk buyer price will be 26.14 cents for the first year. In this scenario the centralized cooling tanks are installed in the communities of small farms. Therefore, only these farms will receive a higher price compared to the first scenario. Milk buyers that acquire milk from the centralized cooling tanks will pay a price of 25.55 cents, which results from adding the premium for volume (1.3 cents) and one-quarter of the premium for high quality (0.7 cents) to the price paid in the first scenario. On the other hand, milk buyers will pay the same price as in the first scenario for milk acquired from medium and large farms.

Finally, for the third scenario the cooperative will haul the milk from farms to the processors. Therefore, milk buyers will pay the same price for raw milk regardless of the size of the farm. The average price paid will be 28.6 cents and consists in the price without premiums (25 cents) plus the premium for volume (1.3 cents) and the premium for high quality (2.3 cents). The premium for high quality may reach up to 3.1 cents (see Chapter IV); however, for this study it is assumed that the premium for high quality reaches 75% of the maximum level.

The total net revenues from marketing on average 38,760 liters per day are $99,899 for the first year of first scenario. Total revenues add to $3.52 million and cash outflows for milk procurement reach $3.42 million. On the other hand, for the second scenario, net revenues are $221,934 for the first year, reaching total revenues $3.64 million and cash outflow for milk procurement $3.42 million. For the third scenario, net revenues will be $565,119 for the first year, reaching total revenues $ 3.99 million and cash outflow for milk procurement $ 3.42 million. Net revenues will increase following the growth in milk procurement and will reach $228,895 for the twentieth year of the first scenario, $451,742 for the second scenario, and $1,240,290 for the twentieth year of the third scenario[22].

#### 8.3.1.2. Operating Costs

For the first scenario of the bargaining phase, the operating costs will consist in expenses for operation of the office and include the wages for hired labor as well as transportation expenses of field staff and expenses for office supplies/utilities and management. The operating costs for the first month are $2,042 and reach $6,106 for the 24th month and beyond.

The secretaries and field staff will be hired gradually according to the number of farms that join the cooperative and will reach five and four, respectively, by the end of the second year. The secretaries/assistants will earn a wage of $200 per month and the field staff $500 per month. Office supplies/utilities will total $218 for the first month, which include expenses for telephone, electricity, water, office supplies, and cleaning and maintenance. This expense will increase according to the number of hired assistants and

[22] See Appendix C for detailed streams of cash inflows for each of the three scenarios of the bargaining cooperative.

farmer members and reach $1,610 in the 24th month. Also, the manager will earn a salary of $1,000 per month[23].

The transportation expenses of field staff include fuel and vehicle maintenance. Each vehicle will run on average 50 km per day and the average yield per gallon of gasoline will be 30 km. The retail price of gasoline was $1.48 per gallon as of January 2003. Therefore, the monthly fuel expense per vehicle is $74. The vehicle maintenance expense is 5% per year of the acquisition value of the vehicle and the monthly expense is $50[24].

For the second scenario of the bargaining phase, the operating costs are the same as in the first scenario and also include the operating costs of the centralized cooling tanks. These latter costs comprise the wage for an employee to receive the milk and operate the tank, electricity, water and cleaning supplies expenses. Operating costs will be $3,657 for the first month and will increase to reach $12,565 on the 24th month and beyond.

Regarding the operating costs of the centralized cooling tanks, one employee will be hired per centralized cooling tank and will earn a wage of $260. Therefore, the cooperative will start with five employees and will gradually increase to 20 in the 21st month of operations of the cooperative. The expenses in electricity, water and sanitation/cleaning supplies will be $63 per cooling tank per month. As a result, the operating costs will be $323 per month per cooling tank[25].

For the third scenario of the bargaining phase, the cooperative will incur the same expenses as in the second scenario and will also incur the expenses for transportation of

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[23] Data obtained by direct communication with Architecture and Consulting-Ecuador on October 15, 2002.
[24] See Appendix C-1 for the detailed streams of operating costs.
[25] See Appendix C-2 for the detailed streams of operating costs.

milk from the farms and centralized cooling tanks to the processors and for operation of the milk testing laboratory. The expenses for milk transportation include fuel, truck-driver wage, cleaning/sanitation supplies and truck maintenance, whereas the expenses for operation of the milk testing laboratory include the technician salary and supplies for milk testing. The total operation costs will be \$5,805 for the first month and will increase to reach \$17,244 for the 24th month and beyond[26].

The operating expenses for milk trucks include fuel, truck drivers, cleaning/sanitation supplies and truck maintenance. The expenses in fuel are calculated assuming the current price of diesel in Ecuador (\$1.04 per gallon as of January/2003) and that every truck will run an estimated distance of 60 km per day to collect the milk and deliver it to the processors. In addition, the yield of diesel per truck will be 20 km/gallon. The number of milk truck drivers will follow the number of trucks that are purchased to collect milk from dairy farms and cooling tanks and will receive a wage of \$220 per month. The monthly expenses for cleaning/sanitation supplies[27] will be \$52 per truck. Regarding truck maintenance expenses, the cooperative will expend five percent of the cost of each truck per year. For the analysis, it is assumed that one-twelfth of the yearly expense is disbursed for every truck per month. In this way, the operating costs to run the three trucks during the first month are \$281 for fuel, \$660 for truck drivers' wages, \$156 for sanitation and \$298 for truck maintenance. These expenses increase gradually according to the number of trucks needed to transport the milk procured from members.

Regarding the operating costs of the milk testing laboratory, two employees will

[26] See Appendix C-3 for detailed streams of operating costs.

[27] Include 120g of chlorinated alkaline detergent and hot water for daily sanitation per truck. The detergent will be provided by the distributor of Delaval products in Ecuador.

be hired and the wage that will receive will be $400 per month. Also, it is assumed a monthly expense of $200 to be used in supplies for milk testing. Therefore, the operating costs of the laboratory will be $1,000 per month.

Lastly, management disbursements include expenses in office assistants, office supplies/utilities and manager's salary. These expenses will follow the same criteria as in the first scenario. Nevertheless, the office supplies/utilities are estimated to be 1.25 times the expense of these items for the first scenario of the bargaining cooperative whereas the expense office assistants' wages and manager's salary will be the same as in the first scenario. Therefore, the expense in office supplies/utilities will be $272 for the first month and will increase gradually to reach $2,012 in the 24$^{th}$ month.

### 8.3.1.3. Financial performance

The financial performance indicators are obtained from the 20 year stream of revenues and costs. The indicators calculated include net present value (NPV) and internal rate of return (IRR).

The key performance indicators are related to the equity-capital. Cash outflows include the debt-financing associated with the investment (i.e. principal payments and interest). Consequently, the NPV calculated is associated with the investment of the cooperative's members thus show the expected return of members' investment (Bierman, 1984). The IRR indicates the rate of return that members will receive by investing in the cooperative.

The general formula for the NPV for return to capital includes three components: Present Value of After-Tax Cash Flows (PVATCF), Present Value of After-Tax Terminal

Value (PVATTV) and the After-Tax Equity Proportion of Initial Investment (ATEPII). The PVATCF include cash inflows, cash outflows and the pertinent calculations to include the effect of depreciation and income taxes in the cash flows. The formulas for the estimation of these components are the following:

$$PVATCF = \sum_{1}^{n} \frac{\text{Revenues}(1-t) - \text{Expenses}(1-t) + \text{Depreciation}(t) - \text{Interest}(1-t) - \text{Principal}}{(1+K_e)^n}.$$

$$PVATTV = \frac{TV}{(1+K_e)^n}(1-t).$$

$$ATEPII = E_0.$$

$K_e$ is the cost of equity-capital, TV is the terminal value of initial investment, $E_0$ is equity in year 0, and t is the income tax rate for the cooperative.

The calculation procedure to obtain the financial indicators consisted in obtaining the Net Cash Flows After-Taxes (NCFAT), which include the deduction for income taxes. For this purpose, the taxable cash flow (cash inflows – operating costs – interest) is calculated as well as the tax allowance that results from depreciation. In this way, NCFAT are obtained by multiplying the taxable cash flow by the after-tax factor (1 – t), adding the tax allowance for depreciation and subtracting the cash flows for principal payment as well as the equity proportion of the investment.

The NCFAT for the twentieth year includes the terminal value (or salvage value) of the fixed and intermediate assets with remaining useful life within the taxable cash flow. For the analysis, it is assumed that computers/software have a useful life of three years, vehicles five years, furniture and cooling trucks 10 years, and infrastructure and centralized cooling tanks 20 years.

In order to obtain the NPV, the NCFAT at different points in time are converted to comparable values at the present time to obtain the present value of the NCFAT. For the calculation of the present value of each cash flow the appropriate discount rate to use is the opportunity cost of equity capital ($K_e$).

The IRR consists of a discount rate that will make the NPV have a value of zero and represents the highest interest rate an investor could afford to pay, without losing money, if all the funds to finance the investment were borrowed (Bierman, 1984).

The third financial indicator is the payback period. Since the present value of NCFAT's are not constant, the calculation of the payback period is obtained by manual calculation assuming that the cash flows for each year is uniform within the year.

**Cost of equity-capital**

The estimation of the opportunity cost of equity capital ($K_e$) is key to calculate the present value of the NCFAT. Since the investment analysis is in constant terms (no inflation), the formula to calculate $K_e$ is the following:

$$K_e = i_{RF} + v$$

where,

$i_{RF}$ = Risk-free interest rate

v = risk premium

The risk-free interest rate ($i_{RF}$) is given by the return to bonds issued by the Central Bank of Ecuador and the average for 2002 was 5.12%[28]. The risk premium (v) for dairy farms in Ecuador is given by the difference between the return of dairy farms in

[28] Weighted average rate for bonds between 84 and 91 days auctioned by the Central Bank of Ecuador.

Ecuador and $i_{RF}$. Since v has not been estimated for dairy farms in Ecuador, for the purpose of this research the risk premium is estimated in 6%. It consists in adding the risk premium of 4% for dairy farms in Michigan (Wolf, et. al., 2003) and an assumed factor of 2% for the fact that Ecuador is a developing country. Consequently, the cost of equity capital for dairy farmers in Cayambe is 11.12%

**Cost of debt and income taxes**

The estimation of the cash flows are in constant terms therefore the interest rate of barrowed capital should be adjusted by inflation. The nominal cost of the loan is assumed to be 16.7%[29], which is the interest rate for a long-term loan in Ecuador on average for year 2002, and the inflation rate for 2002 was 9.4% (INEC, 2003). Thus, the real interest rate for a long-term loan is 7.3%. This rate is used to estimate the cost of financing for the four scenarios.

Recall from chapter II, cooperatives are exempt of income taxes only when members are small farmers. Therefore, since the cooperative has medium and large farmers as members, it is subject to income taxes and for 2002 the rate was 15%.

**Financial performance indicators**

The calculation of the NCFAT is the core element of the financial analysis in order to obtain the key financial indicators. Tables 52, 53 and 54 lay out the summary estimation of the present value of NCFAT. For the first, second and third scenarios of the bargaining cooperative the NCFAT show and increasing trend starting on year two. The

[29] Average interest rate for long-term loans (361 days or more) offered by private banks for 2002 according to the Central Bank of Ecuador.

Table 52. Cash Flow for Bargaining Cooperative - First Scenario

| Year | Equity Proportion of Investment or Terminal Value | Cash Inflow | Raw Milk Procurement | Operating Costs | Debt Financing | | Net Cash Flow Before-Taxes |
|---|---|---|---|---|---|---|---|
| | | | | | Principal | Interest on Loan | |
| 0 | 19,800 | - | - | - | - | - | (19,800) |
| 1 | 39,600 | 3,525,500 | 3,425,600 | 47,902 | 3,749 | 3,853 | 4,796 |
| 2 | 1,000 | 5,873,290 | 5,706,066 | 71,986 | 4,024 | 3,578 | 86,636 |
| 3 | 2,000 | 6,536,299 | 6,350,586 | 73,266 | 4,318 | 3,284 | 102,845 |
| 4 | 2,400 | 6,646,640 | 6,460,397 | 73,266 | 4,635 | 2,967 | 102,975 |
| 5 | 800 | 6,757,995 | 6,568,727 | 73,266 | 4,974 | 2,628 | 107,600 |
| 6 | 13,400 | 6,870,363 | 6,678,162 | 73,266 | 5,339 | 2,263 | 97,932 |
| 7 | 36,600 | 6,983,743 | 6,788,706 | 73,266 | 5,730 | 1,872 | 77,569 |
| 8 | 800 | 7,098,137 | 6,900,360 | 73,266 | 6,149 | 1,453 | 116,109 |
| 9 | 2,000 | 7,213,543 | 7,013,127 | 73,266 | 6,600 | 1,002 | 117,548 |
| 10 | 2,400 | 7,329,963 | 7,127,009 | 73,266 | 7,083 | 519 | 119,686 |
| 11 | 12,200 | 7,447,395 | 7,242,008 | 73,266 | - | - | 119,921 |
| 12 | 36,200 | 7,565,840 | 7,358,127 | 73,266 | - | - | 98,247 |
| 13 | 2,400 | 7,685,298 | 7,475,368 | 73,266 | - | - | 134,264 |
| 14 | 800 | 7,805,769 | 7,593,733 | 73,266 | - | - | 137,971 |
| 15 | 2,000 | 7,927,253 | 7,713,224 | 73,266 | - | - | 138,763 |
| 16 | 13,800 | 8,049,750 | 7,833,845 | 73,266 | - | - | 128,840 |
| 17 | 35,000 | 8,173,260 | 7,952,395 | 73,266 | - | - | 112,600 |
| 18 | 2,000 | 8,297,783 | 8,075,232 | 73,266 | - | - | 147,285 |
| 19 | 2,400 | 8,423,319 | 8,199,206 | 73,266 | - | - | 148,447 |
| 20 | (7,632) | 8,549,868 | 8,320,973 | 73,266 | - | - | 163,261 |
| Total | 219,968 | 144,761,009 | 140,782,850 | 1,438,676 | 52,600 | 23,420 | 2,243,496 |

Table 52 (cont'd).

| Year | Taxes | | | Net Cash Flow After-Taxes | Present Value Factor | Discounted Cash Flows |
|---|---|---|---|---|---|---|
| | After-Tax Deprec. Credit | Tax Charges | Total | | | |
| 0 | - | - | - | (19,800) | 1.0000 | (19,800) |
| 1 | 591 | 7,222 | 6,631 | (1,835) | 0.8999 | (1,651) |
| 2 | 631 | 13,749 | 13,118 | 73,518 | 0.8099 | 59,543 |
| 3 | 631 | 16,375 | 15,744 | 87,101 | 0.7289 | 63,486 |
| 4 | 631 | 16,501 | 15,870 | 87,105 | 0.6559 | 57,136 |
| 5 | 631 | 17,006 | 16,375 | 91,225 | 0.5903 | 53,852 |
| 6 | 631 | 17,501 | 16,870 | 81,063 | 0.5313 | 43,065 |
| 7 | 631 | 17,985 | 17,354 | 60,216 | 0.4781 | 28,789 |
| 8 | 631 | 18,459 | 17,828 | 98,281 | 0.4303 | 42,287 |
| 9 | 631 | 18,922 | 18,291 | 99,257 | 0.3872 | 38,434 |
| 10 | 631 | 19,375 | 18,744 | 100,941 | 0.3485 | 35,176 |
| 11 | 631 | 19,818 | 19,187 | 100,734 | 0.3136 | 31,591 |
| 12 | 631 | 20,167 | 19,536 | 78,711 | 0.2822 | 22,215 |
| 13 | 631 | 20,500 | 19,869 | 114,396 | 0.2540 | 29,056 |
| 14 | 631 | 20,816 | 20,185 | 117,786 | 0.2286 | 26,924 |
| 15 | 631 | 21,114 | 20,483 | 118,280 | 0.2057 | 24,332 |
| 16 | 631 | 21,396 | 20,765 | 108,075 | 0.1851 | 20,008 |
| 17 | 631 | 22,140 | 21,509 | 91,091 | 0.1666 | 15,177 |
| 18 | 631 | 22,393 | 21,762 | 125,523 | 0.1499 | 18,821 |
| 19 | 631 | 22,627 | 21,996 | 126,451 | 0.1349 | 17,063 |
| 20 | 631 | 24,489 | 23,858 | 139,402 | 0.1214 | 16,929 |
| Total | 12,580 | 378,554 | 365,974 | 1,877,521 | - | 622,433 |

Table 53. Cash Flow for Bargaining Cooperative - Second Scenario

| Year | Equity Proportion of Investment or Terminal Value | Cash Inflow | Raw Milk Procurement | Operating Costs | Debt Financing | | Net Cash Flow Before-Taxes |
|---|---|---|---|---|---|---|---|
| | | | | | Principal | Interest on Loan | |
| 0 | 32,639 | - | - | - | - | - | (32,639) |
| 1 | 181,653 | 3,647,534 | 3,425,600 | 94,087 | - | 13,900 | (67,706) |
| 2 | 63,250 | 6,080,272 | 5,706,066 | 145,301 | - | 29,865 | 135,791 |
| 3 | 2,000 | 6,759,146 | 6,350,586 | 150,780 | - | 31,897 | 223,883 |
| 4 | 2,400 | 6,869,488 | 6,460,397 | 150,780 | - | 31,897 | 224,013 |
| 5 | 800 | 6,980,842 | 6,568,727 | 150,780 | - | 31,897 | 228,639 |
| 6 | 13,400 | 7,093,210 | 6,678,162 | 150,780 | - | 31,897 | 218,971 |
| 7 | 36,600 | 7,206,591 | 6,788,706 | 150,780 | - | 31,897 | 198,608 |
| 8 | 800 | 7,320,984 | 6,900,360 | 150,780 | 9,225 | 31,897 | 227,922 |
| 9 | 2,000 | 7,436,391 | 7,013,127 | 150,780 | 21,853 | 31,222 | 217,409 |
| 10 | 2,400 | 7,552,810 | 7,127,009 | 150,780 | 25,182 | 29,621 | 217,818 |
| 11 | 12,200 | 7,670,242 | 7,242,008 | 150,780 | 27,027 | 27,776 | 210,451 |
| 12 | 36,200 | 7,788,688 | 7,358,127 | 150,780 | 29,007 | 25,796 | 188,778 |
| 13 | 2,400 | 7,908,146 | 7,475,368 | 150,780 | 31,131 | 23,672 | 224,795 |
| 14 | 800 | 8,028,617 | 7,593,733 | 150,780 | 33,412 | 21,391 | 228,501 |
| 15 | 2,000 | 8,150,101 | 7,713,224 | 150,780 | 35,859 | 18,944 | 229,294 |
| 16 | 13,800 | 8,272,598 | 7,833,845 | 150,780 | 38,486 | 16,317 | 219,370 |
| 17 | 35,000 | 8,396,108 | 7,952,395 | 150,780 | 41,305 | 13,498 | 203,130 |
| 18 | 2,000 | 8,520,631 | 8,075,232 | 150,780 | 44,330 | 10,473 | 237,815 |
| 19 | 2,400 | 8,646,166 | 8,199,206 | 150,780 | 47,578 | 7,225 | 238,978 |
| 20 | (7,632) | 8,772,715 | 8,320,973 | 150,780 | 51,063 | 3,740 | 253,791 |
| Total | 437,110 | 149,101,278 | 140,782,850 | 2,953,422 | 435,458 | 464,825 | 4,027,613 |

Table 53 (cont'd).

| Year | Taxes | | | Net Cash Flow After-Taxes | Present Value Factor | Discounted Cash Flows |
|---|---|---|---|---|---|---|
| | After-Tax Deprec. Credit | Tax Charges | Total | | | |
| 0 | - | - | - | (32,639) | 1.0000 | (32,639) |
| 1 | 3,171 | 17,092 | 13,921 | (81,627) | 0.8999 | (73,460) |
| 2 | 4,826 | 29,856 | 25,030 | 110,761 | 0.8099 | 89,706 |
| 3 | 5,051 | 33,883 | 28,832 | 195,052 | 0.7289 | 142,168 |
| 4 | 5,051 | 33,962 | 28,911 | 195,102 | 0.6559 | 127,977 |
| 5 | 5,051 | 34,416 | 29,365 | 199,274 | 0.5903 | 117,635 |
| 6 | 5,051 | 34,856 | 29,805 | 189,166 | 0.5313 | 100,496 |
| 7 | 5,051 | 35,281 | 30,230 | 168,378 | 0.4781 | 80,502 |
| 8 | 5,051 | 35,692 | 30,641 | 197,281 | 0.4303 | 84,884 |
| 9 | 5,051 | 36,189 | 31,138 | 186,271 | 0.3872 | 72,128 |
| 10 | 5,051 | 36,810 | 31,759 | 186,059 | 0.3485 | 64,838 |
| 11 | 5,051 | 37,452 | 32,401 | 178,051 | 0.3136 | 55,839 |
| 12 | 5,051 | 38,098 | 33,047 | 155,731 | 0.2822 | 43,953 |
| 13 | 5,051 | 38,749 | 33,698 | 191,097 | 0.2540 | 48,538 |
| 14 | 5,051 | 39,407 | 34,356 | 194,145 | 0.2286 | 44,378 |
| 15 | 5,051 | 40,073 | 35,022 | 194,272 | 0.2057 | 39,964 |
| 16 | 5,051 | 40,748 | 35,697 | 183,673 | 0.1851 | 34,004 |
| 17 | 5,051 | 41,915 | 36,864 | 166,266 | 0.1666 | 27,701 |
| 18 | 5,051 | 42,622 | 37,571 | 200,244 | 0.1499 | 30,025 |
| 19 | 5,051 | 43,343 | 38,292 | 200,686 | 0.1349 | 27,080 |
| 20 | 5,051 | 45,728 | 40,677 | 213,114 | 0.1214 | 25,880 |
| Total | 98,915 | 736,172 | 637,257 | 3,390,356 | - | 1,151,597 |

