



The University of Georgia

Center for Agribusiness and Economic Development

College of Agricultural and Environmental Sciences

A Feasibility Analysis for On-Farm Bottling of Milk in Morgan County Georgia

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Introduction

The Center for Agribusiness and Economic Development (CAED) was contacted by a Dairy in Morgan County Georgia to evaluate the feasibility of constructing an on-site processing facility to produce milk for the local market. In a similar study conducted in 2005 for a dairy in northwest Georgia, the CAED worked with the local highschool's DECCA club to develop and administer a survey to area residents to gauge their interest and willingness to purchase locally produced milk products. Some results of that study are used in this preliminary analysis to gauge the market for a similar operation in Morgan County.

Fresh Fluid Milk Market Analysis

Fluid Milk Market - - Retail sales of fluid milk increased 0.3% in 2003. This was accomplished in spite of a small decline in per capita consumption. The product sales mix changed slightly. In 2003 whole milk sales decreased 0.9% while flavored low fat increased by 4.3%.

Several factors have influenced the growth in milk sales. One factor pertains to improvement in the product package. The appearance of milk packaging, coupled with improved labeling content, account for some of the increase. Another factor is the growth in the coffee house industry offering specialty coffee beverages. These specialty coffee beverages may contain between 50 to 90 percent milk. These two factors, combined with the milk industry promotion, have all contributed to the increase in milk consumption. (Source: *Milk Facts* 1997)

Fluid Milk Market Outlets - - Supermarkets and grocery stores account for roughly 82% of fluid milk sales. Mass merchandise stores accounted for an additional 8.2% of milk sales. Another 5.6% was sold through warehouse clubs with the remaining sales through drug stores, convenience stores and all others.

Fluid Milk Consumption Trends - - Per capita consumption of fluid milk has declined from 29.8 gallons in 1970 to 21.7 gallons in 2003. This includes consumption of plain and flavored milk, whole, light milk and fat-free milk products and buttermilk. Along with the decline in fluid milk consumption, the product mix consumption patterns have changed significantly over the past 30 years. Per capita whole milk consumption has fallen from 24 gallons in 1970 to 7.5 gallons in 2003. During the same period, per capita consumption of lowfat/skim products has increased from 5.1 gallons in 1970 to 13.8 gallons in 2003. The trend for flavored milk has increased over the same time period, but the increase is less dramatic (10 gallons in 1980 to 14.0 gallons in 2002).

Fresh Milk and Cream Consumer profile - Target Market - - The following fluid milk customer profile was created using the 1991 Consumer Expenditure Survey data collected by the Bureau of the Census. The information contained in Table 1 includes plain and flavored fresh milk and cream. The survey respondents keep a two-week diary on small, frequently purchased products. These figures include expenses for food and beverages, both at home and in restaurants. The diary approach is intended to capture expenditures that respondents are likely to forget or recall

incorrectly over long periods of time. More product-specific information was not available. Thus, these results should be used as a generalization of milk and cream consumers.

- The fluid milk and cream consumer is married, with children between the ages of 6 and 17, is between 35 and 44 years of age, and has an annual household income in excess of \$40,000.
- Milk consumption peaks between the ages of 13-17 years of age (27.9 gallons per capita) and the volume per capita decreases after school years, but stabilizes after age 35 (between 9.5 and 11.1 gallons per capita).
- On average, consumer units/households spend \$136.00 in 2001 annually on fresh milk and cream products.

<p align="center">Table 1 Fluid Milk Consumption Breakouts by Demographic Variables ¹ <i>(Results are based on Indexed average expenditures where 100 is the average expenditure of all consumers and the percent reported in the tables show the percent difference from the average expenditure)</i></p>							
Indexed Marital and Children Status Break Out							
Year	Married	Single persons	Married w/ children	Married w/out children	Married w/ oldest child <6	Married w/ oldest child 6-17	Single Parent w/ child <18
1991	24%	- 37%	45%	-12%	35%	58%	12%
Indexed Age Break Out							
Year	<25	25<35	35<45	45<55	55<64	65<74	75+
1991	-44%	7%	26%	6%	-6%	-15%	-24%
Indexed Income Break Out (in tens, add 000)							
Year	<\$10	\$10<\$20	\$20<\$30	\$30<\$40	\$40<\$50	\$50+	
1991	-28%	-8%	-5%	7%	27%	22%	
Total Annual Fluid Milk Expenditures by Age Group²							
Year	<25	25<35	35<45	45<55	55<64	65<74	75+
1991	\$71.84	\$137.81	\$163.50	\$137.17	\$121.09	\$109.77	\$97.86
<p>¹The data in table 1. were taken form the Official Guide to Household Spending, 2nd edition. The data were taken from the Consumer Expenditure Survey conducted annually by the Bureau of the Census, 1991.</p> <p>²The average price includes all respondents not just those who purchase a product, thus the average price may underestimate the amount spent by purchasers.</p>							