Table 54. Cash Flow for Bargaining Cooperative - Third Scenario

| Year | Equity Proportion of Investment or Terminal | Cash Inflow | Raw Milk Procurement | Operating Costs | Debt Financing | | Net Cash Flow Before-Taxes |
|---|---|---|---|---|---|---|---|
| | | | | | Principal | Interest on Loan | |
| 0 | 44,281 | - | - | - | - | - | (44,281) |
| 1 | 204,550 | 3,990,720 | 3,425,600 | 154,395 | - | 30,732 | 175,443 |
| 2 | 75,110 | 6,658,241 | 5,706,066 | 239,625 | - | 57,271 | 580,169 |
| 3 | 2,000 | 7,395,226 | 6,350,586 | 251,052 | - | 61,937 | 729,652 |
| 4 | 2,400 | 7,513,923 | 6,460,397 | 251,052 | - | 61,937 | 738,137 |
| 5 | 800 | 7,633,709 | 6,568,727 | 251,052 | - | 61,937 | 751,194 |
| 6 | 13,400 | 7,754,585 | 6,678,162 | 251,052 | - | 61,937 | 750,035 |
| 7 | 36,600 | 7,876,551 | 6,788,706 | 251,052 | - | 61,937 | 738,257 |
| 8 | 800 | 7,999,607 | 6,900,360 | 251,052 | 20,396 | 61,937 | 765,062 |
| 9 | 2,000 | 8,123,752 | 7,013,127 | 251,052 | 41,759 | 60,443 | 755,371 |
| 10 | 2,400 | 8,248,986 | 7,127,009 | 251,052 | 48,786 | 57,384 | 762,356 |
| 11 | 250,283 | 8,375,311 | 7,242,008 | 251,052 | 52,359 | 53,811 | 525,798 |
| 12 | 83,817 | 8,502,725 | 7,358,127 | 251,052 | 56,194 | 49,975 | 703,560 |
| 13 | 2,400 | 8,631,228 | 7,475,368 | 251,052 | 60,311 | 45,859 | 796,239 |
| 14 | 800 | 8,760,821 | 7,593,733 | 251,052 | 64,728 | 41,441 | 809,067 |
| 15 | 2,000 | 8,891,504 | 7,713,224 | 251,052 | 69,470 | 36,700 | 819,058 |
| 16 | 13,800 | 9,023,277 | 7,833,845 | 251,052 | 74,558 | 31,611 | 818,411 |
| 17 | 35,000 | 9,156,139 | 7,952,395 | 251,052 | 80,020 | 26,150 | 811,523 |
| 18 | 2,000 | 9,290,090 | 8,075,232 | 251,052 | 85,881 | 20,289 | 855,637 |
| 19 | 26,208 | 9,425,132 | 8,199,206 | 256,005 | 92,172 | 13,998 | 837,543 |
| 20 | (31,440) | 9,561,263 | 8,320,973 | 256,005 | 98,924 | 7,246 | 909,555 |
| Total | 769,208 | 162,812,788 | 140,782,850 | 4,922,854 | 845,559 | 904,534 | 14,587,784 |

Table 54 (cont'd).

| Year | Taxes | | | Net Cash Flow After-Taxes | Present Value Factor | Discounted Cash Flows |
|---|---|---|---|---|---|---|
| | After-Tax Deprec. Credit | Tax Charges | Total | | | |
| 0 | - | - | - | (44,281) | 1.0000 | (44,281) |
| 1 | 7,066 | 56,999 | 49,933 | 125,510 | 0.8999 | 112,953 |
| 2 | 10,506 | 98,292 | 87,785 | 492,384 | 0.8099 | 398,785 |
| 3 | 10,731 | 109,748 | 99,016 | 630,635 | 0.7289 | 459,654 |
| 4 | 10,731 | 111,081 | 100,349 | 637,788 | 0.6559 | 418,356 |
| 5 | 10,731 | 112,799 | 102,068 | 649,126 | 0.5903 | 383,192 |
| 6 | 10,731 | 114,515 | 103,784 | 646,251 | 0.5313 | 343,326 |
| 7 | 10,731 | 116,228 | 105,497 | 632,760 | 0.4781 | 302,525 |
| 8 | 10,731 | 117,939 | 107,207 | 657,855 | 0.4303 | 283,055 |
| 9 | 10,731 | 119,870 | 109,138 | 646,233 | 0.3872 | 250,234 |
| 10 | 10,731 | 122,031 | 111,300 | 651,056 | 0.3485 | 226,879 |
| 11 | 10,731 | 124,266 | 113,535 | 412,264 | 0.3136 | 129,291 |
| 12 | 10,731 | 126,536 | 115,804 | 587,755 | 0.2822 | 165,885 |
| 13 | 10,731 | 128,842 | 118,111 | 678,128 | 0.2540 | 172,242 |
| 14 | 10,731 | 131,189 | 120,458 | 688,609 | 0.2286 | 157,405 |
| 15 | 10,731 | 133,579 | 122,848 | 696,211 | 0.2057 | 143,220 |
| 16 | 10,731 | 136,015 | 125,284 | 693,127 | 0.1851 | 128,320 |
| 17 | 10,731 | 138,981 | 128,250 | 683,273 | 0.1666 | 113,839 |
| 18 | 10,731 | 141,528 | 130,796 | 724,840 | 0.1499 | 108,682 |
| 19 | 11,089 | 143,388 | 132,300 | 705,243 | 0.1349 | 95,164 |
| 20 | 11,089 | 151,272 | 140,183 | 769,372 | 0.1214 | 93,430 |
| Total | 211,453 | 2,435,099 | 2,223,645 | 12,364,139 | - | 4,442,157 |

present value of each cash flow is smaller each year due to the discount factor. For a detailed cash flow for the 20 year stream of the three scenarios of the bargaining cooperative see Appendix C.

For the first scenario of the bargaining phase, the salvage value is $7,632 (for three vehicles with remaining useful life of one year and three computers with remaining useful life of one year), for the second scenario the salvage value is the same as for the first scenario and for the third scenario is $31,440, which includes the same values for the second scenario plus three refrigerated trucks with remaining useful life.

The cash flows show that the margin between the price paid to farmers and the price received from the milk buyer provides resources to finance the operation of the cooperative in the three scenarios. The financial performance indicators, which are presented in table 55, show that the third scenario lays out more promising results than the first and second scenarios of the bargaining phase. The price margin for raw milk increases in each of the scenarios as a result of marketing higher quality milk to buyers.

These performance indicators show that the bargaining cooperative is economically viable since the NPV is greater than zero and the IRR is greater that the cost of capital for the three scenarios. Comparing the NPV among the three scenarios, the third scenario reveals that this collective action outcome will result in the highest benefits. The high NPV for the third scenario derives from the fact that the higher prices that the cooperative could receive by offering high quality milk to processors justify the investment to acquire the required assets. Therefore, the third scenario is the most appealing for dairy farmers in terms of potential future profits that the project generates, and the second alternative that offers the largest future profits is the second scenario.

**Table 55. Performance indicators for bargaining cooperative**

| Performance Indicator | First Scenario | Second Scenario | Third Scenario |
|---|---|---|---|
| Net Present Value (USD) | 622,433 | 1,151,597 | 4,442,147 |
| Internal Rate of Return | 152.3% | 102.8% | 445.8% |

Although the key financial ratios demonstrate that the bargaining cooperative will be successful, the capability to achieve this performance is subject to obtaining the resources from PL-480 and implementing the other strategic actions of the plan that were presented in Chapter VII.

### 8.3.2. Investment analysis for two-phase cooperative

The two-phase dairy cooperative consists in forward integration of the third scenario of the bargaining cooperative. During the first two years of operation the cooperative will focus on milk bargaining with processors by collecting milk in trucks from the dairy farms and delivering to the processors. For the third year, the cooperative will start processing milk procured from the dairy farms.

#### 8.3.2.1. Milk procurement and dairy products processed

The procurement of raw milk follows the same volume as in the bargaining phase. However, for the second phase, the cooperative will process 65,000 liters per day at the beginning of the third year of operations and the remaining volume of milk will be marketed to dairy processors of the region or other regions. The processing facility will produce 2% pasteurized milk, 20% fat fresh cheese and butter. The plant will operate six days per week and 10 hours per day. Raw milk will be collected daily from the dairy farms and centralized cooling tanks; therefore the daily processing volume in the 6 days of operations per week will be 70,833 liters based on maintaining 30,000 liters of milk in the receiving bulk tank.

Table 56 lays out the processing volumes for the three dairy products according to the required low (skimmed milk) and high fat (cream). Raw milk (3.7% fat) is separated into skimmed milk (0.02% fat) and cream (47.5% fat). Ninety percent of skimmed milk is used to process pasteurized milk and the remaining skimmed milk is used to process fresh cheese. The excess cream that is obtained from the processing of pasteurized milk and fresh cheese is used to process butter.

**Table 56. Procurement of milk and dairy products processed**

| **Data** | | | **Volume** |
|---|---|---|---|
| Volume procured | | Liters/day | 65,000 |
| Volume processed (6 days a week) | | Liters/day | 70,833 |
| Dairy Products Processed | 2% Pasteurized Milk | Skimmed milk (kg) | 55,288 |
| | | Cream (kg) | 2,406 |
| | | Total (kg) | 57,694 |
| | | Production (2 liters) | 28,847 |
| | 20% fat fresh cheese | Skimmed milk (kg) | 8,816 |
| | | Cream (kg) | 549 |
| | | Total (kg) | 9.365 |
| | | Production (500 g) | 2,626 |
| | Butter | Cream (kg) | 1,791 |
| | | Production (500g) | 2,127 |
| | Total | Skimmed milk (kg) | 64,104 |
| | | Cream (kg) | 4,746 |
| | | Loss (kg) | 1,983 |
| | | Total | 70,833 |

For the production of pasteurized milk and fresh cheese, milk must be standardized in order to obtain the desired content of fat in the serum. The Pearson Square is used to calculate the required proportions of cream and skimmed milk for both dairy products. Starting with 0.02% skimmed milk and 47.5% cream the proportion to obtain 2% milk will be 45.5 parts of skimmed milk per 47.48 parts of pasteurized milk. In order to produce 20% fat fresh cheese, the content of fat in the milk to be coagulated must be 2.8%. In this way, the proportions of high and skimmed milk for fresh cheese will be 44.7 parts of skimmed milk per 47.8 parts of milk.

**8.3.2.2.Revenue**

The total revenue for the fourth scenario include the revenue of the first and second years of the third scenario of the bargaining phase and the revenue from processing dairy products starting on the third year. The average farm price and the milk buyer price will follow the same trend as in the third scenario of the bargaining cooperative. For the first two years of the fourth scenario, revenues are the same as in the third scenario. Starting on the 25th month revenues include the marketing of pasteurized milk, fresh cheese and butter[30].

The processing cooperative will market dairy products to distributors and the estimated processor prices[31] for the stream of revenues are $ 0.751 for 2-liter pasteurized milk, $1.10 for 500g fresh cheese and 1.05 for 500g butter. Other by-products like whey and buttermilk are not considered to generate revenue for the firm.

[30] See Appendix D for detailed streams of cash inflows for the two-phase (fourth scenario) cooperative.
[31] The prices were obtained from the industry expert interviews to processors and retailers in Cayambe.

Based on the processing and marketing volumes and the assumptions on growth of milk procurement, the total revenue will reach $8.41 million for the third year and will increase every year to reach $10.58 million in the twentieth year. The largest revenue for the third year represents the marketing of pasteurized milk (74.1%), followed by fresh cheese (9.9%), raw milk (8.4%) and butter (7.6%).The volume of raw milk marketed increases on the following years while the volume of marketed dairy products remains constant; therefore, the percentage of revenue from marketing raw milk increases to 27.1% for the 20$^{th}$ year while for dairy products the participation in revenue reduces to 59.0% for pasteurized milk, 7.9% for fresh cheese and 6.1% for butter.

#### 8.3.2.3. Operating Costs

Similarly as in the revenues, the operating costs for the first two years of the two-phase cooperative are given by the costs of the third scenario of the bargaining cooperative while starting on the third year the operating costs include also the processing of dairy products. For the purpose of presenting more consistent costs for the processing phase, the expense in electricity and telephone are presented separately rather than added to the supplies/utilities cost. In this way, for the third through twentieth year the expenses in supplies and other utilities (water) for centralized cooling tanks, milk testing laboratory, refrigerated milk trucks and office are included in the item "supplies/water". Table 57 lays out the annual operating expenses for the third and twentieth years.

**Table 57. Operating costs for the processing phase**

| Operating Cost | Year 3 | | Year 20 | |
|---|---|---|---|---|
| | USD | % | USD | % |
| Fuel | 17,030 | 1.6 | 23,299 | 2.2 |
| Dairy processing inputs | 700,025 | 67.5 | 700,025 | 66.1 |
| Labor | 210,480 | 20.3 | 221,040 | 20.9 |
| Maintenance | 27,685* | 2.7 | 32,447* | 3.1 |
| Electricity/telephone | 21,831 | 2.1 | 21,831 | 2.1 |
| Supplies/water | 42,129 | 4.1 | 42,129 | 4.0 |
| Management | 18,000 | 1.7 | 18,000 | 1.7 |
| Total | 1,037,180 | 100 | 1,058,771 | 100 |

*Includes $5,500 for spare parts for pasteurizing and bottling system every 6 months.

The operating costs for the third year and beyond comprise fuel for transportation of milk from dairy farms and centralized cooling tanks to the dairy plant as well as for transportation of field staff, dairy processing inputs, labor (truck drivers, secretary/assistants, field staff, centralized cooling tanks employees, laboratory employees, processing plant employees, and quality control manager), maintenance expenses (for trucks, vehicles and dairy plant), electricity/telephone, supplies/water and management. Table 57 shows the yearly expenses and reveals that about 65% of operating costs include dairy processing inputs. The second item with the largest participation in operating costs is labor with about 20%[32].

Dairy processing inputs represent the largest share in operating costs. Table 58 lays out the disaggregated inputs costs for dairy processing. The items included are: 2-liter containers, cheese enzyme and plastic package, butter packaging, cleaning and sanitation expenses, and "other" expenses. Since the dairy facility processes 64% of raw milk into pasteurized milk for the third year of operations and reduces to 50% for the twentieth year, the 2-liter containers participate with 64% of operating costs in the third

[32] See Appendix D for detailed streams of operating costs.

year and reduce slightly to 62.7.0% for the twentieth year. The cost of each 2-liter bottle was estimated in 8 cents[33].

**Table 58. Cost of dairy processing inputs**

| Processing inputs | USD/month | % |
|---|---|---|
| 2-liter milk container | 55,386 | 94.9 |
| Cheese enzyme/packing | 472 | 0.8 |
| Butter packing | 2,042 | 3.5 |
| Cleaning/sanitation | 86 | 0.1 |
| Other | 350 | 0.6 |
| Total | 58,335 | 100 |

The costs for cheese processing comprise the enzyme for coagulation and the packing for the cheese. For cheese coagulation is required 9ml of enzyme per each 100 liters of milk, and the price offered by a distributor[34] in Ecuador is $13.44 per liter for purchases of more than 40 liters of enzyme. The monthly processing volume of standardized milk is 224,770 liters thus the monthly cost of enzyme is $272 (0.009x13.44x224,770/100). The estimated monthly expense for cheese packing is $200, which includes the plastic and labels for vacuum packing. This leads to have a monthly cost for cheese inputs of $472.

The cost for butter packing, which consists of the customized paper to wrap the butter, will be four cents per piece of 500g. The cleaning and sanitation expenses are estimated in $86 per month and include the cost of hot water and one pound per day of chlorinated alkaline detergent to clean the equipment and utensils used for processing dairy products. The expenses of "other" are estimated in $350 per month and will include the hygiene utensils that are used by employees like brushes, brooms, gloves and hairnets in order to assure quality during the production process.

[33] Referenced price obtained from Gene Mueller, Plastipack.
[34] The firm that will supply the enzyme is Max Tomaselli Cia. Ltda.

Labor expenses include contracting truck drivers, office assistants, field staff, centralized cooling tanks employees, laboratory employees, processing plant employees and a quality control manager. The number of truck drivers, field staff, centralized cooling tank employees and laboratory employees follows the same figures as in the third scenario of bargaining phase. Office assistants will increase from five to eight when the processing phase starts. The number of employees for dairy processing will be seven and the distribution of tasks and responsibilities is presented in a Gantt chart (see Appendix E). These employees will earn a wage of $300 per month. Lastly, the processing facility will have a quality control manager in order to assure quality during the processing processes and supervise the tasks that each of the employees must accomplish.

Maintenance expenses comprise the repairs of milk trucks, vehicles and dairy equipment. The expense in truck and vehicle maintenance follows the same figures as in the third scenario. Parts will be required to be replaced in the dairy equipment and it is budgeted an expense of $5,500 every six months. This expense includes parts for the milk filler system and the HTST pasteurization system.

The expenses of electricity/telephone are estimated as follows. The usage of electricity is estimated in 18,000 KW per month starting the first year of the processing phase. The rate per KW is 7.88 cents for industrial firms according to the National Council of Electricity of Ecuador. On the other hand, the expense in telephone is estimated in $400 starting the first year of the processing phase. In this way, the monthly expense in electricity/telephone is about $1,800 dollars.

The expenses in supplies for centralized cooling tanks, milk testing laboratory and refrigerated milk trucks will follow the same trend as in the third scenario of the

bargaining phase. Only the expenses in office supplies will increase starting on the third year and are estimated to be 50% higher than the expenses in office supplies for the second scenario of the bargaining phase. Therefore, expenses in office supplies will reach $2,051 per month starting on the third year. Lastly, the manager will earn a salary of $1,500 and will be responsible for coordinating the actions of the cooperative in order to reach the market share and financial objectives that were presented in the strategic plan.

#### 8.3.2.4. Financial performance

Similarly as in the bargaining phase of the cooperative, in order to address the financial performance of the second phase of the cooperative, key financial indicators are calculated. The cost of capital (11.12%), the real cost of debt (7.3%) and income tax rate (15%) are the same as for the bargaining cooperative.

**Financial performance indicators**

Similarly as the bargaining cooperative, the three performance indicators are calculated for the processing phase. Table 59 lays out the cash flow for the 20 years of the processing phase of the cooperative. The net cash flow is negative from year zero through year two because investment is required for the bargaining cooperative in years 0 and one, and for installing the processing facility in year two. Additional investment is required during the 20 years life span, which includes the replacement of obsolete milk trucks, vehicles as well as computers and software for the administration office. The cash flow includes a salvage value in year 20 and comprises the land and the remaining value

Table 59. Cash Flow for Two-Phase Cooperative

| Year | Equity Proportion of Investment or Terminal Value | Cash Inflow | Raw Milk Procurement | Operating Costs | Debt Financing | | Net Cash Flow Before-Taxes |
|---|---|---|---|---|---|---|---|
| | | | | | Principal | Interest on Loan | |
| 0 | 44,281 | - | - | - | - | - | (44,281) |
| 1 | 204,550 | 3,990,720 | 3,425,600 | 154,395 | - | 30,732 | 175,443 |
| 2 | 240,049 | 6,658,241 | 5,706,066 | 239,625 | - | 57,271 | 415,231 |
| 3 | 2,000 | 8,416,974 | 6,350,586 | 1,037,180 | - | 132,839 | 894,370 |
| 4 | 26,208 | 8,535,671 | 6,460,397 | 1,043,910 | - | 132,839 | 872,317 |
| 5 | 3,200 | 8,655,458 | 6,568,727 | 1,043,910 | - | 132,839 | 906,782 |
| 6 | 13,400 | 8,776,334 | 6,678,162 | 1,043,910 | - | 132,839 | 908,023 |
| 7 | 36,600 | 8,898,300 | 6,788,706 | 1,043,910 | - | 132,839 | 896,245 |
| 8 | 3,200 | 9,021,355 | 6,900,360 | 1,043,910 | 20,396 | 132,839 | 920,650 |
| 9 | 25,808 | 9,145,500 | 7,013,127 | 1,048,864 | 41,759 | 131,345 | 884,597 |
| 10 | 2,400 | 9,270,735 | 7,127,009 | 1,048,864 | 109,063 | 128,286 | 855,114 |
| 11 | 254,283 | 9,397,059 | 7,242,008 | 1,048,864 | 117,052 | 120,297 | 614,556 |
| 12 | 85,817 | 9,524,473 | 7,358,127 | 1,048,864 | 125,626 | 111,723 | 794,317 |
| 13 | 2,400 | 9,652,977 | 7,475,368 | 1,048,864 | 134,828 | 102,521 | 888,996 |
| 14 | 50,817 | 9,782,570 | 7,593,733 | 1,053,817 | 144,704 | 92,645 | 846,854 |
| 15 | 2,000 | 9,913,253 | 7,713,224 | 1,053,817 | 155,304 | 82,045 | 906,862 |
| 16 | 13,800 | 10,045,025 | 7,833,845 | 1,053,817 | 166,680 | 70,669 | 906,214 |
| 17 | 37,400 | 10,177,887 | 7,952,395 | 1,053,817 | 178,889 | 58,460 | 896,927 |
| 18 | 2,000 | 10,311,839 | 8,075,232 | 1,053,817 | 191,992 | 45,356 | 943,440 |
| 19 | 50,017 | 10,446,880 | 8,199,206 | 1,058,771 | 206,056 | 31,293 | 901,539 |
| 20 | (131,772) | 10,583,011 | 8,320,973 | 1,058,771 | 221,149 | 16,199 | 1,097,690 |
| Total | 968,456 | 181,204,260 | 140,782,850 | 19,281,697 | 1,813,497 | 1,875,872 | 16,481,888 |

Table 59 (cont'd).

| Year | Taxes | | | Net Cash Flow After-Taxes | Present Value Factor | Discounted Cash Flows |
|---|---|---|---|---|---|---|
| | After-Tax Deprec. Credit | Tax Charges | Total | | | |
| 0 | - | - | - | (44,281) | 1.0000 | (44,281) |
| 1 | 7,066 | 56,999 | 49,933 | 125,510 | 0.8999 | 112,953 |
| 2 | 10,506 | 98,292 | 87,785 | 327,445 | 0.8099 | 265,200 |
| 3 | 18,801 | 134,455 | 115,655 | 778,715 | 0.7289 | 567,585 |
| 4 | 19,158 | 134,779 | 115,621 | 756,696 | 0.6559 | 496,354 |
| 5 | 19,158 | 136,497 | 117,340 | 789,443 | 0.5903 | 466,024 |
| 6 | 19,158 | 138,213 | 119,056 | 788,967 | 0.5313 | 419,145 |
| 7 | 19,158 | 139,927 | 120,769 | 775,476 | 0.4781 | 370,759 |
| 8 | 19,158 | 141,637 | 122,479 | 798,171 | 0.4303 | 343,429 |
| 9 | 19,515 | 142,825 | 123,310 | 761,287 | 0.3872 | 294,786 |
| 10 | 19,515 | 144,986 | 125,472 | 729,642 | 0.3485 | 254,264 |
| 11 | 19,515 | 147,884 | 128,369 | 486,187 | 0.3136 | 152,474 |
| 12 | 19,515 | 150,864 | 131,349 | 662,968 | 0.2822 | 187,113 |
| 13 | 19,515 | 153,934 | 134,419 | 754,578 | 0.2540 | 191,660 |
| 14 | 19,872 | 156,356 | 136,484 | 710,370 | 0.2286 | 162,379 |
| 15 | 19,872 | 159,625 | 139,753 | 767,109 | 0.2057 | 157,805 |
| 16 | 19,872 | 163,004 | 143,132 | 763,082 | 0.1851 | 141,271 |
| 17 | 19,872 | 166,982 | 147,110 | 749,816 | 0.1666 | 124,926 |
| 18 | 19,872 | 170,615 | 150,743 | 792,698 | 0.1499 | 118,857 |
| 19 | 20,229 | 173,642 | 153,413 | 748,126 | 0.1349 | 100,950 |
| 20 | 20,229 | 197,826 | 177,597 | 920,094 | 0.1214 | 111,733 |
| Total | 369,553 | 2,909,342 | 2,539,789 | 13,942,099 | - | 4,995,385 |

of milk trucks and computers; the infrastructure and dairy equipment is assumed to have a useful life of 20 years therefore the salvage value will be zero[35].

Table 60 lays out the performance indicators for the processing phase. The indicators show that dairy farmers should consider integrating forward in the supply chain by installing a processing facility. The NPV is significantly greater than zero and the IRR is greater than the average cost of capital (15.3%).

**Table 60. Performance indicators for two-phase cooperative**

| Performance Indicator | Value |
|---|---|
| Net Present Value | 4,995,385 |
| Internal Rate of Return | 411.3% |

Further, when comparing these results with the performance indicators of the three scenarios of the bargaining cooperative, the NPV for the two-phase cooperative is the largest among the four scenarios. Also, the IRR for the two-phase cooperative is the second largest and the payback period is the second smallest among the four scenarios. The two-phase cooperative will be the most desirable outcome for dairy farmers in Cayambe because the NPV is the largest among the four scenarios. This indicates that starting a bargaining cooperative for the first two years and then integrating forward by installing a dairy processing plant will generate collectively the largest benefits that will be distributed among members. Nevertheless, the effective benefits that dairy farmers will gain from each of the four alternatives are assessed further in this chapter.

[35] See Appendix D for detailed streams of cash inflows and outflows for the 20 years streams.

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### 8.3.3. Break-even analysis of financial performance

The break-even analysis of cooperative financial performance assists in estimating boundaries for key economic variables. For our purposes we estimate the value of coop sales price that makes net present value of the cooperative venture zero. This result provides the lower boundary of coop sales price. The analysis is conducted for each all four scenarios.

#### 8.3.3.1. Milk prices margin

The break-even analysis to obtain a NPV=0 is presented based on the margin of the prices of raw milk. The farm prices of raw milk are assumed to be constant as explained above across the four scenarios. A new coop sales price is estimated in order to obtain a NPV=0 for the three scenarios of the bargaining cooperative and a new price of pasteurized milk for the two-phase cooperative.

Table 61 shows the results of the break-even analysis given the prices of raw milk. The average farm price for the 20 year stream analysis was 24.72 cents. The largest break-even net margin of raw milk is for the third scenario with 1.36 cents, which represents 35% of the original net margin of raw milk (3.88 cents) per liter. The smallest breakeven net margin is for the first scenario of the bargaining phase with 0.30 cents, which represents 43% of the original net margin of raw milk (0.70 cents). The breakeven sales margin for the second scenario was 0.80 cents and represented 54% of the original net margin of raw milk (1.47 cents).

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**Table 61. Break-even values of milk buyer price for NPV=0**

| Variables | | Bargaining cooperative First Scenario | Bargaining cooperative Second Scenario | Bargaining cooperative Third Scenario | Two-phase cooperative |
|---|---|---|---|---|---|
| Original Values | Avg. farm price (USD cents/liter) | 24.72 | 24.72 | 24.72 | 24.72 |
| | Buyer price (USD cents/liter) | 25.42 | 26.19 | 28.60 | 37.55* |
| | Margin (cents/liter) | 0.70 | 1.47 | 3.88 | 12.83 |
| | NPV (USD) | 622,433 | 1,151,597 | 4,442,147 | 4,995,385 |
| | IRR | 152.3% | 102.8% | 445.8% | 411.3% |
| Breakeven Values for NPV=0 | Coop sale price (USD cents/liter) | 25.02 | 25.52 | 26.07 | 31.84* |
| | Margin (cents/liter) | 0.30 | 0.80 | 1.35 | 7.12 |
| | Reduction in margin (USD cents/liter) | 0.40 | 0.67 | 2.53 | 5.72 |
| | IRR ≈ $K_e$ | 10.8% | 11.3% | 11.2% | 11.1% |

* Processor price for 1-liter pasteurized milk

The results show that although the viability of the third scenario is constrained by having the largest net margin, the nominal reduction on the buyer price to obtain the break-even net margin is the second largest. The third scenario will still be viable with the second largest reduction (2.53 cents) of the buyer price. On the other hand, the first scenario depicts the smallest break-even net margin (0.30) and the coop sale price could be 0.40 cents lower for the first scenario and still break-even.

In addition, for the two-phase cooperative the original net margin between the processor price of 2-liter pasteurized milk and raw milk is 12.83 cents per liter of milk and the breakeven net margin reduces to 7.12 cents. This shows that the viability of the processing phase is constrained to setting a net margin of at least about 7.12 cents between the price of pasteurized milk at the processor level and the price of raw milk, assuming th

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assuming that the prices for fresh cheese, butter and excess raw milk remain constant. This provides a broad flexibility of about 5.72 cents per liter for setting the price of pasteurized milk at the processor level, while for the first scenario is 0.40 cents, the second scenario 0.67 cents and the third scenario 2.53 cents.

The latter analysis suggests the minimum margins for the four scenarios of the cooperative to be financially viable. The cooperative will be viable in each scenario as long as the difference between the price negotiated with milk buyers and the farm pricing formula is higher than the minimum margins, which cover the operating costs of the cooperative. The increasing minimum margins as the cooperative integrates forward in the supply chain reflect the fact of improving milk quality marketed to buyers (three scenarios of the bargaining cooperative) or assuring quality dairy products to distributors (fourth scenario).

Members will be receiving increased benefits by either receiving higher farm prices or patronage refunds that result from fulfilling higher price margins. For the first scenario, the cooperative will be viable only if as a result of milk bargaining the net margin is larger than 0.30 cents whereas for the second scenario the net margin should be larger than about 0.80 cents and for the third scenario larger than about 1.35 cents. The processing phase of the cooperative will be viable only if the dairy distributor must pay about 7.12 cents per liter higher than the farm price.

## 8.4. COOPERATIVE BENEFITS

This section presents an analysis of the benefits that the cooperative will provide to society and farmers. The societal issues refer to promote orderly marketing in the supply of m

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supply of milk and to maintain rural community income. The farmer issues refer to the distribution of benefits among members to assure large farms joining small farms thus minimizing free-rider problems.

### 8.4.1. Societal issues

The societal issues consist of the benefits that society will gain from having a more efficient outcome for marketing of raw milk in the region of Cayambe. As mentioned above, these gains are given by promoting orderly marketing and maintaining rural community income.

"Orderly marketing" refers to spread the marketing of a farm commodity over a sufficient period of time to avoid the local drops in prices often occurring when large quantities of a commodity were thrown on the market at harvest time (Manchester, 1983). Cooperative marketing offers possibilities for orderly marketing, which include the establishment of market standards and grades, reduction of inefficiency in distribution, searching for more adequate utilization of commodities, and aggressive marketing.

The start-up of a dairy bargaining cooperative in Cayambe may create the conditions for improved marketing orderliness. When processors contract with a bargaining cooperative instead of individual farmers, their market power is counterbalanced thus processors may be less able to drop farm prices. A balanced market relation between dairy farmers and processors will allow minimizing the variations in price (low volatility). This behavior in prices will give clearer signals to the actors of the dairy supply chain in order to plan their future actions, like providing improved inputs/services to dairy farmers and processors. For example, when farm prices are stable and a

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stable and allow the farmer to gain a reasonable profit, the farmer will have the incentives to search for improved services like pastures management and fertilization or accountancy and tax management, which will result in gaining efficiency in milk production in the medium run.

Regarding rural communities income, the start-up of a cooperative that includes as members small indigenous farmers will provide them with a higher and stable income which results in an incentive to maintain and/or increase the production of milk. Consequently, the migration of rural population to the urban centers will be discouraged thus counteract the increase of poverty in Ecuador.

### 8.4.2. Farmers benefits

The distribution of potential benefits from starting the cooperative is key to assure member commitment and minimize free-riders. Cooperative benefits are distributed to members by an effective pricing formula and patronage refunds. An effective pricing formula must 1) reflect incentives for large farmers joining small farms to market milk, 2) pay higher prices than the current situation, and 3) minimize free-riders. Patronage refunds consist of the distribution among members of net earnings received by the cooperative

The farm pricing formula will likely need to include volume and quality premiums as well as deductions to cover the operational expenses of the cooperative. The categories of large and small farms contribute each with 44% of milk procured by the cooperative and medium farms contribute with 12%. The small farms need the volume from th

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from the large farms to bargain for higher prices. The pricing formula that is discussed below addresses the specifics for small and large farms.

The volume premium may be the same across the four scenarios of the cooperative. Large farms are likely to be offered a higher price by the incumbent processors. Therefore, the pricing formula should include an additional premium for large farms to avoid the incentive to free-rider on coop bargaining rather than join the coop. In the four scenarios, only large farms reach the volume to receive the volume premium. For the second through fourth scenarios, which include the centralized cooling tanks for small farms, both small and large farms may receive a quality premium.

The implicit estimated discounts to cover the operational expenses of the cooperative may be differentiated according to the category of farms based on the fact that centralized cooling tanks benefit only small farms. The steering committee and management of the cooperative may define whether or not the operational expenses are differentiated among the categories of farms. Both large and small farms would be charged an implicit fee to cover operational expenses. It is possible that only small farms may be charged for the operational expenses of centralized cooling tanks for the second scenario and beyond. As a result, deductions for small farms may be higher than for large farms.

Patronage refunds are distributed to members according to the volume of milk marketed. Therefore, large farms would receive a higher total payment than small farms. The role of the manager is key to define the required retains in order to assure enough resources for debt payment and raise the funds established by Ecuadorian Law of Cooperatives.

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There should be a balance between the definition of the pricing formula and the resulting net earnings of the cooperative. An effective pricing formula must create incentives for commitment of farms but on the other hand there may be a higher likelihood for liquidity and solvency problems. This shortcoming may be avoided by hiring an experienced manager while developing an incentives plan for members that includes the issues discussed in this section.

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# CHAPTER IX

## SUMMARY AND CONCLUSIONS

This research assessed the viability of dairy farmers in Cayambe, Ecuador to engage in collective action and start a dairy cooperative. The core elements of the assessment were a strategic analysis and plan for the start-up cooperative and financial feasibility analysis of the proposed collective action outcomes. An interview of 28 dairy farmers was conducted and information collected from processors and retailers in Cayambe. The interview to farmers collected data about the marketing of milk, the production characteristics of the farm and about the willingness and conditions under which farmers would act collectively. Although the farmers interviewed were not sampled randomly, it was assumed that they were representative of the characteristics of farmers in each size category.

Cayambe is an important dairy area located in the north-central region of the highlands in Ecuador. This region has a higher milk yield per cow than the national average and the heterogeneity of dairy farmers, which include a large number of small farms organized in communities, makes this region a useful case study for assessing the viability of a dairy cooperative. Milk production represents 14% of milk production in the province of Pichincha, which is the province with the largest production nationwide (20% of national milk production or about 720,000 liters per day). This region includes a total of 3,891 farms according to the 2000 Census of Agriculture and includes 3,741 small farms (1-10 milking cows), 99 medium farms (11-30 milking cows) and 50 large farms (more than 30 milking cows). The average milk yield for these categories of farms in

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Cayambe is 4.9, 8.3 and 14.7 liters/cow/day, respectively, and reveals a higher level of productivity than the national average (4.4 liters/cow/day).

There are trends in the dairy market and economy of Ecuador that provided elements of analysis for the organization of the dairy cooperative. First, farm prices for 2001 have reached the same level (25 – 27 cents/liter) as prior to the bank crisis and macroeconomic instability that affected the economy during 1998-1999. The adoption of the US dollar as the domestic currency has led to a significant reduction on inflation and less uncertainty about price trends. Second, the GDP grew 5.1% in 2001, 3.3% in 2002 and an agreement signed with the IMF in early 2003 includes a goal of 3.5% growth rate for 2003 and 6% for 2004. Therefore, a sustained growth of the economy would imply an increased average income per capita that should result in a higher demand for dairy products since these products are normal goods for low-income urban population, which includes 75% of total urban population. Third, another consequence of the economic recovery is that the consumer is likely to substitute the consumption of raw milk with pasteurized milk, a market which may be partly filled by the start-up dairy processing cooperative. Finally, the supply of milk in Ecuador has relied less on imports since 1998 (3.8% in 1998 to 0.4% in 2000) whereas the participation of exports in total utilization has increased from 0.1% to 0.5%. This suggests promising results for milk powder processors to export large volume of milk thus higher demand for raw milk.

The 28 interviewed farmers included eight small-sized farms (1-10 cows), five medium-sized farms (11-30 cows) and 15 large-sized farms (31 + cows). Eight farms were interviewed that belong to the community of La Chimba, which is one of the six indigenous communities that exist in the highlands of Cayambe. Seven of the eight farms wer

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were small and one was medium-sized, while one small farm did not belong to La Chimba. Overall, small farms represent mainly indigenous farmers from La Chimba and medium and large farms non-La Chimba farmers.

Although larger farmers had a higher volume of milk production, 84 liters per day for small farms, 194 liters per day for medium farms, and 1,030 liters for large farms, small farms had an average higher productivity than medium farms since the milk yield per cow was 11.2 liters per day for small farms, 10.6 liters for medium farms and 14.22 for large farms.

Farmers in La Chimba owned an average of 7.5 ha of land and 11 animals, which include six cows, four younger animals and one bull. The average production per farm was 28 liters/day and the yield per cow 6.5 liters/day. About 55% of farms used controlled natural breeding and only 16% used artificial insemination. The market of raw milk in La Chimba can be characterized as oligopsonistic because the four-buyer concentration ratio is 63% and the largest buyer acquired 24% of milk volume marketed.

The most common breed of the interviewed farms was a crossbreed between a native breed and Holstein Friesian breed. Dairy farmers used land mainly for grazing (75% of land), feed crops were grown by 40% of farmers and included vicia, oats, alfalfa and maize. Also, about 50% of farmers cultivated cash crops and small farms dedicated the largest percentage of land (25%) to grow principally potatoes. Thus, small farms had a more diversified land use than medium and large farms. The average participation of milk sales on gross revenue was 90%. However, there were two farms (one medium and one large-sized) that cultivated flowers in green houses and the sales of this crop represented 92% of gross income.

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The milking and breeding technology were more developed among larger farms than small farms. Nonetheless, artificial insemination was more common among medium and small farms than the use of a milking machine. Also, it was common that medium and large farmers own a tractor and small farms rent a tractor. Regarding farm labor, family labor was concentrated in small farms while hired labor was more common in larger farms. The average family labor for small farms was four members, for medium farms 2.2 members, and for large farms 1.4 members.

The marketing volume of the farm was correlated with the type of milk buyer. Most small farms (75%) market their milk to middlemen whereas most medium farms (80%) and all large farms market raw milk to dairy processors. Small farms received an average price of 22.6 cents per liter, which does not differs significantly from the average price paid by middlemen to small farms (22.3 cents). Medium farms received and average price of 24.8 cents while the price paid by processors to medium farms was 25.7 cents. Large farms received an average price of 26.35 cents that was paid by processors.

There was an informal relationship between the dairy farmer and the milk buyer. The interview showed that 90% of farmers contracted verbally with the milk buyer. This is reflected in the fact that 93% of farmers received a flat price for raw milk, which meant that there were no premiums for volume and quality. However, processors revealed that the most common pricing policy was based on minimum quality standards of fat, water content and acidity, and no quality premiums. This suggests that the cooperative should define a clear pricing policy for raw milk.

Regression analysis was used to define the factors that explained farm milk price in Cayambe. These factors were used to define the cooperative pricing policy for raw milk

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milk. Milk price was regressed on milk production, hauling distance, and type of buyer (middlemen or processor). The intercept of the regression was 25 cents and reflects a price without premiums. The coefficients of the explanatory variables revealed the share of middlemen and volume premiums. Middlemen received a gross income of 2.9 cents per liter. The premium for volume of milk would be 1.3 cents per 1,000 liters.

The start-up of a dairy cooperative in Cayambe responds to these motivations for the need of a cooperative. First, a possible market failure might be off-set if farmers achieve bargaining power. In dairy processing, technology and scale economies dictate relatively small numbers on one side of the market. In this situation, a dairy bargaining cooperative may acquire market power for the benefit of its members.

The second motivation for the need of a cooperative may be lower transaction costs. The fact that the milk buyer negotiates with the cooperative the conditions of the transaction will result in lower costs than the milk buyer negotiating individually with each farmer.

Third, there is a need for a quality market of raw milk. Dairy farmers may start a cooperative and offer high quality milk to processors. Milk farm price would increase by improving raw milk quality. However, the emergence of a market for high quality milk is subject to the definition of raw milk quality standards, which must be defined by agreement between processors and dairy farmers and sponsored by the Government.

The results from the collective action section of the interview to farmers indicated that the most likely outcome was to sell milk as a group (2.32 points over 4), followed by installing a centralized cooling tank(s) (1.71 points over 4), and installing a processing facility (1.64 points over 4). Consequently, the start-up of the dairy cooperative was modeled i

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modeled in two phases, first a bargaining phase for a period of two years, and then the cooperative would reach a decision point on whether or not move on to a processing phase. The bargaining phase analyzed included three scenarios. First, forming a bargaining cooperative that marketed raw milk as a group. Second, starting a bargaining cooperative that installed centralized cooling tanks among small farms and market the milk to processors and middlemen. Third, the second scenario plus investing in cooling trucks to offer high quality milk to processors.

The potential members of the cooperative are the 3,891 dairy farmers in Cayambe, which produce a total of 103,751 liters per day. Nevertheless, the number of farms that are likely to join the cooperative is 3,062 due to the fact that 828 small farms use their production for self-consumption. In this way, the potential members of the cooperative are 2,913 small farms (95.1% of total farms), 99 medium farms (3.3% of farms), and 50 large farms (1.6% of farms). As a result, the volume of milk marketed by dairy farmers would reach 93,299 liters per day and the volume marketed for each size category is 35,177 liters (12 liters per farm) for small farms, 10,286 liters (104 liters per farm) for medium farms and 47,765 liters per day (955 liters per farm) for large farms.

The strategic analysis specified the key success factors for the two phases of the start-up cooperative in order to lay out the critical issues that are addressed by the strategic plan. The core key success factors for both phases of the cooperative were: to handle sufficient business volume, develop an effective pricing structure, have an effective leadership of the steering committee as well as an effective management information system, and posses the required assets and resources. For the bargaining phase, horizontal integration among farmers and effective negotiating skills were key success

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success factors for this particular phase, while for the second phase are downstream integration and effective operational efficiency skills.

The results of the financial feasibility analysis for the start-up cooperative showed that dairy farmers would likely be better off as they engaged in collective action and integrated forward in the supply chain. The highest net present value was for the outcome of starting a bargaining cooperative and after two years engaging into processing of dairy products (pasteurized milk, fresh cheese, and butter). However, Cayambe dairy farmers may establish a resource-based alliance to innovate the current facilities and equipment of incumbent processors and start the processing phase of the cooperative.

The viability of the second and third scenarios of the bargaining cooperative as well as the processing phase of the two-phase cooperative are subject to obtaining the required financing from PL-480 food aid program. The level of debt required reaches $430,000 for the second scenario, $800,000 for the third scenario and $1.8 million for the processing phase. Although the required capital would be available, the start-up of the cooperative would be in stages and the three scenarios of the bargaining phase reflect the steps that the cooperative should take.