Demographics

The data in Table 2. provides insight into the demographics of the people interviewed in the northwest Georgia study. The demographics of this area are quite similar to those of Morgan County and several other surrounding counties that would likely comprise the potential market for the dairy. The dairy requesting the study is located in western Morgan County, near its border with Newton County. It was determined that Morgan, Newton, and Rockdale counties would be evaluated as likely target markets due to their close proximity, population density, and demographic makeup.

Not surprisingly, the majority of the respondents in the original survey were female (64%) and middle aged. The typical respondent can be described as a white, 34 year old female with at least a high school education and an average household income of \$62,000 annually.

These demographics align fairly closely with Morgan/Newton/Rockdale County Census Demographic Data. The respondents are significantly more likely to be female than the general population but that is expected given that females are more likely to purchase food products for the household than males. The racial composition of the respondents is similar to that of the general three-county area's population. The respondents are under represented in terms of Hispanic people. The respondents are significantly more affluent than the general population of three-county area. The average age of the respondents is similar to the average age of the county population.

Table. 2 Demographic Profile				
Demographic	Percent (Survey)	Percent (Morgan)	Percent (Newton)	Percent (Rockdale)
Gender				
<i>Male</i>	36%	48.4%	48.6%	49.1%
<i>Female</i>	64%	51.6%	51.4%	50.9%
Children in Household	1.69			
Average Household Size (persons)	2.07	2.75	2.77	2.87
Education				17.6%
<i>< Highschool</i>	25%	21.0%	25.3%	29.4%
<i>Highschool/GED</i>	31%	37.1%	35.0%	29.7%
<i>Some College/technical degree/associate</i>	22%	18.2%	25.0%	15.9%
<i>Bachelors</i>	6%	13.0%	10.0%	
<i>Some graduate work</i>	4%			
<i>Advanced degree/professional degree</i>	12%	5.7%	5.0%	7.5%
Primary Food Shopper				
<i>Female head of house</i>	77%			
<i>Male head of house</i>	21%			
<i>Someone else</i>	2%			
Age (years)	34.00	36.8	33.3	35.4
Race				
<i>White</i>	85%	69.7%	75.0%	75.5%
<i>Black</i>	11%	28.5%	22.0%	18.2%
<i>Asian</i>	1%	0.3%	0.7%	1.9%
<i>Hispanic</i>	1%	1.6%	2.0%	1.9%
<i>Multi-racial</i>	2%	0.9%	1.0%	6.0%
				1.3%
Household Income				
<i>< \$14,000</i>	3%	16.6%	11.5%	9.3%
<i>\$15,000 -- \$24,999</i>	5%	12.4%	11.3%	18.7%
<i>\$25,000 - \$34,999</i>	7%	13.6%	12.7%	11.4%
<i>\$35,000 - \$49,999</i>	11%	16.9%	20.7%	16.3%
<i>\$50,000 - \$74,999</i>	24%	21.3%	24.0%	24.6%
<i>\$75,000 or more</i>	18%	19.1%	20.0%	29.8%
<i>Don't know/ Do not want to answer</i>	32%			
Mean	\$75,500 +	\$40,249	\$44,875	\$53,599

Market Analysis

Product Consumption

To gauge interest in local demand for fluid milk products, it is important to determine the types of milk products being purchased and consumed in the area. The information presented in Table 3 reveals that flavored milk, plain whole milk and 2% milk are the most popular fluid milk products with regard to stated consumption and purchases. It is assumed that these preferences are similar for the Morgan/Newton/Rockdale area. Interestingly, flavored milk, most likely chocolate, is the most frequently purchased and consumed milk as reported in the survey. The dairy may want to produce a flavored milk product to take advantage of this ready made market.