The start-up of a dairy cooperative in Cayambe will promote orderly marketing (societal level) because market power would be counterbalanced and processors would not be able to bargain for a drop in prices. Farm price volatility may be lower since the cooperative may off-set excess raw milk by marketing to a milk powder processor owned by dairy farmers. The farmer benefits will be given only by investment returns through hither farm prices. Investment returns increase nominally as dairy farmers integrate horizontally and engage in more collective action operations (three scenarios of the bargaini

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bargaining phase), and also by integrating vertically (processing phase). When comparing the increase rate of investment returns with the increase rate in the capital invested across the scenarios, only for small farms on the second scenario the increase rate of investment returns is not higher than the increase rate of capital invested. In contrast, for the processing phase the increase rate of capital invested doubles the increase rate of investment returns for medium and large farms. Therefore, small farms in the second scenario and medium and large farms in the processing phase face a trade-off between market assurance and potential higher price and a lower return on investment.

Small dairy farms may start jointly a bargaining cooperative because the commitment of large farms to join the cooperative is not assured. The results from the interview show that large farms may join small farms to market milk as long as there is a premium for volume of milk. However, large farms may expect to receive a higher premium from individual processors, especially in the face of cooperative competition. Therefore, the viability of the dairy cooperative with only small farms as members is assessed. Although farmers would not receive a significant increase in the farm price as a result of installing centralized cooling tanks and marketing large volumes of milk, the cooperative would be able to negotiate higher prices with the processors as long as consistent and high quality milk is delivered to the cooling tanks. The cooperative will start with 200 members and 5 centralized cooling tanks of 1,920 liters capacity. As a result of scale economies, the marketing cost per liter will fall as new farmers join the cooperative and more centralized cooling tanks are installed.

# APPENDICES

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## APPENDIX A-1: INTERVIEW TO DAIRY FARMERS

### A. MARKETING QUESTIONS

A1 Through which type of organization do you currently sell your milk?

Proprietary processor.......................... 1 ( )
Middlemen.................................... 2 ( )
Another member of community............ 3 ( )
Other (specify:_____________________) 4 ( )

A2 How long have you been selling milk to the current buyer? _________ years

A3 What is the name of the processor that processes your milk? ___________________

A4 What type of contract/agreement do you have with the milk buyer? (check only one)

Written contract 1 ( )   Verbal agreement 2 ( )   None 3 ( )

A5 If the answer to the question above includes 1 or 2, how is the contract/agreement negotiated? How often is it negotiated?

_______________________________________________________________

_______________________________________________________________

_______________________________________________________________

_______________________________________________________________

_______________________________________________________________

A6 In a scale of 1 to 5, how well do you know the way that milk is priced by the processor or middleman? (1= don't know ........ 5= knows completely)

1 ( )   2 ( )   3 ( )   4 ( )   5 ( )

A7 Which factors determine the farm-level price for the milk? Indicate the floor price and explain the premium for each factor. (check all that apply)

Floor price: ___________

Characteristics of the milk:_________________________________________

Volume 1 ( ) ________________________________________________

Fat 2 ( ) ________________________________________________

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Reductase 3 ( ) ______________________________

Somatic cells 4 ( ) ______________________________

Other: _________ 5 ( ) ______________________________

Other: _________ 6 ( ) ______________________________

None _________ 7 ( )

A8 How satisfied are you with your current milk buyer? (check only one)

| | | | |
|---|---|---|---|
| Very satisfied | 1 ( ) | Unsatisfied | 3 ( ) |
| Satisfied | 2 ( ) | Very unsatisfied | 4 ( ) |

A9 Why did you choose to sell milk through your current milk buyer? (check all that apply)

| | | | |
|---|---|---|---|
| Pays the highest price | 1 ( ) | Lowest deductions | 5 ( ) |
| Only choice | 2 ( ) | Assured market | 6 ( ) |
| Other farms recommended | 3 ( ) | Assured payment | 7 ( ) |
| Fewer claims | 4 ( ) | Other (specify)___________ | 8 ( ) |

A10 What would you change in the relationship with the milk buyer?

______________________________

______________________________

______________________________

______________________________

______________________________

A11 Which are the top-three problems in your relation with the milk buyer?

The 1st most important problem is: ______________________________

The 2nd most important problem is: ______________________________

The 3rd most important problem is: ______________________________

A12 What was the price received per liter in the last week? $_________

A13 How long have you been paid this price? _____ weeks

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have

1. ____

2. ____

3. ____

A14 Who pays the milk hauling costs? (check only one)

Dairy farmer 1 ( )   Processor 2 ( )   Middlemen 3 ( )

A15 If the answer to the question above is 1, how much do you pay per liter? $______

A16 How far is milk hauled to be processed? __________ Km

A17 Do you know the price other **local farmers** received for the milk last week?

Yes ( )   No ( )

If Yes, the price that you received compared to other farmer's price is:
(check only one)

Lower 1 ( )   The same 2 ( )   Higher 3 ( )

A18 If the answer to the question above is 1 (Lower), which of the following options you consider that explain why you received a lower price? (check all that apply)

| | |
|---|---|
| Lower volume of milk | 1 ( ) |
| Lower fat content | 2 ( ) |
| Location of farm | 3 ( ) |
| Milking machine not available | 4 ( ) |
| The current buyer pays in general low prices | 5 ( ) |

A19 Do you know the price **farmers from other regions** received for the milk last week?

Yes ( )   No ( )

If Yes, the price that you received compared to other farmer's price is:
(check only one)

Lower 1 ( )   The same 2 ( )   Higher 3 ( )

A20 If the answer to the question above is 1 (Lower), which of the following options you believe explain why you received a lower price? (check all that apply)

| | |
|---|---|
| Lower volume of milk | 1 ( ) |
| Lower fat content | 2 ( ) |
| Location of farm | 3 ( ) |
| Milking machine not available | 4 ( ) |
| The current buyer pays in general low prices | 5 ( ) |

A21 Have you ever considered in switching to other milk buyer? Yes ( ) No ( )

A22 If the answer to the question above is Yes, which are the **top-three problems** that have hampered from switching to another organization.

1. ____________________________________________

2. ____________________________________________

3. ____________________________________________

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3. __

B5 Woul

## B. COLLECTIVE ACTION QUESTIONS

B1 Have you ever considered joining local farmers in order to:
(check all that apply and rank):

| | | Rank |
|---|---|---|
| Sell the milk as a group to the processor | 1 ( ) | ______ |
| Install a centralized cooling tank | 2 ( ) | ______ |
| Develop a processing facility | 3 ( ) | ______ |
| Purchase inputs collectively | 4 ( ) | ______ |
| None of the above | 5 ( ) | |

B2 If the response to the question above included 1, which are the top-three reasons why you would join local farmers to **sell milk as a group to the processor**?

1. ____________________________________________

2. ____________________________________________

3. ____________________________________________

B3 If the answer to question B1 included 2, which are the top-three reasons why you would join local farmers to **install a centralized cooling tank for milk**?

1. ____________________________________________

2. ____________________________________________

3. ____________________________________________

B4 If the answer to question B1 included 3, which are the top-three reasons why you would join local farmers to **develop a dairy processing facility**?

1. ____________________________________________

2. ____________________________________________

3. ____________________________________________

B5 Would you be inclined to invest resources in a processing facility?
Yes ( ) No ( )

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willing

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B10 If Y

B11 *Wha*
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B6 If the answer to the question above is Yes, what is the amount of capital you would be willing to invest?

| | |
|---|---|
| 0 - $ 100 ( ) | $ 1,001 - $ 2,000 ( ) |
| $ 101 - $ 300 ( ) | $ 2,001 - $ 5,000 ( ) |
| $ 301 - $ 500 ( ) | $ 5,001 - $10,000 ( ) |
| $ 501 - $ 1,000 ( ) | $10,001 - $20,000 ( ) |

B7 If the answer to question B1 included 4, which are the top-three reasons why you would join local farmers to **purchase inputs collectively**?

1. ______________________________

2. ______________________________

3. ______________________________

B8 If the answer to question B1 is 5, which are the top-three reasons why you have not ever considered joining local farmers?

1. ______________________________

2. ______________________________

3. ______________________________

**Questions B9, B10 and B11 for dairy farmers with a herd size of more than 50 cows (milking and dry) only.**

B9 If the answer to question D1 includes 1 and/or 2, would you want to join with a farmer whose herd size is less than 50 cows as long as you receive a premium for volume? Yes ( ) No ( )

B10 If Yes, what premium would you expect to receive per liter? $ _____

B11 What other advantages you believe are relevant for large dairy farmers in order to join small dairy farmers to market milk collectively?

______________________________

______________________________

______________________________

______________________________

**Questions B12 and B13 for dairy farmers with a herd size of less than 50 cows (milking and dry) only.**

B12 If the answer to question B1 includes 1 and/or 2, would you join large dairy farmers and agree to have a pricing formula in which the volume of milk is a component of the formula? Yes ( ) No ( )

B13 If the answer above is No, which are the top-three reasons why not?

1. ____________________

2. ____________________

3. ____________________

B14 Which are your needs for dairy farming? (check all that apply and rank)

| | | Rank |
|---|---|---|
| Pastures management and fertilization | ( ) | ______ |
| Herd management | ( ) | ______ |
| Quality of milk | ( ) | ______ |
| Accountancy and taxes | ( ) | ______ |
| Other (specify) | ( ) | ______ |
| Other (specify) | ( ) | ______ |

## C. PRODUCTION QUESTIONS

C1 What is the utilization of land?
Check the unit: Hectares ( ) or Square meters ( )

| | Area |
|---|---|
| Pastures for grazing of dairy herd | |
| Pastures for calves | |
| Pastures for grazing of other animals (fattening animals and other) | |
| Feed crops (specifiy: ____________________) | |
| Vegetables | |
| Other: ____________________ | |
| Other: ____________________ | |
| Total | |

C2 What is the average area of grazing lots for the milking herd? ___ Ha ( ) or m2 ( )

C3 How many lots for grazing of the milking herd has the farm? _________

C4 What is the average number of days that the herd stays in a lot? ________ days

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C5 What pasturing system do you use [continuous (one or two main pastures), rotational (four to six pastures), controlled (small strip grazing with new pasture area every 12 to 48 hours), combinations of all types]? Explain.

____________________________________________________________

____________________________________________________________

____________________________________________________________

C6 Do you use electric fence to control grazing? Yes ( ) No ( )

C7 Which are the most important agricultural products of the farm regarding their participation in gross revenue?

| | | % Gross revenue |
|---|---|---|
| Milk...................................................................... | | ______ |
| Vegetables (specify) | ____________________ | ______ |
| | ____________________ | ______ |
| | ____________________ | ______ |
| Other (specify) | ____________________ | ______ |
| | ____________________ | ______ |

C8 What was the average volume of agricultural production during the last year?

| | Quantity |
|---|---|
| Milk (liters per day) | ______ |
| Other relevant crop (specify)____________________ | ______ |
| Other relevant crop (specify)____________________ | ______ |

C9 What infrastructure do you have in the farm? (check all that apply)

| | | | |
|---|---|---|---|
| Barn for calves | ( ) | Workers housing | ( ) |
| Corrals for milking cows | ( ) | Manager's office | ( ) |
| Stanchion barn with __ stanchions | ( ) | Other (specify) __________ | ( ) |
| Barn or storage facility | ( ) | Other (specify) __________ | ( ) |

C10 Do you use animal traction? Yes ( ) No ( )

C11 Do you use any machinery? Yes ( ) No ( )

If Yes,

What machinery is owned? ______________________________________

C12 W

C13 W

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| Jo |

C14 Wh

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C15 Do

C16 If yo

**D. GEN**

D1 How

D2 How

What machinery is rented? ______________________________________

C12 What is the current composition (number) of the herd?

| | |
|---|---|
| Cows (milking) | |
| Cows (dry) | |
| Heifers | |
| Calves | |
| Steers | |
| Total | |

C13 What is the breed of the cattle? (number of animals or percentage)

| | | | |
|---|---|---|---|
| Holstein pure-bred | | Normando pure-bred | |
| Holstein registered crossbreed | | Normando crossbreed | |
| Holstein crossbreed | | Otro: ______________ | |
| Jersey pure-bred | | Otro: ______________ | |
| Jersey crossbreed | | Otro: ______________ | |

C14 What milking technique is used? By hand ( ) Milking machine ( )

If milking machine is used, how many stanchions does it has? _______

C15 Do you use artificial insemination (AI)? Yes ( ) No ( )

C16 If you don't use AI, what reason(s) do you use natural service? (check all that apply)

Availability of semen ( )
Cost of semen ( )
Lack handling facilities ( )
Not familiar with technique ( )

**D. GENERAL QUESTIONS**

D1 How many families operate the dairy unit (excluding hired labor)? ___________

D2 How long have you been in dairy? _____ Years

and in farming? _____ Years

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D6 How

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D8 How

D3 Members of the family that work in the farm (check all that apply)

| | | | |
|---|---|---|---|
| Owner | ( ) | Child 1 under 12 yrs. | ( ) |
| Spouse | ( ) | Child 2 under 12 yrs. | ( ) |
| Teenager 1 | ( ) | Other1 (specify): _______________ | ( ) |
| Teenager 2 | ( ) | Other2 (specify):: _______________ | ( ) |

D4 Family labor educational level

| | Owner | Spouse | Teen 1 | Teen 2 | Child1 | Child 2 | Other1 | Other2 |
|---|---|---|---|---|---|---|---|---|
| Primary (1-3 grade) | 1 ( ) | 1 ( ) | 1 ( ) | 1 ( ) | 1 ( ) | 1 ( ) | 1 ( ) | 1( ) |
| Primary (4-6 grade) | 2 ( ) | 2 ( ) | 2 ( ) | 2 ( ) | 2 ( ) | 2 ( ) | 2 ( ) | 2( ) |
| High Schl. (7-9 gr.) | 3 ( ) | 3 ( ) | 3 ( ) | 3 ( ) | | | 3 ( ) | 3( ) |
| High Schl. (10-12 gr.) | 4 ( ) | 4 ( ) | 4 ( ) | 4 ( ) | | | 4 ( ) | 4( ) |
| Technical training | 5 ( ) | 5 ( ) | 5 ( ) | 5 ( ) | | | 5 ( ) | 5( ) |

D5 Do you have hired labor working in the dairy unit? Yes ( ) No ( )

If Yes,

| | Number of Workers | Avg. months worked per worker | Avg. hours worked per week |
|---|---|---|---|
| Full time workers | _______ | ________ | ________ |
| Part time workers | _______ | ________ | ________ |
| Seasonal workers | _______ | ________ | ________ |

D6 How many families of hired labor live in the farm? _________

D7 Who is the manager of the farm? (check only one)

| | | |
|---|---|---|
| Owner ( ) | Hired manager ( ) | Associate-manager ( ) |
| Owner's son/daughter ( ) | Other owner's relative ( ) | Employee-manager ( ) |

D8 How many hours per week does the manager work? ________ hours/week

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## APPENDIX A-2: INTERVIEW TO PROCESSORS

1. In the last year what volume of milk has been processed per day?
   The average volume has been ___________ Liters/day
   The largest volume has been ___________ Liters/day
   The smallest volume has been ___________ Liters/day

2. What is the full capacity level of processing? ___________ Liters/day

3. Does the daily processing volume changes across the year? Yes ( ) No ( )

4. If the answer to the previous question is Yes,

   In which months is processed the largest volume of milk?

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Jan | ____ | Apr | ____ | Jul | ____ | Oct | ____ |
| Feb | ____ | May | ____ | Aug | ____ | Nov | ____ |
| Mar | ____ | Jun | ____ | Sep | ____ | Dec | ____ |

   In which months is processed the smallest volume of milk?

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Jan | ____ | Apr | ____ | Jul | ____ | Oct | ____ |
| Feb | ____ | May | ____ | Aug | ____ | Nov | ____ |
| Mar | ____ | Jun | ____ | Sep | ____ | Dec | ____ |

5. How many liters are collected from Cayambe region?

   Large farmers (more than 1,000 lt/day) ___________________ liters/day
   Middle size farmers (201 – 1000 lt/day) ___________________ liters/day
   Small farmers (up to 200 lt/day) ___________________ liters/day
   Total............................................... ___________________ liters/day

6. What was the average price paid to dairy farmers in the last week?

   Large farmers (more than 1,000 lt/day) ___________________ USD/liter
   Middle size farmers (201 – 1000 lt/day) ___________________ USD/liter
   Small farmers (up to 200 lt/day) ___________________ USD/liter
   Average price ___________________ USD/liter

7. Does the price of milk paid to dairy farmers varies according to the quality of milk?
   Yes ___ No ___

8. If the answer to the previous question is Yes, what is the method used to measure the quality of milk? Explain.

_______________________________________________________________

_______________________________________________________________

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9. If the answer to question 7 is No, what determines the price of milk paid to farmers? Explain.

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10. Is there a floor price for the milk? Yes ( ) No ( )

11. If the answer to the previous question is Yes,
What is the current floor price for milk? _______ USD/liter

What minimum standards the milk must fulfill in order to receive the floor price?

Fat: _____ Reductase _____________

Other __________________________________________________

________________________________________________________

12. Which are premiums for milk according to its quality? Explain

Fat content: ____________________________________________

________________________________________________________

Reductase: _____________________________________________

________________________________________________________

Volume: _______________________________________________

________________________________________________________

Somatic cells count: ______________________________________

________________________________________________________

Other (specify): __________________________________________

________________________________________________________

13.

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18. Doe

Why

Other (specify): ______________________________________________

______________________________________________

13. Would milk pricing be different for large volumes purchased from a group of dairy farmers? Yes ( ) No ( )

14. If the answer to the previous question is Yes,
    What is the minimum volume in order to receive a different price? _________ lt/day

    What price would be the price for this volume of milk? _________ USD/lt

15. What type of container is used to transport milk from farms to the plant?

| | % raw milk |
|---|---|
| Plastic tanks .......................... | ________ |
| Metalic tanks.......................... | ________ |
| Milk truck............................. | ________ |
| Other (specify) ____________...... | ________ |

16. What daily average volumes of dairy products process this facility?

| | Volume | | Volume |
|---|---|---|---|
| Pasteurized milk | _________ | Butter ......................... | ________ |
| UHT milk | _________ | Cream ......................... | ________ |
| Fresh cheese | _________ | Powdered milk.............. | ________ |
| Mature cheese | _________ | Other (specify): _________ | ________ |
| Yogurt | _________ | Other (specify): _________ | ________ |

17. What is the wholesale price for the output of the processing plant?

| | Wholesale Price | | Wholesale Price |
|---|---|---|---|
| Pasteurized milk | _________ | Butter ......................... | ________ |
| UHT milk | _________ | Cream ......................... | ________ |
| Fresh cheese | _________ | Powdered milk.............. | ________ |
| Mature cheese | _________ | Other (specify): _________ | ________ |
| Yogurt | _________ | Other (specify): _________ | ________ |

18. Does the board of directors have considered expanding the processing facility?
    Yes ( ) No ( )

    Why? ______________________________________________

______________________________________________

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<u>Brand</u>
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## APPENDIX A-3: INTERVIEW TO RETAILER

1. What dairy products do you buy in a regular basis from the wholesaler? (check all that apply and indicate how often and the volume)

| | | How often? | Volume |
|---|---|---|---|
| Pasteurized milk | ( ) | __________ | __________ |
| Whole UHT milk | ( ) | __________ | __________ |
| 2% UHT milk | ( ) | __________ | __________ |
| Nonfat UHT milk | ( ) | __________ | __________ |
| Flavored UHT milk | ( ) | __________ | __________ |
| Other UHT milk | ( ) | __________ | __________ |
| Fresh cheese | ( ) | __________ | __________ |
| Mature cheese | ( ) | __________ | __________ |
| Yogurt | ( ) | __________ | __________ |
| Butter | ( ) | __________ | __________ |
| Cream | ( ) | __________ | __________ |
| Powdered milk | ( ) | __________ | __________ |
| Other: ____________ | ( ) | __________ | __________ |

2. Which is the rank for pasteurized milk brands according to sales?

| Brand | Rank |
|---|---|
| Floralp | ______ |
| Gonzalez | ______ |
| Miraflores | ______ |
| Parmalat | ______ |
| Vita | ______ |
| Other (specify):_____________ | ______ |
| Other (specify):_____________ | ______ |

3. Which is the rank for UHT milk brands according to sales?

| Brand | Rank | Brand | Rank |
|---|---|---|---|
| Nestle, whole milk | ______ | Parmalat, whole milk | ______ |
| Nestle, 2% milk | ______ | Parmalat, 2% milk | ______ |
| Nestle, nonfat milk | ______ | Parmalat, nonfat milk | ______ |
| Nestle, chocolate milk | ______ | Parmalat, flavored milk | ______ |
| Vita, whole milk | ______ | Parmalat, fortified milk | ______ |
| Vita, 2% milk | ______ | Parmalat Light | ______ |
| Vita, chocolate milk | ______ | Parmalat Omega 3 | ______ |
| Vita, flavored milk | ______ | Other (specify):__________ | ______ |
| Nutrileche, whole milk | ______ | Other (specify):__________ | ______ |
| Nutrileche, 2% milk | ______ | Other (specify):__________ | ______ |

4. Which is the rank for **cheese** brands according to sales?

| Brand | Fresh or | Mature | Rank |
|---|---|---|---|
| | ( ) | ( ) | |
| | ( ) | ( ) | |
| | ( ) | ( ) | |
| | ( ) | ( ) | |
| | ( ) | ( ) | |
| | ( ) | ( ) | |

5. Which is the rank for **yogurt** brands according to sales?

| Brand | Specification | Rank |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

6. Which is the rank for **butter** brands according to sales?

| Brand | Rank |
|---|---|
| | |
| | |
| | |
| | |

7. Which is the rank for **cream** brands according to sales?

| Brand | Specification | Rank |
|---|---|---|
| | | |
| | | |

8. Which is the rank for **powdered milk** brands according to sales?

| Brand | Specification | Rank |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

9. Which is the rank for ____________________ brands according to sales?

| Brand | Specification | Rank |
|---|---|---|
| | | |
| | | |
| | | |

10. Which is the rank for ____________________ brands according to sales?

| Brand | Specification | Rank |
|---|---|---|
| | | |
| | | |

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Why?

11. Which is the range of the **wholesale price** for each of the following dairy products?

| | Min | Max |
|---|---|---|
| Pasteurized milk (1 liter) | ___________ | ___________ |
| UHT milk (1 liter) | ___________ | ___________ |
| Fresh cheese | ___________ | ___________ |
| Mature cheese | ___________ | ___________ |
| Yogurt | ___________ | ___________ |
| Butter | ___________ | ___________ |
| Cream | ___________ | ___________ |
| Powdered milk | ___________ | ___________ |
| Other (specify):__________ | ___________ | ___________ |
| Other (specify):__________ | ___________ | ___________ |

12. Which is the range of the **retail price** for each of the following dairy products?

| | Min | Max |
|---|---|---|
| Pasteurized milk (1 liter) | ___________ | ___________ |
| UHT milk (1 liter) | ___________ | ___________ |
| Fresh cheese | ___________ | ___________ |
| Mature cheese | ___________ | ___________ |
| Yogurt | ___________ | ___________ |
| Butter | ___________ | ___________ |
| Cream | ___________ | ___________ |
| Powdered milk | ___________ | ___________ |
| Other (specify):__________ | ___________ | ___________ |
| Other (specify):__________ | ___________ | ___________ |

13. Which is the dairy product with the highest volume of sales? ________________

14. Would you accept to have an additional brand of **pasteurized milk** for sale?

Yes ( ) No ( )

Why? ____________________________________________________________

____________________________________________________________

15. Would you accept to have an additional brand of **UHT milk** for sale?

Yes ( ) No ( )

Why? ____________________________________________________________

____________________________________________________________

16. Would you accept to have an additional brand of **fresh cheese** for sale?

Yes ( ) No ( )

Why? ____________________________________________________________

____________________________________________________________

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Why?

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Why?

17. Would you accept to have an additional brand of **mature cheese** for sale?

Yes ( ) No ( )

Why? ______________________________________________

______________________________________________

18. Would you accept to have an additional brand of **yogurt** for sale?

Yes ( ) No ( )

Why? ______________________________________________

______________________________________________

19. Would you accept to have an additional brand of **butter** for sale?

Yes ( ) No ( )

Why? ______________________________________________

______________________________________________

20. Would you accept to have an additional brand of **cream** for sale?

Yes ( ) No ( )

Why? ______________________________________________

______________________________________________

21. Would you accept to have an additional brand of **powdered milk** for sale?

Yes ( ) No ( )

Why? ______________________________________________

______________________________________________

22. Would you accept to have an additional brand of ________________ for sale?

Yes ( ) No ( )

Why? ______________________________________________

______________________________________________

23. Would you accept to have an additional brand of ________________ for sale?

Yes ( ) No ( )

Why? ______________________________________________

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## APPENDIX B

## REGRESSIONS TO FORECAST THE VOLUME OF MILK PRODUCED BY COOPERATIVE'S MEMBERS

The volume of milk produced mainly in medium and large farms increases over time and the two variables that affect the volume of milk are the number of milking cows and the milk yield per cow. The only data available to forecast the volume of milk produced by cooperative's members was obtained from the Agricultural Information System of the Ministry of Agriculture of Ecuador and consisted in the national number of milking cows and the average yield per cow for the years 1988 through 2000. Two regressions were run and the explanatory variable for both was the time trend.

### 1. MILKING COWS

The results from running the number of milking cows (C) as dependent variable and the time trend (T) as explanatory variable are the following:

$$\begin{array}{llcl} C = & -44{,}830{,}932.81 & + & 22{,}872.06724\,T \\ Se = & (1{,}175{,}678.7770) & & (589.6071) \\ p = & (0.0000) & & (0.0000) \\ & R^2 = 0.992 & & \end{array}$$

These results show that the time trend is a significant variable at a 10% confidence level and the high $R^2$ determines that 99.2% of the observed values are explained by the model.

The following table lays out the observed and forecasted values for the number of milking cows in Ecuador. The yearly increase rate (I.R.) is calculated in order to use this rate for the growth of milking cows in the dairy farmers' herds.

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| Year | Observed Milking cows | Year | Forecasted Milking Cows | | Year | Forecasted Milking Cows | |
|---|---|---|---|---|---|---|---|
| | Number | | Number | I.R. | | Number | I.R. |
| 1988 | 629,990 | 2001 | 936,074 | 4.0% | 2014 | 1,233,411 | 1.9% |
| 1989 | 658,232 | 2002 | 958,946 | 2.4% | 2015 | 1,256,283 | 1.9% |
| 1990 | 686,978 | 2003 | 981,818 | 2.4% | 2016 | 1,279,155 | 1.8% |
| 1991 | 711,722 | 2004 | 1,004,690 | 2.3% | 2017 | 1,302,027 | 1.8% |
| 1992 | 737,883 | 2005 | 1,027,562 | 2.3% | 2018 | 1,324,899 | 1.8% |
| 1993 | 756,795 | 2006 | 1,050,434 | 2.2% | 2019 | 1,347,771 | 1.7% |
| 1994 | 778,071 | 2007 | 1,073,306 | 2.2% | 2020 | 1,370,643 | 1.7% |
| 1995 | 787,370 | 2008 | 1,096,178 | 2.1% | 2021 | 1,393,515 | 1.7% |
| 1996 | 817,786 | 2009 | 1,119,050 | 2.1% | 2022 | 1,416,387 | 1.6% |
| 1997 | 856,871 | 2010 | 1,141,922 | 2.0% | 2023 | 1,439,259 | 1.6% |
| 1998 | 874,009 | 2011 | 1,164,794 | 2.0% | - | - | - |
| 1999 | 891,489 | 2012 | 1,187,666 | 2.0% | - | - | - |
| 2000 | 900,404 | 2013 | 1,210,539 | 1.9% | - | - | - |

## 2. MILK YIELD PER COW

The results from running the milk yield per cow as dependent variable and the time trend (T) as explanatory variable are the following:

$$
\begin{array}{llll}
C = & -71.0721 & + & 0.0387\,T \\
Se = & (36.5269) & & (0.0183) \\
p = & (0.0776) & & (0.0579) \\
 & R^2 = 0.225 & &
\end{array}
$$

These results show that the time trend is a significant variable at a 10% confidence level and the low $R^2$ determines that only 22.5% of the observed values are explained by the model. The $R^2$ is low because the trend of milk yield during 1988 – 2000 would resemble a concave curve when plotting against the time trend. Nevertheless, it is assumed that the milk yield per cow would increase as a result of improving the efficiency in the production of milk which would be an incentive of receiving higher prices for raw milk by marketing through the cooperative.

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The following table lays out the observed and forecasted values for the average milk yield per cow in Ecuador. The yearly increase rate (I.R.) is calculated in order to use this rate for the growth of milk yield in the dairy farmers' herds.

| Year | Observed Milk Yield per Cow | Year | Forecasted Milk Yield per Cow | | Year | Forecasted Milk Yield per Cow | |
|---|---|---|---|---|---|---|---|
| | Number | | Number | I.R. | | Number | I.R. |
| 1988 | 5.71 | 2001 | 6.51 | 4.85% | 2014 | 7.02 | 0.56% |
| 1989 | 6.14 | 2002 | 6.55 | 0.60% | 2015 | 7.05 | 0.55% |
| 1990 | 6.12 | 2003 | 6.59 | 0.59% | 2016 | 7.09 | 0.55% |
| 1991 | 6.07 | 2004 | 6.63 | 0.59% | 2017 | 7.13 | 0.55% |
| 1992 | 6.06 | 2005 | 6.67 | 0.59% | 2018 | 7.17 | 0.54% |
| 1993 | 6.21 | 2006 | 6.71 | 0.58% | 2019 | 7.21 | 0.54% |
| 1994 | 6.27 | 2007 | 6.74 | 0.58% | 2020 | 7.25 | 0.54% |
| 1995 | 6.77 | 2008 | 6.78 | 0.57% | 2021 | 7.29 | 0.53% |
| 1996 | 6.54 | 2009 | 6.82 | 0.57% | 2022 | 7.33 | 0.53% |
| 1997 | 6.60 | 2010 | 6.86 | 0.57% | 2023 | 7.36 | 0.53% |
| 1998 | 6.03 | 2011 | 6.90 | 0.57% | | | |
| 1999 | 6.40 | 2012 | 6.94 | 0.56% | | | |
| 2000 | 6.21 | 2013 | 6.98 | 0.56% | | | |

***Appendix C-1: Cash Flow for Bargaining Cooperative - First Scenario***

YEAR

0 1 2 9 10

## Appendix C-1: Cash Flow for Bargaining Cooperative - First Scenario

| | YEAR 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cash Inflow** | | | | | | | | | | | |
| Average weighted buyer price | | 0.253 | 0.252 | 0.253 | 0.253 | 0.253 | 0.253 | 0.254 | 0.254 | 0.254 | 0.254 |
| Raw milk volume | | 13,953,565 | 23,280,563 | 25,857,433 | 26,272,457 | 26,691,291 | 27,113,935 | 27,540,389 | 27,970,652 | 28,404,726 | 28,842,609 |
| Raw milk volume (average liters/day) | | 38,760 | 64,668 | 71,826 | 72,979 | 74,142 | 75,316 | 76,501 | 77,696 | 78,902 | 80,118 |
| Raw milk sale | - | 3,525,500 | 5,873,290 | 6,536,299 | 6,646,640 | 6,757,995 | 6,870,363 | 6,983,743 | 7,098,137 | 7,213,543 | 7,329,963 |
| **Cash Outflows** | | | | | | | | | | | |
| **Milk procurement** | | | | | | | | | | | |
| Raw milk farm price | | 0.2455 | 0.2451 | 0.2456 | 0.2459 | 0.2461 | 0.2463 | 0.2465 | 0.2467 | 0.2469 | 0.2471 |
| Milk procurement | - | 3,425,600 | 5,706,066 | 6,350,586 | 6,460,397 | 6,568,727 | 6,678,162 | 6,788,706 | 6,900,360 | 7,013,127 | 7,127,009 |
| **Operating costs** | | | | | | | | | | | |
| Fuel | | | | | | | | | | | |
| Price (USD/gal) | | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 |
| Km/day/vehicle | | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Vehicles | | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Total Gasoline | | 2,220 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 |
| Labor | | | | | | | | | | | |
| Secretary/Assistant | | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Wage | | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 |
| Total | | 7,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 |
| Field men/technical assistance | | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Wage | | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| Total | | 15,000 | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 |
| Total labor | - | 22,000 | 36,000 | 36,000 | 36,000 | 36,000 | 36,000 | 36,000 | 36,000 | 36,000 | 36,000 |
| Vehicle maintenance | | | | | | | | | | | |
| Vehicles | | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Monthly expenditure per truck | | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Total | | 1,500 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 |
| Office supplies-utilities | - | 10,182 | 18,034 | 19,314 | 19,314 | 19,314 | 19,314 | 19,314 | 19,314 | 19,314 | 19,314 |
| Management | - | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 |
| Total operating costs | - | 47,902 | 71,986 | 73,266 | 73,266 | 73,266 | 73,266 | 73,266 | 73,266 | 73,266 | 73,266 |

**Appendix C-1: Cash Flow for Bargaining Cooperative - First Scenario**

| | | | | YEAR |
|---|---|---|---|---|
| 11 | 12 | 13 | 14 | 15 |

## Appendix C-1: Cash Flow for Bargaining Cooperative - First Scenario

| | YEAR | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| **Cash Inflow** | | | | | | | | | | |
| **Average weighted buyer price** | 0.254 | 0.254 | 0.255 | 0.255 | 0.255 | 0.255 | 0.255 | 0.255 | 0.256 | 0.256 |
| **Raw milk volume** | 29,284,303 | 29,729,806 | 30,179,119 | 30,632,242 | 31,089,175 | 31,549,918 | 32,014,471 | 32,482,834 | 32,955,006 | 33,430,989 |
| **Raw milk volume (average liters/day)** | 81,345 | 82,583 | 83,831 | 85,090 | 86,359 | 87,639 | 88,929 | 90,230 | 91,542 | 92,864 |
| **Raw milk sale** | 7,447,395 | 7,565,840 | 7,685,298 | 7,805,769 | 7,927,253 | 8,049,750 | 8,173,260 | 8,297,783 | 8,423,319 | 8,549,868 |
| | | | | | | | | | | 228,895 |
| **Cash Outflows** | | | | | | | | | | |
| **Milk procurement** | | | | | | | | | | |
| Raw milk farm price | 0.2473 | 0.2475 | 0.2477 | 0.2479 | 0.2481 | 0.2483 | 0.2484 | 0.2486 | 0.2488 | 0.2489 |
| Milk procurement | 7,242,008 | 7,358,127 | 7,475,368 | 7,593,733 | 7,713,224 | 7,833,845 | 7,952,395 | 8,075,232 | 8,199,206 | 8,320,973 |
| **Operating costs** | | | | | | | | | | |
| Fuel | | | | | | | | | | |
| Price (USD/gal) | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 |
| Km/day/vehicle | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Vehicles | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Total Gasoline | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 |
| Labor | | | | | | | | | | |
| Secretary/Assistant | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Wage | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 |
| Total | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 |
| Field men/technical assistance | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Wage | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| Total | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 |
| Total labor | 36,000 | 36,000 | 36,000 | 36,000 | 36,000 | 36,000 | 36,000 | 36,000 | 36,000 | 36,000 |
| Vehicle maintenance | | | | | | | | | | |
| Vehicles | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Monthly expenditure per truck | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Total | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 |
| Office supplies-utilities | 19,314 | 19,314 | 19,314 | 19,314 | 19,314 | 19,314 | 19,314 | 19,314 | 19,314 | 19,314 |
| Management | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 |
| Total operating costs | 73,266 | 73,266 | 73,266 | 73,266 | 73,266 | 73,266 | 73,266 | 73,266 | 73,266 | 73,266 |

*Appendix C-1: Cash Flow for Bargaining Cooperative - First Scenario*

| | | | | | YEAR | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

## Appendix C-1: Cash Flow for Bargaining Cooperative - First Scenario

| | YEAR | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| **Debt financing** | | | | | | | | | | | |
| Interest | - | 3,853 | 3,578 | 3,284 | 2,967 | 2,628 | 2,263 | 1,872 | 1,453 | 1,002 | 519 |
| Principal | - | 3,749 | 4,024 | 4,318 | 4,635 | 4,974 | 5,339 | 5,730 | 6,149 | 6,600 | 7,083 |
| **Total Cash Outflows** | - | 3,481,104 | 5,785,654 | 6,431,454 | 6,541,265 | 6,649,595 | 6,759,030 | 6,869,574 | 6,981,228 | 7,093,995 | 7,207,877 |
| **Investment** | | | | | | | | | | | |
| Computers/software | 2,000 | 2,400 | 800 | - | - | - | - | - | - | - | - |
| Furniture | 2,400 | 1,200 | 200 | - | - | - | - | - | - | - | - |
| Vehicles | 12,000 | 36,000 | - | - | - | - | - | - | - | - | - |
| Infrastructure | 56,000 | - | - | - | - | - | - | - | - | - | - |
| Replacement of computers/software | - | - | - | 2,000 | 2,400 | 800 | 2,000 | 2,400 | 800 | 2,000 | 2,400 |
| Replacement of vehicles | - | - | - | - | - | - | 11,400 | 34,200 | - | - | - |
| Total investment | 72,400 | 39,600 | 1,000 | 2,000 | 2,400 | 800 | 13,400 | 36,600 | 800 | 2,000 | 2,400 |
| **Equity proportion of investment** | 19,800 | 39,600 | 1,000 | 2,000 | 2,400 | 800 | 13,400 | 36,600 | 800 | 2,000 | 2,400 |
| **Net Cash Flow Before-Taxes** | (19,800) | 4,796 | 86,636 | 102,845 | 102,975 | 107,600 | 97,932 | 77,569 | 116,109 | 117,548 | 119,686 |
| **Tax allowance** | | | | | | | | | | | |
| After-tax depreciation credit | - | 591 | 631 | 631 | 631 | 631 | 631 | 631 | 631 | 631 | 631 |
| **Tax charges** | - | 7,222 | 13,749 | 16,375 | 16,501 | 17,006 | 17,501 | 17,985 | 18,459 | 18,922 | 19,375 |
| **Total taxes** | - | 6,631 | 13,118 | 15,744 | 15,870 | 16,375 | 16,870 | 17,354 | 17,828 | 18,291 | 18,744 |
| **Net Cash Flow After-Taxes** | (19,800) | (1,835) | 73,518 | 87,101 | 87,105 | 91,225 | 81,063 | 60,216 | 98,281 | 99,257 | 100,941 |
| **Present Value Cash Flows** | (19,800) | (1,651) | 59,543 | 63,486 | 57,136 | 53,852 | 43,065 | 28,789 | 42,287 | 38,434 | 35,176 |
| **Net Present Value** | 622,433 | | | | | | | | | | |
| **Payback Period** | 1.29 | | | | | | | | | | |
| **IRR** | 152.3% | | | | | | | | | | |

*Appendix C-1: Cash Flow for Bargaining Cooperative - First Scenario*

## Appendix C-1: Cash Flow for Bargaining Cooperative - First Scenario

| | YEAR 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Debt financing** | | | | | | | | | | |
| Interest | - | - | - | - | - | - | - | - | - | - |
| Principal | - | - | - | - | - | - | - | - | - | - |
| **Total Cash Outflows** | 7,315,274 | 7,431,393 | 7,548,634 | 7,666,999 | 7,786,490 | 7,907,111 | 8,025,661 | 8,148,498 | 8,272,472 | 8,394,239 |
| **Investment** | | | | | | | | | | |
| Computers/software | - | - | - | - | - | - | - | - | - | - |
| Furniture | - | - | - | - | - | - | - | - | - | - |
| Vehicles | - | - | - | - | - | - | - | - | - | - |
| Infrastructure | - | - | - | - | - | - | - | - | - | - |
| Replacement of computers/software | 800 | 2,000 | 2,400 | 800 | 2,000 | 2,400 | 800 | 2,000 | 2,400 | (792) |
| Replacement of vehicles | 11,400 | 34,200 | - | - | - | 11,400 | 34,200 | - | - | (6,840) |
| Total investment | 12,200 | 36,200 | 2,400 | 800 | 2,000 | 13,800 | 35,000 | 2,000 | 2,400 | (7,632) |
| **Equity proportion of investment** | 12,200 | 36,200 | 2,400 | 800 | 2,000 | 13,800 | 35,000 | 2,000 | 2,400 | - |
| **Net Cash Flow Before-Taxes** | 119,921 | 98,247 | 134,264 | 137,971 | 138,763 | 128,840 | 112,600 | 147,285 | 148,447 | 163,261 |
| **Tax allowance** | | | | | | | | | | |
| After-tax depreciation credit | 631 | 631 | 631 | 631 | 631 | 631 | 631 | 631 | 631 | 631 |
| **Tax charges** | 19,818 | 20,167 | 20,500 | 20,816 | 21,114 | 21,396 | 22,140 | 22,393 | 22,627 | 24,489 |
| **Total taxes** | 19,187 | 19,536 | 19,869 | 20,185 | 20,483 | 20,765 | 21,509 | 21,762 | 21,996 | 23,858 |
| **Net Cash Flow After-Taxes** | 100,734 | 78,711 | 114,396 | 117,786 | 118,280 | 108,075 | 91,091 | 125,523 | 126,451 | 139,402 |
| **Present Value Cash Flows** | 31,591 | 22,215 | 29,056 | 26,924 | 24,332 | 20,008 | 15,177 | 18,821 | 17,063 | 16,929 |
| **Net Present Value** | | | | | | | | | | |
| **Payback Period** | | | | | | | | | | |
| **IRR** | | | | | | | | | | |

**Appendix C-2: Cash Flow for Bargaini**

## Appendix C-2: Cash Flow for Bargaining Cooperative - Second Scenario

| | YEAR | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| **Cash Inflow** | | | | | | | | | | | |
| Average weighted buyer price (USD) | | 0.2614 | 0.2612 | 0.2614 | 0.2615 | 0.2615 | 0.2616 | 0.2617 | 0.2617 | 0.2618 | 0.2619 |
| Raw milk volume (liters per year) | | 13,953,565 | 23,280,563 | 25,857,433 | 26,272,457 | 26,691,291 | 27,113,935 | 27,540,389 | 27,970,652 | 28,404,726 | 28,842,609 |
| Raw milk volume (average liters/day) | | 38,760 | 64,668 | 71,826 | 72,979 | 74,142 | 75,316 | 76,501 | 77,696 | 78,902 | 80,118 |
| Raw milk sale (USD) | - | 3,647,534 | 6,080,272 | 6,759,146 | 6,869,488 | 6,980,842 | 7,093,210 | 7,206,591 | 7,320,984 | 7,436,391 | 7,552,810 |
| | | 221,934 | | | | | | | | | |
| **Cash Outflows** | | | | | | | | | | | |
| **Milk procurement** | | | | | | | | | | | |
| Average weighted farm price (USD) | | 0.2455 | 0.2451 | 0.2456 | 0.2459 | 0.2461 | 0.2463 | 0.2465 | 0.2467 | 0.2469 | 0.2471 |
| Milk procurement (USD) | - | 3,425,600 | 5,706,066 | 6,350,586 | 6,460,397 | 6,568,727 | 6,678,162 | 6,788,706 | 6,900,360 | 7,013,127 | 7,127,009 |
| **Operating costs** | | | | | | | | | | | |
| Fuel | | | | | | | | | | | |
| Price (USD/gal) | | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 |
| Km/day/vehicle | | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Vehicles | | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Total Gasoline (USD) | | 2,220 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 |
| Labor | | | | | | | | | | | |
| Secretary/Assistant | | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Wage (USD/month) | | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 |
| Total (USD) | | 7,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 |
| Field men/technical assistance | | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Wage (USD/month) | | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| Total (USD) | | 15,000 | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 |
| Centralized cooling tanks employees | | 12 | 19 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Wage (USD/month) | | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 |
| Total (USD) | | 37,180 | 59,020 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 |
| Total labor (USD) | - | 59,180 | 95,020 | 98,400 | 98,400 | 98,400 | 98,400 | 98,400 | 98,400 | 98,400 | 98,400 |
| Vehicle maintenance | | | | | | | | | | | |
| Vehicles | | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Monthly expenditure per vehicle | | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Total (USD) | | 1,500 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 |

**Appendix C-2: Cash Flow for Bargaining Cooperative - Second Scenario**

## Appendix C-2: Cash Flow for Bargaining Cooperative - Second Scenario

| | YEAR | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| **Cash Inflow** | | | | | | | | | | |
| **Average weighted buyer price (USD)** | 0.2619 | 0.2620 | 0.2620 | 0.2621 | 0.2622 | 0.2622 | 0.2623 | 0.2623 | 0.2624 | 0.2624 |
| **Raw milk volume (liters per year)** | 29,284,303 | 29,729,806 | 30,179,119 | 30,632,242 | 31,089,175 | 31,549,918 | 32,014,471 | 32,482,834 | 32,955,006 | 33,430,989 |
| **Raw milk volume (average liters/day)** | 81,345 | 82,583 | 83,831 | 85,090 | 86,359 | 87,639 | 88,929 | 90,230 | 91,542 | 92,864 |
| **Raw milk sale (USD)** | 7,670,242 | 7,788,688 | 7,908,146 | 8,028,617 | 8,150,101 | 8,272,598 | 8,396,108 | 8,520,631 | 8,646,166 | 8,772,715 |
| | | | | | | | | | | 451,742 |
| **Cash Outflows** | | | | | | | | | | |
| **Milk procurement** | | | | | | | | | | |
| Average weighted farm price (USD) | 0.2473 | 0.2475 | 0.2477 | 0.2479 | 0.2481 | 0.2483 | 0.2484 | 0.2486 | 0.2488 | 0.2489 |
| Milk procurement (USD) | 7,242,008 | 7,358,127 | 7,475,368 | 7,593,733 | 7,713,224 | 7,833,845 | 7,952,395 | 8,075,232 | 8,199,206 | 8,320,973 |
| **Operating costs** | | | | | | | | | | |
| Fuel | | | | | | | | | | |
| Price (USD/gal) | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 |
| Km/day/vehicle | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Vehicles | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Total Gasoline (USD) | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 |
| Labor | | | | | | | | | | |
| Secretary/Assistant | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Wage (USD/month) | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 |
| Total (USD) | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 |
| Field men/technical assistance | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Wage (USD/month) | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| Total (USD) | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 |
| Centralized cooling tanks employees | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Wage (USD/month) | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 |
| Total (USD) | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 |
| Total labor (USD) | 98,400 | 98,400 | 98,400 | 98,400 | 98,400 | 98,400 | 98,400 | 98,400 | 98,400 | 98,400 |
| Vehicle maintenance | | | | | | | | | | |
| Vehicles | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Monthly expenditure per vehicle | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Total (USD) | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 |

***Appendix C-2: Cash Flow for Bargaining Cooperative - Second Scenario***

| | YEAR | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

## Appendix C-2: Cash Flow for Bargaining Cooperative - Second Scenario

| | YEAR | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Supplies-utlities | | | | | | | | | | | |
| Centralized cooling tanks (USD) | | 9,005 | 14,295 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 |
| Office (USD) | - | 10,182 | 18,034 | 19,314 | 19,314 | 19,314 | 19,314 | 19,314 | 19,314 | 19,314 | 19,314 |
| Total (USD) | | 19,187 | 32,329 | 34,428 | 34,428 | 34,428 | 34,428 | 34,428 | 34,428 | 34,428 | 34,428 |
| Management (USD) | - | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 |
| Total operating costs (USD) | - | 94,087 | 145,301 | 150,780 | 150,780 | 150,780 | 150,780 | 150,780 | 150,780 | 150,780 | 150,780 |
| **Debt financing** | | | | | | | | | | | |
| Interest | - | 13,900 | 29,865 | 31,897 | 31,897 | 31,897 | 31,897 | 31,897 | 31,897 | 31,222 | 29,621 |
| Principal | - | - | - | - | - | - | - | - | 9,225 | 21,853 | 25,182 |
| **Total Cash Outflows** | - | 3,533,587 | 5,881,232 | 6,533,263 | 6,643,074 | 6,751,404 | 6,860,839 | 6,971,383 | 7,092,262 | 7,216,982 | 7,332,592 |
| **Investment** | | | | | | | | | | | |
| Computers/software | 2,000 | 2,400 | 800 | - | - | - | - | - | - | - | - |
| Furniture | 2,400 | 1,200 | 200 | - | | | | | | | |
| Vehicles | 12,000 | 36,000 | - | - | - | - | - | - | - | - | - |
| Infrastructure | 56,000 | | | | | | | | | | |
| Centralized cooling tanks | 150,000 | 360,000 | 90,000 | - | | | | | | | |
| Replacement of computers/software | | | | 2,000 | 2,400 | 800 | 2,000 | 2,400 | 800 | 2,000 | 2,400 |
| Replacement of vehicles | | | | | | | 11,400 | 34,200 | | | |
| Total investment (USD) | 222,400 | 399,600 | 91,000 | 2,000 | 2,400 | 800 | 13,400 | 36,600 | 800 | 2,000 | 2,400 |
| **Equity proportion of investment** | 32,639 | 181,653 | 63,250 | 2,000 | 2,400 | 800 | 13,400 | 36,600 | 800 | 2,000 | 2,400 |
| **Net Cash Flow Before-Taxes** | (32,639) | (67,706) | 135,791 | 223,883 | 224,013 | 228,639 | 218,971 | 198,608 | 227,922 | 217,409 | 217,818 |
| **Tax allowance** | | | | | | | | | | | |
| After-tax depreciation credit | - | 3,171 | 4,826 | 5,051 | 5,051 | 5,051 | 5,051 | 5,051 | 5,051 | 5,051 | 5,051 |
| **Tax charges** | - | 17,092 | 29,856 | 33,883 | 33,962 | 34,416 | 34,856 | 35,281 | 35,692 | 36,189 | 36,810 |
| **Total taxes** | - | 13,921 | 25,030 | 28,832 | 28,911 | 29,365 | 29,805 | 30,230 | 30,641 | 31,138 | 31,759 |
| **Net Cash Flow After-Taxes** | (32,639) | (81,627) | 110,761 | 195,052 | 195,102 | 199,274 | 189,166 | 168,378 | 197,281 | 186,271 | 186,059 |
| **Present Value Cash Flows** | (32,639) | (73,460) | 89,706 | 142,168 | 127,977 | 117,635 | 100,496 | 80,502 | 84,884 | 72,128 | 64,838 |
| **Net Present Value** | 1,151,597 | | | | | | | | | | |
| **Payback Period** | 2.02 | | | | | | | | | | |
| **IRR** | 102.8% | | | | | | | | | | |

*Appendix C-2: Cash Flow for Bargaining Cooperative - Second Scenario*

YEAR

## Appendix C-2: Cash Flow for Bargaining Cooperative - Second Scenario

| | YEAR | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| Supplies-utlities | | | | | | | | | | |
| Centralized cooling tanks (USD) | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 |
| Office (USD) | 19,314 | 19,314 | 19,314 | 19,314 | 19,314 | 19,314 | 19,314 | 19,314 | 19,314 | 19,314 |
| Total (USD) | 34,428 | 34,428 | 34,428 | 34,428 | 34,428 | 34,428 | 34,428 | 34,428 | 34,428 | 34,428 |
| Management (USD) | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 |
| Total operating costs (USD) | 150,780 | 150,780 | 150,780 | 150,780 | 150,780 | 150,780 | 150,780 | 150,780 | 150,780 | 150,780 |
| **Debt financing** | | | | | | | | | | |
| Interest | 27,776 | 25,796 | 23,672 | 21,391 | 18,944 | 16,317 | 13,498 | 10,473 | 7,225 | 3,740 |
| Principal | 27,027 | 29,007 | 31,131 | 33,412 | 35,859 | 38,486 | 41,305 | 44,330 | 47,578 | 51,063 |
| **Total Cash Outflows** | 7,447,591 | 7,563,710 | 7,680,951 | 7,799,316 | 7,918,807 | 8,039,427 | 8,157,977 | 8,280,815 | 8,404,788 | 8,526,556 |
| **Investment** | | | | | | | | | | |
| Computers/software | - | - | - | - | - | - | - | - | - | - |
| Furniture | | | | | | | | | | |
| Vehicles | - | - | - | - | - | - | - | - | - | - |
| Infrastructure | | | | | | | | | | |
| Centralized cooling tanks | | | | | | | | | | |
| Replacement of computers/software | 800 | 2,000 | 2,400 | 800 | 2,000 | 2,400 | 800 | 2,000 | 2,400 | (792) |
| Replacement of vehicles | 11,400 | 34,200 | | | | 11,400 | 34,200 | | | (6,840) |
| Total investment (USD) | 12,200 | 36,200 | 2,400 | 800 | 2,000 | 13,800 | 35,000 | 2,000 | 2,400 | (7,632) |
| **Equity proportion of investment** | 12,200 | 36,200 | 2,400 | 800 | 2,000 | 13,800 | 35,000 | 2,000 | 2,400 | - |
| **Net Cash Flow Before-Taxes** | 210,451 | 188,778 | 224,795 | 228,501 | 229,294 | 219,370 | 203,130 | 237,815 | 238,978 | 253,791 |
| **Tax allowance** | | | | | | | | | | |
| After-tax depreciation credit | 5,051 | 5,051 | 5,051 | 5,051 | 5,051 | 5,051 | 5,051 | 5,051 | 5,051 | 5,051 |
| **Tax charges** | 37,452 | 38,098 | 38,749 | 39,407 | 40,073 | 40,748 | 41,915 | 42,622 | 43,343 | 45,728 |
| **Total taxes** | 32,401 | 33,047 | 33,698 | 34,356 | 35,022 | 35,697 | 36,864 | 37,571 | 38,292 | 40,677 |
| **Net Cash Flow After-Taxes** | 178,051 | 155,731 | 191,097 | 194,145 | 194,272 | 183,673 | 166,266 | 200,244 | 200,686 | 213,114 |
| **Present Value Cash Flows** | 55,839 | 43,953 | 48,538 | 44,378 | 39,964 | 34,004 | 27,701 | 30,025 | 27,080 | 25,880 |
| **Net Present Value** | | | | | | | | | | |
| **Payback Period** | | | | | | | | | | |
| **IRR** | | | | | | | | | | |

## Appendix C-3: Cash Flow for Bargaining Cooperative - Third Scenario

## Appendix C-3: Cash Flow for Bargaining Cooperative - Third Scenario

| | YEAR 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cash Inflow** | | | | | | | | | | | |
| Average weighted buyer price (USD) | | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 |
| Raw milk volume (liters per year) | | 13,953,565 | 23,280,563 | 25,857,433 | 26,272,457 | 26,691,291 | 27,113,935 | 27,540,389 | 27,970,652 | 28,404,726 | 28,842,609 |
| Raw milk volume (average liters/day) | | 38,760 | 64,668 | 71,826 | 72,979 | 74,142 | 75,316 | 76,501 | 77,696 | 78,902 | 80,118 |
| Raw milk sale (USD) | - | 3,990,720 | 6,658,241 | 7,395,226 | 7,513,923 | 7,633,709 | 7,754,585 | 7,876,551 | 7,999,607 | 8,123,752 | 8,248,986 |
| **Cash Outflows** | | | | | | | | | | | |
| **Milk procurement** | | | | | | | | | | | |
| Average weighted farm price (USD) | | 0.2455 | 0.2451 | 0.2456 | 0.2459 | 0.2461 | 0.2463 | 0.2465 | 0.2467 | 0.2469 | 0.2471 |
| Milk procurement expense (USD) | - | 3,425,600 | 5,706,066 | 6,350,586 | 6,460,397 | 6,568,727 | 6,678,162 | 6,788,706 | 6,900,360 | 7,013,127 | 7,127,009 |
| **Operating costs** | | | | | | | | | | | |
| Fuel | | | | | | | | | | | |
| Price (USD/gal) | | 1.040 | 1.040 | 1.040 | 1.040 | 1.040 | 1.040 | 1.040 | 1.040 | 1.040 | 1.040 |
| Km/day/truck | | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| Trucks | | 7 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Total Diesel (USD) | | 7,769 | 12,542 | 13,478 | 13,478 | 13,478 | 13,478 | 13,478 | 13,478 | 13,478 | 13,478 |
| Price (USD/gal) | | 1.480 | 1.480 | 1.480 | 1.480 | 1.480 | 1.480 | 1.480 | 1.480 | 1.480 | 1.480 |
| Km/day/vehicle | | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Vehicles | | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Total Gasoline (USD) | | 2,220 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 |
| Total fuel (USD) | | 9,989 | 16,094 | 17,030 | 17,030 | 17,030 | 17,030 | 17,030 | 17,030 | 17,030 | 17,030 |
| Labor | | | | | | | | | | | |
| Truck drivers | | 7 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Wage (USD/month) | | 220 | 220 | 220 | 220 | 220 | 220 | 220 | 220 | 220 | 220 |
| Total (USD) | | 18,260 | 29,480 | 31,680 | 31,680 | 31,680 | 31,680 | 31,680 | 31,680 | 31,680 | 31,680 |
| Secretary/Assistant | | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Wage (USD/month) | | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 |
| Total (USD) | | 7,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 |
| Field men/technical assistance | | 4 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Wage (USD/month) | | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| Total (USD) | | 26,500 | 46,500 | 48,000 | 48,000 | 48,000 | 48,000 | 48,000 | 48,000 | 48,000 | 48,000 |

**Appendix C-3: Cash Flow for Bargaining Cooperative - Third Scenario**

YEAR

## Appendix C-3: Cash Flow for Bargaining Cooperative - Third Scenario

| | YEAR | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| **Cash Inflow** | | | | | | | | | | |
| Average weighted buyer price (USD) | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 |
| Raw milk volume (liters per year) | 29,284,303 | 29,729,806 | 30,179,119 | 30,632,242 | 31,089,175 | 31,549,918 | 32,014,471 | 32,482,834 | 32,955,006 | 33,430,989 |
| Raw milk volume (average liters/day) | 81,345 | 82,583 | 83,831 | 85,090 | 86,359 | 87,639 | 88,929 | 90,230 | 91,542 | 92,864 |
| Raw milk sale (USD) | 8,375,311 | 8,502,725 | 8,631,228 | 8,760,821 | 8,891,504 | 9,023,277 | 9,156,139 | 9,290,090 | 9,425,132 | 9,561,263 |
| **Cash Outflows** | | | | | | | | | | |
| **Milk procurement** | | | | | | | | | | |
| Average weighted farm price (USD) | 0.2473 | 0.2475 | 0.2477 | 0.2479 | 0.2481 | 0.2483 | 0.2484 | 0.2486 | 0.2488 | 0.2489 |
| Milk procurement expense (USD) | 7,242,008 | 7,358,127 | 7,475,368 | 7,593,733 | 7,713,224 | 7,833,845 | 7,952,395 | 8,075,232 | 8,199,206 | 8,320,973 |
| **Operating costs** | | | | | | | | | | |
| Fuel | | | | | | | | | | |
| Price (USD/gal) | 1.040 | 1.040 | 1.040 | 1.040 | 1.040 | 1.040 | 1.040 | 1.040 | 1.040 | 1.040 |
| Km/day/truck | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| Trucks | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 13 | 13 |
| Total Diesel (USD) | 13,478 | 13,478 | 13,478 | 13,478 | 13,478 | 13,478 | 13,478 | 13,478 | 14,602 | 14,602 |
| Price (USD/gal) | 1.480 | 1.480 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 |
| Km/day/vehicle | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Vehicles | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Total Gasoline (USD) | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 | 3,552 |
| Total fuel (USD) | 17,030 | 17,030 | 17,030 | 17,030 | 17,030 | 17,030 | 17,030 | 17,030 | 18,154 | 18,154 |
| Labor | | | | | | | | | | |
| Truck drivers | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 13 | 13 |
| Wage (USD/month) | 220 | 220 | 220 | 220 | 220 | 220 | 220 | 220 | 220 | 220 |
| Total (USD) | 31,680 | 31,680 | 31,680 | 31,680 | 31,680 | 31,680 | 31,680 | 31,680 | 34,320 | 34,320 |
| Secretary/Assistant | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Wage (USD/month) | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 |
| Total (USD) | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 |
| Field men/technical assistance | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Wage (USD/month) | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| Total (USD) | 48,000 | 48,000 | 48,000 | 48,000 | 48,000 | 48,000 | 48,000 | 48,000 | 48,000 | 48,000 |

**Appendix C-3: Cash Flow for Bargaining Cooperative - Third Scenario**

## Appendix C-3: Cash Flow for Bargaining Cooperative - Third Scenario

| | YEAR | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Centralized cooling tanks employees | | 12 | 19 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Wage (USD/month) | | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 |
| Total (USD) | | 37,180 | 59,020 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 |
| Laboratory employee | | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Wage (USD/month) | | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| Total (USD) | | 9,600 | 9,600 | 9,600 | 9,600 | 9,600 | 9,600 | 9,600 | 9,600 | 9,600 | 9,600 |
| Total Labor (USD) | | 98,540 | 156,600 | 163,680 | 163,680 | 163,680 | 163,680 | 163,680 | 163,680 | 163,680 | 163,680 |
| Truck and vehicle maintenance | | | | | | | | | | | |
| Trucks | | 7 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Monthly expenditure per truck | | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 |
| Total (USD) | | 8,234 | 13,293 | 14,285 | 14,285 | 14,285 | 14,285 | 14,285 | 14,285 | 14,285 | 14,285 |
| Vehicles | | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Monthly expenditure per vehicle | | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Total (USD) | | 1,500 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 |
| Total maintenance (USD) | | 9,734 | 15,693 | 16,685 | 16,685 | 16,685 | 16,685 | 16,685 | 16,685 | 16,685 | 16,685 |
| Supplies-utilities | | | | | | | | | | | |
| Centralized cooling tanks (USD) | | 9,005 | 14,295 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 |
| Milk testing laboratory (USD) | | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 |
| Office (USD) | | 12,727 | 22,543 | 24,143 | 24,143 | 24,143 | 24,143 | 24,143 | 24,143 | 24,143 | 24,143 |
| Total (USD) | | 24,132 | 39,238 | 41,656 | 41,656 | 41,656 | 41,656 | 41,656 | 41,656 | 41,656 | 41,656 |
| Management (USD) | | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 |
| Total operating costs (USD) | - | 154,395 | 239,625 | 251,052 | 251,052 | 251,052 | 251,052 | 251,052 | 251,052 | 251,052 | 251,052 |
| **Debt financing** | | | | | | | | | | | |
| Interest | - | 30,732 | 57,271 | 61,937 | 61,937 | 61,937 | 61,937 | 61,937 | 61,937 | 60,443 | 57,384 |
| Principal | - | - | - | - | - | - | - | - | 20,396 | 41,759 | 48,786 |
| **Total Cash Outflows** | - | 3,610,727 | 6,002,962 | 6,663,574 | 6,773,386 | 6,881,715 | 6,991,151 | 7,101,695 | 7,233,745 | 7,366,381 | 7,484,230 |
| **Investment** | | | | | | | | | | | |
| Milk trucks | 71,425 | 166,658 | 47,617 | - | - | - | - | - | - | - | - |
| Vehicles | 12,000 | 36,000 | - | - | | | | | | | |
| Milk testing equipment for lab. | 100,000 | | | | | | | | | | |

***Appendix C-3: Cash Flow for Bargaining Cooperative - Third Scenario***

YEAR

## Appendix C-3: Cash Flow for Bargaining Cooperative - Third Scenario

| | YEAR | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| Centralized cooling tanks employees | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Wage (USD/month) | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 |
| Total (USD) | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 |
| Laboratory employee | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Wage (USD/month) | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| Total (USD) | 9,600 | 9,600 | 9,600 | 9,600 | 9,600 | 9,600 | 9,600 | 9,600 | 9,600 | 9,600 |
| Total Labor (USD) | 163,680 | 163,680 | 163,680 | 163,680 | 163,680 | 163,680 | 163,680 | 163,680 | 166,320 | 166,320 |
| Truck and vehicle maintenance | | | | | | | | | | |
| Trucks | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 13 | 13 |
| Monthly expenditure per truck | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 |
| Total (USD) | 14,285 | 14,285 | 14,285 | 14,285 | 14,285 | 14,285 | 14,285 | 14,285 | 15,475 | 15,475 |
| Vehicles | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Monthly expenditure per vehicle | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Total (USD) | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 |
| Total maintenance (USD) | 16,685 | 16,685 | 16,685 | 16,685 | 16,685 | 16,685 | 16,685 | 16,685 | 17,875 | 17,875 |
| Supplies-utilities | | | | | | | | | | |
| Centralized cooling tanks (USD) | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 |
| Milk testing laboratory (USD) | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 |
| Office (USD) | 24,143 | 24,143 | 24,143 | 24,143 | 24,143 | 24,143 | 24,143 | 24,143 | 24,143 | 24,143 |
| Total (USD) | 41,656 | 41,656 | 41,656 | 41,656 | 41,656 | 41,656 | 41,656 | 41,656 | 41,656 | 41,656 |
| Management (USD) | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 |
| Total operating costs (USD) | 251,052 | 251,052 | 251,052 | 251,052 | 251,052 | 251,052 | 251,052 | 251,052 | 256,005 | 256,005 |
| **Debt financing** | | | | | | | | | | |
| Interest | 53,811 | 49,975 | 45,859 | 41,441 | 36,700 | 31,611 | 26,150 | 20,289 | 13,998 | 7,246 |
| Principal | 52,359 | 56,194 | 60,311 | 64,728 | 69,470 | 74,558 | 80,020 | 85,881 | 92,172 | 98,924 |
| **Total Cash Outflows** | 7,599,229 | 7,715,348 | 7,832,589 | 7,950,954 | 8,070,446 | 8,191,066 | 8,309,616 | 8,432,454 | 8,561,381 | 8,683,148 |
| **Investment** | | | | | | | | | | |
| Milk trucks | - | - | - | - | - | - | - | - | 23,808 | (19,047) |
| Vehicles | | | | | | | | | | |
| Milk testing equipment for lab. | | | | | | | | | | |

***Appendix C-3: Cash Flow for Bargaining Cooperative - Third Scenario***

YEAR

0 1 2

## Appendix C-3: Cash Flow for Bargaining Cooperative - Third Scenario

| | YEAR | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Computers/software | 2,000 | 2,400 | 800 | - | - | - | - | - | - | - | - |
| Furniture | 2,400 | 1,800 | 400 | - | | | | | | | |
| Office infrastructure | 56,000 | | | | | | | | | | |
| Laboratory infrastructure | 70,000 | | | | | | | | | | |
| Centralized cooling tanks | 150,000 | 360,000 | 90,000 | - | | | | | | | |
| Replacement of milk trucks | | | | | | | | | | | |
| Replacement of computers/software/furniture | | | | 2,000 | 2,400 | 800 | 2,000 | 2,400 | 800 | 2,000 | 2,400 |
| Replacement of vehicles | | | | | | | 11,400 | 34,200 | - | - | - |
| Total investment (USD) | 463,825 | 566,858 | 138,817 | 2,000 | 2,400 | 800 | 13,400 | 36,600 | 800 | 2,000 | 2,400 |
| **Equity proportion of investment** | 44,281 | 204,550 | 75,110 | 2,000 | 2,400 | 800 | 13,400 | 36,600 | 800 | 2,000 | 2,400 |
| **Net Cash Flow Before-Taxes** | (44,281) | 175,443 | 580,169 | 729,652 | 738,137 | 751,194 | 750,035 | 738,257 | 765,062 | 755,371 | 762,356 |
| **Tax allowance** | | | | | | | | | | | |
| After-tax depreciation credit | | 7,066 | 10,506 | 10,731 | 10,731 | 10,731 | 10,731 | 10,731 | 10,731 | 10,731 | 10,731 |
| **Tax charges** | - | 56,999 | 98,292 | 109,748 | 111,081 | 112,799 | 114,515 | 116,228 | 117,939 | 119,870 | 122,031 |
| **Total taxes** | - | 49,933 | 87,785 | 99,016 | 100,349 | 102,068 | 103,784 | 105,497 | 107,207 | 109,138 | 111,300 |
| **Net Cash Flow After-Taxes** | (44,281) | 125,510 | 492,384 | 630,635 | 637,788 | 649,126 | 646,251 | 632,760 | 657,855 | 646,233 | 651,056 |
| **Present Value Cash Flows** | (44,281) | 112,953 | 398,785 | 459,654 | 418,356 | 383,192 | 343,326 | 302,525 | 283,055 | 250,234 | 226,879 |
| **Net Present Value** | 4,442,157 | | | | | | | | | | |
| **Payback Period** | 0.35 | | | | | | | | | | |
| **IRR** | 445.8% | | | | | | | | | | |

***Appendix C-3: Cash Flow for Bargaining Cooperative - Third Scenario***

## Appendix C-3: Cash Flow for Bargaining Cooperative - Third Scenario

| | YEAR | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| Computers/software | - | - | - | - | - | - | - | - | - | - |
| Furniture | | | | | | | | | | |
| Office infrastructure | | | | | | | | | | |
| Laboratory infrastructure | | | | | | | | | | |
| Centralized cooling tanks | | | | | | | | | | |
| Replacement of milk trucks | 238,083 | 47,617 | - | - | - | - | - | - | - | (4,762) |
| Replacement of computers/software/furn | 800 | 2,000 | 2,400 | 800 | 2,000 | 2,400 | 800 | 2,000 | 2,400 | (792) |
| Replacement of vehicles | 11,400 | 34,200 | - | - | - | 11,400 | 34,200 | - | - | (6,840) |
| Total investment (USD) | 250,283 | 83,817 | 2,400 | 800 | 2,000 | 13,800 | 35,000 | 2,000 | 26,208 | (31,440) |
| **Equity proportion of investment** | 250,283 | 83,817 | 2,400 | 800 | 2,000 | 13,800 | 35,000 | 2,000 | 26,208 | - |
| **Net Cash Flow Before-Taxes** | 525,798 | 703,560 | 796,239 | 809,067 | 819,058 | 818,411 | 811,523 | 855,637 | 837,543 | 909,555 |
| **Tax allowance** | | | | | | | | | | |
| After-tax depreciation credit | 10,731 | 10,731 | 10,731 | 10,731 | 10,731 | 10,731 | 10,731 | 10,731 | 11,089 | 11,089 |
| **Tax charges** | 124,266 | 126,536 | 128,842 | 131,189 | 133,579 | 136,015 | 138,981 | 141,528 | 143,388 | 151,272 |
| **Total taxes** | 113,535 | 115,804 | 118,111 | 120,458 | 122,848 | 125,284 | 128,250 | 130,796 | 132,300 | 140,183 |
| **Net Cash Flow After-Taxes** | 412,264 | 587,755 | 678,128 | 688,609 | 696,211 | 693,127 | 683,273 | 724,840 | 705,243 | 769,372 |
| **Present Value Cash Flows** | 129,291 | 165,885 | 172,242 | 157,405 | 143,220 | 128,320 | 113,839 | 108,682 | 95,164 | 93,430 |
| **Net Present Value** | | | | | | | | | | |
| **Payback Period** | | | | | | | | | | |
| **IRR** | | | | | | | | | | |

Appendix C-4: Cash Flow for Processing Two-Phase Cooperative

YEAR

## Appendix C-4: Cash Flow for Processing Two-Phase Cooperative

| | YEAR 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cash Inflow** | | | | | | | | | | | |
| **Raw milk** | | | | | | | | | | | |
| Average buyer price (USD) | | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 |
| Volume (liters per year) | | 13,953,565 | 23,280,563 | 2,457,433 | 2,872,457 | 3,291,291 | 3,713,935 | 4,140,389 | 4,570,652 | 5,004,726 | 5,442,609 |
| Total sale (USD) | | 3,990,720 | 6,658,241 | 702,826 | 821,523 | 941,309 | 1,062,185 | 1,184,151 | 1,307,207 | 1,431,352 | 1,556,586 |
| Pasteurized milk | | | | | | | | | | | |
| Price (USD) | | 0.751 | 0.751 | 0.751 | 0.751 | 0.751 | 0.751 | 0.751 | 0.751 | 0.751 | 0.751 |
| Volume (liters per year) | | | | 8,307,900 | 8,307,900 | 8,307,900 | 8,307,900 | 8,307,900 | 8,307,900 | 8,307,900 | 8,307,900 |
| Total sale (USD) | | - | - | 6,239,233 | 6,239,233 | 6,239,233 | 6,239,233 | 6,239,233 | 6,239,233 | 6,239,233 | 6,239,233 |
| Fresh cheese | | | | | | | | | | | |
| Price (USD) | | 1.100 | 1.100 | 1.100 | 1.100 | 1.100 | 1.100 | 1.100 | 1.100 | 1.100 | 1.100 |
| Volume (500 g units per year) | | | | 756,207 | 756,207 | 756,207 | 756,207 | 756,207 | 756,207 | 756,207 | 756,207 |
| Total sale (USD) | | - | - | 831,828 | 831,828 | 831,828 | 831,828 | 831,828 | 831,828 | 831,828 | 831,828 |
| Butter price | | | | | | | | | | | |
| Price (USD) | | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 |
| Volume (500 g units per year) | | | | 612,464 | 612,464 | 612,464 | 612,464 | 612,464 | 612,464 | 612,464 | 612,464 |
| Total sale (USD) | | - | - | 643,087 | 643,087 | 643,087 | 643,087 | 643,087 | 643,087 | 643,087 | 643,087 |
| **Total Cash Inflow** | | 3,990,720 | 6,658,241 | 8,416,974 | 8,535,671 | 8,655,458 | 8,776,334 | 8,898,300 | 9,021,355 | 9,145,500 | 9,270,735 |
| **Cash Outflows** | | | | | | | | | | | |
| **Milk procurement** | | | | | | | | | | | |
| Average weighted farm price (USD) | | 0.2455 | 0.2451 | 0.2456 | 0.2459 | 0.2461 | 0.2463 | 0.2465 | 0.2467 | 0.2469 | 0.2471 |
| Milk procurement expense (USD) | | 3,425,600 | 5,706,066 | 6,350,586 | 6,460,397 | 6,568,727 | 6,678,162 | 6,788,706 | 6,900,360 | 7,013,127 | 7,127,009 |
| **Operating costs** | | | | | | | | | | | |
| Fuel | | | | | | | | | | | |
| Price (USD/gal) | | 1.040 | 1.040 | 1.040 | 1.040 | 1.040 | 1.040 | 1.040 | 1.040 | 1.040 | 1.040 |
| Km/day/truck | | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| Trucks | | 7 | 12 | 12 | 13 | 13 | 13 | 13 | 13 | 14 | 14 |
| Total Diesel (USD) | | 7,769 | 12,542 | 13,478 | 14,602 | 14,602 | 14,602 | 14,602 | 14,602 | 15,725 | 15,725 |

**Appendix C-4: Cash Flow for Processing Two-Phase Cooperative**

YEAR

## Appendix C-4: Cash Flow for Processing Two-Phase Cooperative

| | YEAR | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| **Cash Inflow** | | | | | | | | | | |
| Raw milk | | | | | | | | | | |
| Average buyer price (USD) | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 |
| Volume (liters per year) | 5,884,303 | 6,329,806 | 6,779,119 | 7,232,242 | 7,689,175 | 8,149,918 | 8,614,471 | 9,082,834 | 9,555,006 | 10,030,989 |
| Total sale (USD) | 1,682,911 | 1,810,325 | 1,938,828 | 2,068,421 | 2,199,104 | 2,330,877 | 2,463,739 | 2,597,690 | 2,732,732 | 2,868,863 |
| Pasteurized milk | | | | | | | | | | |
| Price (USD) | 0.751 | 0.751 | 0.751 | 0.751 | 0.751 | 0.751 | 0.751 | 0.751 | 0.751 | 0.751 |
| Volume (liters per year) | 8,307,900 | 8,307,900 | 8,307,900 | 8,307,900 | 8,307,900 | 8,307,900 | 8,307,900 | 8,307,900 | 8,307,900 | 8,307,900 |
| Total sale (USD) | 6,239,233 | 6,239,233 | 6,239,233 | 6,239,233 | 6,239,233 | 6,239,233 | 6,239,233 | 6,239,233 | 6,239,233 | 6,239,233 |
| | | | | | | | | | | 59.0% |
| Fresh cheese | | | | | | | | | | |
| Price (USD) | 1.100 | 1.100 | 1.100 | 1.100 | 1.100 | 1.100 | 1.100 | 1.100 | 1.100 | 1.100 |
| Volume (500 g units per year) | 756,207 | 756,207 | 756,207 | 756,207 | 756,207 | 756,207 | 756,207 | 756,207 | 756,207 | 756,207 |
| Total sale (USD) | 831,828 | 831,828 | 831,828 | 831,828 | 831,828 | 831,828 | 831,828 | 831,828 | 831,828 | 831,828 |
| | | | | | | | | | | 7.9% |
| Butter price | | | | | | | | | | |
| Price (USD) | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 |
| Volume (500 g units per year) | 612,464 | 612,464 | 612,464 | 612,464 | 612,464 | 612,464 | 612,464 | 612,464 | 612,464 | 612,464 |
| Total sale (USD) | 643,087 | 643,087 | 643,087 | 643,087 | 643,087 | 643,087 | 643,087 | 643,087 | 643,087 | 643,087 |
| | | | | | | | | | | 6.1% |
| **Total Cash Inflow** | 9,397,059 | 9,524,473 | 9,652,977 | 9,782,570 | 9,913,253 | 10,045,025 | 10,177,887 | 10,311,839 | 10,446,880 | 10,583,011 |
| **Cash Outflows** | | | | | | | | | | |
| **Milk procurement** | | | | | | | | | | |
| Average weighted farm price (USD) | 0.2473 | 0.2475 | 0.2477 | 0.2479 | 0.2481 | 0.2483 | 0.2484 | 0.2486 | 0.2488 | 0.2489 |
| Milk procurement expense (USD) | 7,242,008 | 7,358,127 | 7,475,368 | 7,593,733 | 7,713,224 | 7,833,845 | 7,952,395 | 8,075,232 | 8,199,206 | 8,320,973 |
| **Operating costs** | | | | | | | | | | |
| Fuel | | | | | | | | | | |
| Price (USD/gal) | 1.040 | 1.040 | 1.040 | 1.040 | 1.040 | 1.040 | 1.040 | 1.040 | 1.040 | 1.040 |
| Km/day/truck | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| Trucks | 14 | 14 | 14 | 15 | 15 | 15 | 15 | 15 | 16 | 16 |
| Total Diesel (USD) | 15,725 | 15,725 | 15,725 | 16,848 | 16,848 | 16,848 | 16,848 | 16,848 | 17,971 | 17,971 |

**Appendix C-4: Cash Flow for Processing Two-Phase Cooperative**

YEAR

## Appendix C-4: Cash Flow for Processing Two-Phase Cooperative

| | YEAR | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Price (USD/gal) | | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 |
| Km/day/vehicle | | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Vehicles | | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Total Gasoline (USD) | | 2,220 | 3,552 | 3,552 | 5,328 | 5,328 | 5,328 | 5,328 | 5,328 | 5,328 | 5,328 |
| Total fuel (USD) | | 9,989 | 16,094 | 17,030 | 19,930 | 19,930 | 19,930 | 19,930 | 19,930 | 21,053 | 21,053 |
| **Dairy processing inputs** | | | | | | | | | | | |
| 2-liter milk container | | - | - | 664,632 | 664,632 | 664,632 | 664,632 | 664,632 | 664,632 | 664,632 | 664,632 |
| Cheese enzyme/packing | | - | - | 5,663 | 5,663 | 5,663 | 5,663 | 5,663 | 5,663 | 5,663 | 5,663 |
| Butter packing | | - | - | 24,499 | 24,499 | 24,499 | 24,499 | 24,499 | 24,499 | 24,499 | 24,499 |
| Cleaning/sanitation | | - | - | 1,032 | 1,032 | 1,032 | 1,032 | 1,032 | 1,032 | 1,032 | 1,032 |
| Other (hygiene) | | - | - | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 |
| Total (USD) | | - | - | 700,025 | 700,025 | 700,025 | 700,025 | 700,025 | 700,025 | 700,025 | 700,025 |
| **Labor** | | | | | | | | | | | |
| Truck drivers | | 7 | 12 | 12 | 13 | 13 | 13 | 13 | 13 | 14 | 14 |
| Wage (USD/month) | | 220 | 220 | 220 | 220 | 220 | 220 | 220 | 220 | 220 | 220 |
| Total (USD) | | 18,260 | 29,480 | 31,680 | 34,320 | 34,320 | 34,320 | 34,320 | 34,320 | 36,960 | 36,960 |
| Secretary/Assistant | | 3 | 5 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Wage (USD/month) | | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 |
| Total (USD) | | 7,000 | 12,000 | 19,200 | 19,200 | 19,200 | 19,200 | 19,200 | 19,200 | 19,200 | 19,200 |
| Field men/technical assistance | | 4 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Wage (USD/month) | | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| Total (USD) | | 26,500 | 46,500 | 48,000 | 48,000 | 48,000 | 48,000 | 48,000 | 48,000 | 48,000 | 48,000 |
| Centralized cooling tanks employees | | 12 | 19 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Wage (USD/month) | | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 |
| Total (USD) | | 37,180 | 59,020 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 |
| Laboratory employee | | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Wage (USD/month) | | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| Total (USD) | | 9,600 | 9,600 | 9,600 | 9,600 | 9,600 | 9,600 | 9,600 | 9,600 | 9,600 | 9,600 |
| Processing plant employees | | - | - | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| Wage (USD/month) | | - | - | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 |
| Total (USD) | | - | - | 25,200 | 25,200 | 25,200 | 25,200 | 25,200 | 25,200 | 25,200 | 25,200 |
| Quality control manager (USD/year) | | - | - | 14,400 | 14,400 | 14,400 | 14,400 | 14,400 | 14,400 | 14,400 | 14,400 |
| Total labor (USD) | | 98,540 | 156,600 | 210,480 | 213,120 | 213,120 | 213,120 | 213,120 | 213,120 | 215,760 | 215,760 |

Appendix C.4: Cash Flow for Proces

## Appendix C-4: Cash Flow for Processing Two-Phase Cooperative

| | YEAR | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| Price (USD/gal) | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 |
| Km/day/vehicle | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Vehicles | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Total Gasoline (USD) | 5,328 | 5,328 | 5,328 | 5,328 | 5,328 | 5,328 | 5,328 | 5,328 | 5,328 | 5,328 |
| Total fuel (USD) | 21,053 | 21,053 | 21,053 | 22,176 | 22,176 | 22,176 | 22,176 | 22,176 | 23,299 | 23,299 |
| Dairy processing inputs | | | | | | | | | | |
| 2-liter milk container | 664,632 | 664,632 | 664,632 | 664,632 | 664,632 | 664,632 | 664,632 | 664,632 | 664,632 | 664,632 |
| Cheese enzyme/packing | 5,663 | 5,663 | 5,663 | 5,663 | 5,663 | 5,663 | 5,663 | 5,663 | 5,663 | 5,663 |
| Butter packing | 24,499 | 24,499 | 24,499 | 24,499 | 24,499 | 24,499 | 24,499 | 24,499 | 24,499 | 24,499 |
| Cleaning/sanitation | 1,032 | 1,032 | 1,032 | 1,032 | 1,032 | 1,032 | 1,032 | 1,032 | 1,032 | 1,032 |
| Other (hygiene) | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 |
| Total (USD) | 700,025 | 700,025 | 700,025 | 700,025 | 700,025 | 700,025 | 700,025 | 700,025 | 700,025 | 700,025 |
| Labor | | | | | | | | | | |
| Truck drivers | 14 | 14 | 14 | 15 | 15 | 15 | 15 | 15 | 16 | 16 |
| Wage (USD/month) | 220 | 220 | 220 | 220 | 220 | 220 | 220 | 220 | 220 | 220 |
| Total (USD) | 36,960 | 36,960 | 36,960 | 39,600 | 39,600 | 39,600 | 39,600 | 39,600 | 42,240 | 42,240 |
| Secretary/Assistant | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Wage (USD/month) | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 |
| Total (USD) | 19,200 | 19,200 | 19,200 | 19,200 | 19,200 | 19,200 | 19,200 | 19,200 | 19,200 | 19,200 |
| Field men/technical assistance | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Wage (USD/month) | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| Total (USD) | 48,000 | 48,000 | 48,000 | 48,000 | 48,000 | 48,000 | 48,000 | 48,000 | 48,000 | 48,000 |
| Centralized cooling tanks employees | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Wage (USD/month) | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 |
| Total (USD) | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 | 62,400 |
| Laboratory employee | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Wage (USD/month) | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| Total (USD) | 9,600 | 9,600 | 9,600 | 9,600 | 9,600 | 9,600 | 9,600 | 9,600 | 9,600 | 9,600 |
| Processing plant employees | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| Wage (USD/month) | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 |
| Total (USD) | 25,200 | 25,200 | 25,200 | 25,200 | 25,200 | 25,200 | 25,200 | 25,200 | 25,200 | 25,200 |
| Quality control manager (USD/year) | 14,400 | 14,400 | 14,400 | 14,400 | 14,400 | 14,400 | 14,400 | 14,400 | 14,400 | 14,400 |
| Total labor (USD) | 215,760 | 215,760 | 215,760 | 218,400 | 218,400 | 218,400 | 218,400 | 218,400 | 221,040 | 221,040 |

Appendix C-4: Cash Flow for Processing Two-Phase Cooperative

## Appendix C-4: Cash Flow for Processing Two-Phase Cooperative

| | YEAR | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Maintenance | | | | | | | | | | | |
| Trucks | | 7 | 12 | 12 | 13 | 13 | 13 | 13 | 13 | 14 | 14 |
| Monthly expenditure per truck | | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 |
| Total (USD) | | 8,234 | 13,293 | 14,285 | 15,475 | 15,475 | 15,475 | 15,475 | 15,475 | 16,666 | 16,666 |
| Vehicles | | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Monthly expenditure per vehicle | | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Total (USD) | | 1,500 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 |
| Milk Rotary Filler (USD) | | - | - | 7,500 | 7,500 | 7,500 | 7,500 | 7,500 | 7,500 | 7,500 | 7,500 |
| Pasteurization system (USD) | | - | - | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 |
| Total maintenance (USD) | | 9,734 | 15,693 | 27,685 | 28,875 | 28,875 | 28,875 | 28,875 | 28,875 | 30,066 | 30,066 |
| Electricity/telephone (USD) | | 2,370 | 3,630 | 21,831 | 21,831 | 21,831 | 21,831 | 21,831 | 21,831 | 21,831 | 21,831 |
| Supplies/water | | | | | | | | | | | |
| Centralized cooling tanks (USD) | | 9,005 | 14,295 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 |
| Milk testing laboratory (USD) | | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 |
| Office (USD) | | 10,358 | 18,913 | 24,615 | 24,615 | 24,615 | 24,615 | 24,615 | 24,615 | 24,615 | 24,615 |
| Total (USD) | | 21,763 | 35,608 | 42,129 | 42,129 | 42,129 | 42,129 | 42,129 | 42,129 | 42,129 | 42,129 |
| Management (USD) | | 12,000 | 12,000 | 18,000 | 18,000 | 18,000 | 18,000 | 18,000 | 18,000 | 18,000 | 18,000 |
| Total operating costs (USD) | - | 154,395 | 239,625 | 1,037,180 | 1,043,910 | 1,043,910 | 1,043,910 | 1,043,910 | 1,043,910 | 1,048,864 | 1,048,864 |
| **Debt financing** | | | | | | | | | | | |
| Interest | - | 30,732 | 57,271 | 132,839 | 132,839 | 132,839 | 132,839 | 132,839 | 132,839 | 131,345 | 128,286 |
| Principal | - | - | - | - | - | - | - | - | 20,396 | 41,759 | 109,063 |
| **Total Cash Outflow** | - | 3,610,727 | 6,002,962 | 7,520,605 | 7,637,146 | 7,745,475 | 7,854,911 | 7,965,455 | 8,097,505 | 8,235,095 | 8,413,221 |
| **Investment** | | | | | | | | | | | |
| Land | - | - | 40,000 | - | - | - | - | - | - | - | - |
| Milk trucks | 71,425 | 166,658 | 47,617 | - | 23,808 | - | - | - | - | 23,808 | - |
| Vehicles | 12,000 | 36,000 | - | - | - | - | - | - | - | - | - |
| Milk testing equipment for laboratory | 100,000 | - | - | - | - | - | - | - | - | - | - |
| Computers/software | 2,000 | 2,400 | 3,200 | - | - | - | - | - | - | - | - |
| Furniture | 2,400 | 1,800 | 3,000 | - | - | - | - | - | - | - | - |
| Dairy processing equipment | - | - | 789,877 | - | - | - | - | - | - | - | - |
| Office infrastructure | 56,000 | - | 28,000 | - | - | - | - | - | - | - | - |

**Appendix C-4: Cash Flow for Processing Two-Phase Cooperative**

YEAR

## Appendix C-4: Cash Flow for Processing Two-Phase Cooperative

| | YEAR | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| Maintenance | | | | | | | | | | |
| Trucks | 14 | 14 | 14 | 15 | 15 | 15 | 15 | 15 | 16 | 16 |
| Monthly expenditure per truck | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 |
| Total (USD) | 16,666 | 16,666 | 16,666 | 17,856 | 17,856 | 17,856 | 17,856 | 17,856 | 19,047 | 19,047 |
| Vehicles | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Monthly expenditure per vehicle | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Total (USD) | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 |
| Milk Rotary Filler (USD) | 7,500 | 7,500 | 7,500 | 7,500 | 7,500 | 7,500 | 7,500 | 7,500 | 7,500 | 7,500 |
| Pasteurization system (USD) | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 |
| Total maintenance (USD) | 30,066 | 30,066 | 30,066 | 31,256 | 31,256 | 31,256 | 31,256 | 31,256 | 32,447 | 32,447 |
| Electricity/telephone (USD) | 21,831 | 21,831 | 21,831 | 21,831 | 21,831 | 21,831 | 21,831 | 21,831 | 21,831 | 21,831 |
| Supplies/water | | | | | | | | | | |
| Centralized cooling tanks (USD) | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 | 15,114 |
| Milk testing laboratory (USD) | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 |
| Office (USD) | 24,615 | 24,615 | 24,615 | 24,615 | 24,615 | 24,615 | 24,615 | 24,615 | 24,615 | 24,615 |
| Total (USD) | 42,129 | 42,129 | 42,129 | 42,129 | 42,129 | 42,129 | 42,129 | 42,129 | 42,129 | 42,129 |
| Management (USD) | 18,000 | 18,000 | 18,000 | 18,000 | 18,000 | 18,000 | 18,000 | 18,000 | 18,000 | 18,000 |
| Total operating costs (USD) | 1,048,864 | 1,048,864 | 1,048,864 | 1,053,817 | 1,053,817 | 1,053,817 | 1,053,817 | 1,053,817 | 1,058,771 | 1,058,771 |
| **Debt financing** | | | | | | | | | | |
| Interest | 120,297 | 111,723 | 102,521 | 92,645 | 82,045 | 70,669 | 58,460 | 45,356 | 31,293 | 16,199 |
| Principal | 117,052 | 125,626 | 134,828 | 144,704 | 155,304 | 166,680 | 178,889 | 191,992 | 206,056 | 221,149 |
| **Total Cash Outflow** | 8,528,220 | 8,644,339 | 8,761,580 | 8,884,899 | 9,004,390 | 9,125,011 | 9,243,561 | 9,366,398 | 9,495,325 | 9,617,093 |
| **Investment** | | | | | | | | | | |
| Land | - | - | - | - | - | - | - | - | - | (40,000) |
| Milk trucks | - | - | - | 23,808 | - | - | - | - | 23,808 | (26,189) |
| Vehicles | - | - | - | - | - | - | - | - | - | - |
| Milk testing equipment for laboratory | - | - | - | - | - | - | - | - | - | - |
| Computers/software | - | - | - | - | - | - | - | - | - | - |
| Furniture | - | - | - | - | - | - | - | - | - | - |
| Dairy processing equipment | - | - | - | - | - | - | - | - | - | - |
| Office infrastructure | - | - | - | - | - | - | - | - | - | - |

***Appendix C-4: Cash Flow for Processing Two-Phase Cooperative***

## Appendix C-4: Cash Flow for Processing Two-Phase Cooperative

| | YEAR | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Laboratory infrastructure | 70,000 | - | - | - | - | - | - | - | - | - | - |
| Dairy processing plant infrastructure | - | - | 270,000 | - | - | - | - | - | - | - | - |
| Centralized cooling tanks | 150,000 | 360,000 | 90,000 | - | - | - | - | - | - | - | - |
| Replacement of milk trucks | - | - | - | - | - | - | - | - | - | - | - |
| Replacement of computers/software | - | - | - | 2,000 | 2,400 | 3,200 | 2,000 | 2,400 | 3,200 | 2,000 | 2,400 |
| Replacement of vehicles | - | - | - | - | - | - | 11,400 | 34,200 | - | - | |
| Total investment (USD) | 463,825 | 566,858 | 1,271,693 | 2,000 | 26,208 | 3,200 | 13,400 | 36,600 | 3,200 | 25,808 | 2,400 |
| **Equity proportion of investment** | 44,281 | 204,550 | 240,049 | 2,000 | 26,208 | 3,200 | 13,400 | 36,600 | 3,200 | 25,808 | 2,400 |
| **Net Cash Flow Before-Taxes** | (44,281) | 175,443 | 415,231 | 894,370 | 872,317 | 906,782 | 908,023 | 896,245 | 920,650 | 884,597 | 855,114 |
| **Tax allowance** | | | | | | | | | | | |
| After-tax depreciation credit | - | 7,066 | 10,506 | 18,801 | 19,158 | 19,158 | 19,158 | 19,158 | 19,158 | 19,515 | 19,515 |
| **Tax charges** | - | 56,999 | 98,292 | 134,455 | 134,779 | 136,497 | 138,213 | 139,927 | 141,637 | 142,825 | 144,986 |
| **Total taxes** | - | 49,933 | 87,785 | 115,655 | 115,621 | 117,340 | 119,056 | 120,769 | 122,479 | 123,310 | 125,472 |
| **Net Cash Flow After-Taxes** | (44,281) | 125,510 | 327,445 | 778,715 | 756,696 | 789,443 | 788,967 | 775,476 | 798,171 | 761,287 | 729,642 |
| **Present Value Cash Flows** | (44,281) | 112,953 | 265,200 | 567,585 | 496,354 | 466,024 | 419,145 | 370,759 | 343,429 | 294,786 | 254,264 |
| **Net Present Value** | 4,995,385 | | | | | | | | | | |
| **Payback Period** | 0.35 | | | | | | | | | | |
| **IRR** | 411.3% | | | | | | | | | | |

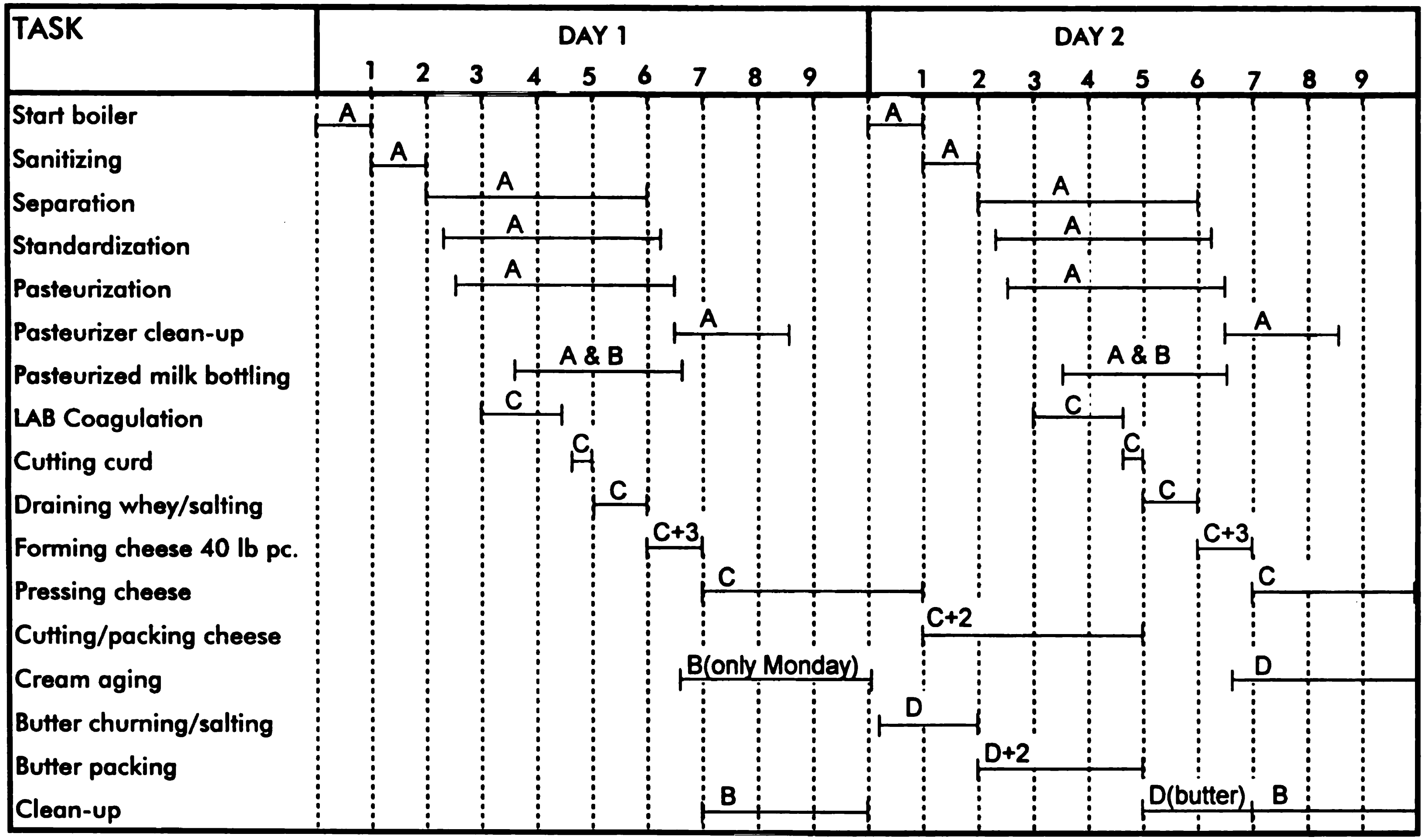
*Appendix C-4: Cash Flow for Processing*

## Appendix C-4: Cash Flow for Processing Two-Phase Cooperative

| | YEAR | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| Laboratory infrastructure | - | - | - | - | - | - | - | - | - | - |
| Dairy processing plant infrastructure | - | - | - | - | - | - | - | - | - | (27,000) |
| Centralized cooling tanks | - | - | - | - | - | - | - | - | - | - |
| Replacement of milk trucks | 238,083 | 47,617 | - | 23,808 | - | - | - | - | 23,808 | (30,951) |
| Replacement of computers/software | 4,800 | 4,000 | 2,400 | 3,200 | 2,000 | 2,400 | 3,200 | 2,000 | 2,400 | (792) |
| Replacement of vehicles | 11,400 | 34,200 | - | - | - | 11,400 | 34,200 | - | - | (6,840) |
| Total investment (USD) | 254,283 | 85,817 | 2,400 | 50,817 | 2,000 | 13,800 | 37,400 | 2,000 | 50,017 | (131,772) |
| **Equity proportion of investment** | 254,283 | 85,817 | 2,400 | 50,817 | 2,000 | 13,800 | 37,400 | 2,000 | 50,017 | - |
| **Net Cash Flow Before-Taxes** | 614,556 | 794,317 | 888,996 | 846,854 | 906,862 | 906,214 | 896,927 | 943,440 | 901,539 | 1,097,690 |
| **Tax allowance** | | | | | | | | | | |
| After-tax depreciation credit | 19,515 | 19,515 | 19,515 | 19,872 | 19,872 | 19,872 | 19,872 | 19,872 | 20,229 | 20,229 |
| **Tax charges** | 147,884 | 150,864 | 153,934 | 156,356 | 159,625 | 163,004 | 166,982 | 170,615 | 173,642 | 197,826 |
| **Total taxes** | 128,369 | 131,349 | 134,419 | 136,484 | 139,753 | 143,132 | 147,110 | 150,743 | 153,413 | 177,597 |
| **Net Cash Flow After-Taxes** | 486,187 | 662,968 | 754,578 | 710,370 | 767,109 | 763,082 | 749,816 | 792,698 | 748,126 | 920,094 |
| **Present Value Cash Flows** | 152,474 | 187,113 | 191,660 | 162,379 | 157,805 | 141,271 | 124,926 | 118,857 | 100,950 | 111,733 |
| **Net Present Value** | | | | | | | | | | |
| **Payback Period** | | | | | | | | | | |
| **IRR** | | | | | | | | | | |

GANTT CHART FOR DAIRY PLANT

# Appendix E: GANTT CHART FOR DAIRY PLANT




Employees: A - Start up and pasteurizer operator
B - Bottling and clean-up
C - Cheese maker
D - Butter maket
3 General employees

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# BIBLIOGRAPHY


Amrine, Harold T., John A. Ritchey and Oliver S. Hulley. *Manufacturing Organization and Management*, Prentice-Hall Inc., Englewood Cliffs, N.J., 1982.

Aplin, Richard D., George L. Casler and Cheryl P. Francis. *Capital Investment Analysis: Using Discounted Cash Flows*, Second edition, Grid, Inc., 1977.

Bailey, Kenneth W. *Marketing and Pricing of Milk and Dairy Products in the U.S.*, Ames: Iowa State University Press, 1997.

Baker, Harold. "There is More to Co-ops Than Meets the Eye", *Farmer Cooperatives*, Vol. 55, No. 10, January 1989, pp. 8.

Bierman, Harold Jr. and Seymour Smidt. *The Capital Budgeting Decision: Economic Analysis of Investment Projects*, Sixth edition, Macmillan Publishing Company, 1984.

Bruynis, Chris L., Peter Goldsmith, David E. Hahn and William J. Taylor. "Key success factors for emerging agricultural marketing cooperatives", *Journal of Cooperatives*, Vol. 16, 2001.

Bunje, Ralph B., *Cooperative Farm Bargaining and Price Negotiations*, Cooperative Information Report No. 26, USDA, 1980.

Butler, Leslie J. "The establishment of a milk marketing system in the Yaroslavl Oblast of Russia: two steps back and one step forward", Department of Agricultural and Resource Economics, University of California, Davis. Final Report prepared for the *Winrock Center for International Development*. September 1998.

Cattlemen's Association. Statistics of Dairy Sector in Ecuador 1998-2001.

Central Bank of Ecuador (online at www.bce.fin.ec)

Cook, Michael. "Cooperatives and Group Action", in *Food and Agricultural Marketing Issues for the 21st Century*, edited by Daniel I. Padberg. Food and Agricultural Marketing Consortium, FAMC 93-1. College Station, TX: Texas A&M University, 1993.

Corporación de Estudios y Publicaciones. *Ley de Cooperativas: Reglamento y legislación conexa*, Junio 2001.

Cropp, Robert. "Milk Money: How Dairy Cooperatives Impact Farm-Level Milk Prices", *Rural Cooperatives*, Vol. 64, No. 6, pp. 4-10.

DiMento, Douglas. "Dairy Farmers Find Better Prices Via Strength of Co-op Marketing", *Farmer Cooperatives*, Vol. 56, No. 8, pp. 24-25.

Dun & Bradstreet. *Industry Norms and Key Business Ratios One Year*, 2001

Empson, John. *International Study of Dairy Cooperatives*, International Dairy Federation, Bulletin No. 155, 1983.

Empson, John. "Large Dairy Cooperatives Dominate in Major Milk Producing Countries", *Farmer Cooperatives*, Vol. 52, No. 2, pp. 12-17.

Galbraith, John Kenneth, *American Capitalism: The Concept of Countervailing Power*, rev. ed. Boston: Houghton Mifflin Co., 1956.

Harsh, Stephen B., Larry J. Connor and Gerald D. Schwab, *Managing the Farm Business*, Prentice-Hall, Inc., 1981.

Henehan, Brian M. *"Questions You Should Answer Before Starting a New Dairy Processing Enterprise"*, Cornell Program on Dairy Policy and Markets, December 1999.

Ladd, George W. *Agricultural Bargaining Power*, Ames: Iowa State University Press, 1964.

Ling, Charles and Carolyn Liebrand. *Marketing Operations of Dairy Cooperatives*, ACS Research Report No. 133, USDA-ACS, 1994.

McBride, Glynn. *Agricultural Cooperatives: Their Why and Their How*, Avni Publishing Company Inc., 1986.

Manchester, Alden C. *The Public Role in the Dairy Economy: Why and How Governments Intervene in the Milk Business*, Westview Press Inc., 1983.

National Institute of Statistics and Census of Ecuador (online at www.inec.gov.ec)

Pearce, John A. and Richard B. Robinson, Jr. *Formulation, Implementation, and Control of Competitive Strategy*, Seventh Edition, McGraw-Hill, 2000.

Peterson, Christopher H. and Bruce L. Anderson, "Cooperative Strategy: Theory and Practice", *Agribusiness*, Vol. 12, No. 4, 371-383, 1996.

Rapp, Galen and Gerald Ely. *How to Start a Cooperative*, USDA, Cooperative Information Report 7, 1996.

Schrarder, L.F. "Economic Justification." In *Cooperatives in Agriculture*, ed. D.W. Cobbia, pp. 121-36. Englewoods Cliffs, N.J.: Prentice Hall, 1989.

Servicio de Informaci6n y Censo Agropecuario (SICA), Statistics of Dairy Sector in Ecuador. (online at www.sica.gov.ec)

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Servicio Integrado de Indicadores Sociales del Ecuador (SIISE), 2002 (online at www.siise.gov.ec)
Siebert, Jerome B., Ruth Lee and David Zollinger. *Starting an Agricultural Marketing Cooperative*, Center for Cooperatives, University of California, 1999.

Staatz, John, "Farmers' Incentives to Tare Collective Action via Cooperatives: A Transaction Cost Approach", in *Cooperative Theory: New Approaches*, ed. Jeffrey S. Royer, Washington, D.C.: USDA-ACS Service Rep. 18, July 1987b.

Troy, Leo. Almanac *of Business and Industrial Financial Ratios*, Aspen Publishers Inc., New York, 2003

U.S. Department of Agriculture, Rural Business Cooperative Service. *Cooperative Benefits and Limitations*, Cooperative Information Report No.1, Section 3, 1990.

U.S. Department of Agriculture, Rural Business Cooperative Service. *Cooperative in the Dairy Industry*, Cooperative Information Report No.1, Section 16, 2002.

U.S. Department of Agriculture, Rural Business Cooperative Service. *Cooperative Feasibility Study Guide*, RBS Service Report 58, 2000.

U.S. Department of Agriculture, Rural Business Cooperative Service. *What are Patronage Refunds*, Cooperative Information Report No.9, 1993.

U.S. Department of Agriculture, Rural Business Cooperative Service. *What are Cooperatives*, Cooperative Information Report No.10, 1995.

U.S. Department of Agriculture, Rural Business Cooperative Service. *Managing Your Cooperative's Equity*, Cooperative Information Report No.56, 1997.

Vázquez, German. *Cooperativismo*, Undécima edición, Editorial Ecuador F.B.T. Cia Ltda, Quito, 1999.

Williamson, Oliver. The Modern Corporation: Origins, Evolution, Attributes.", *Journal of Economic Literature*, No. 19, 1981, pp. 1537-568.

Wolf, Christopher, Steve Hanson, Eric Wittenberg and Stephen Harsh. *Discount Rates for Dairy Farms*, Staff Paper 02-08, Departament of Agricultural Economics, Michigan State University, May 2002.

Wolf, Christopher A., Stephen Harsh, Shawn Bucholtz, Amy Damon and James Lloyd. *Michigan Dairy Farm Industry: Summary and Analysis of the 1999 Michigan State University Dairy Farm Survey*, Michigan Agricultural Experiment Station, Michigan State University, Research Report 573, December 2000.

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Yin, Robert K. *Case Study Research: Design and Methods*, Second Edition, Sage Publications, 1994.

Zimbelman, Karen, E. Kim Coontz and Audrey Malan. *Steps to Starting a Marketing Cooperative*, Second Edition, Center for Cooperatives, University of California, 2000.