The data in Table 3 suggests that by producing three fluid milk products, the dairy can capture a significant percentage of the milk being consumed in the area. The market for butter milk, skim milk and low fat milk are small relative to the other products and may not warrant the cost associated with bringing these products to market.

Table 3. Fluid Milk Product Consumption and Purchase		
Milk Product	Drink These Milk Products	Buy These Milk Products
Flavored Milk	61%	60%
Plain Whole	56%	53%
Reduced Fat (2%)	51%	46%
Butter Milk	25%	29%
Fat Free (skim)	25%	22%
Lowfat (1%)	15%	14%

Purchase Frequency

Another important aspect of estimating market potential is to estimate the frequency with which products are purchased. Having an estimate of purchase frequency allows for a more realistic market potential determination.

As with the reported purchase and consumption data in Table 3, the most frequently purchased fluid milk products are flavored, plain whole and 2% milk. These products are purchased significantly more frequently than the remaining products. Flavored milk appears to be purchased about every two weeks where as plain whole milk is more likely to be purchased weekly. This difference may lie in the fact that milk is a household staple that is used in breakfast and other meal preparations as well as being served as a meal time beverage. Flavored milk on the other hand is generally used a beverage.

The data in Table 4 suggest that the plain whole milk will turn over faster than any of the other milk products, followed by 2% milk.

Table 4. Frequency of Purchasing Milk Products				
Milk Product	Never	< Once a Week	Weekly	Every 2 weeks or more
Flavored Milk	21%	12%	21%	46%
Plain Whole	33%	17%	40%	10%
Reduced Fat (2%)	41%	15%	30%	15%
Buttermilk	56%	4%	8%	31%
Fat Free (skim)	64%	11%	18%	7%
Lowfat (1%)	78%	2%	10%	11%

Container Preferences

The old adage, “it is easier to sell something that people want than it is to sell something that is easy to produce” is relevant to the fluid milk market. People are more willing to purchase a product if it is packaged in a manner that suits their particular needs. For instance, if a family only uses a ½ gallon of milk per week, they will be unlikely to purchase milk by the gallon if they have the choice of purchasing it in a ½ gallon container. Therefore, the dairy needs to understand the packaging preferences of potential consumers so that it can package its product in the most desirable manner.

The results in Table 5 indicate that a gallon container is the most commonly purchased container for plain whole and 2% milk. The gallon container is purchased significantly more often than the other container sizes for these two milk products. Interestingly, this does not hold as true for flavored milk, one of the more popular fluid milk products. Flavored milk is more likely to be purchased in ½ gallon containers (38%) than in gallon containers (30%). This suggests that the dairy should offer flavored milk in two container sizes to best access the flavored milk market.

To access the school milk market, milk would have to be packaged in a ½ pint container. The school milk market could potentially be the most difficult to enter profitably. School systems generally wish to contract with a single supplier and it is likely to prove difficult for a small dairy operator to supply a commercial market, as well as an entire school system on a highly seasonal basis. School systems also typically contract for milk deliveries at very low margins which would be less profitable than other niche markets that a local on-farm bottling operation could take advantage of. There would also be considerable risk involved in setting up an operation for half-pint containers and losing the contract to larger, lower cost bidders in future years.

Milk Product	Gallon	½ Gallon	Quart	Pint
Plain Whole	71%	17%	4%	2%
Reduced Fat (2%)	72%	23%	3%	2%
Lowfat (1%)	55%	32%	7%	7%
Fat Free (skim)	61%	23%	11%	4%
Buttermilk	21%	51%	19%	9%
Flavored Milk	30%	38%	15%	18%

Purchase Location

To access the fluid milk market, it is important to determine where potential consumers are most likely to purchase milk products, Table 6. The northwest Georgia survey asked respondents where they purchased their milk products. Not surprisingly, the supermarkets were the retail outlets where most of the fluid milk products are purchased. However, it was noticeable that only a small amount of fluid milk was reportedly purchased at convenience stores. The dairy should focus its marketing efforts on the grocery store supermarket marketing channel and not worry about the convenience store and mass merchandise outlets. These outlets only represent a small proportion of milk sales as reported by the respondents. The only exception may be flavored milk products.

Milk Product	Supermarket	Convenience	Mass Merchandise	Other
Plain Whole	93%	5%	0%	2%
Reduced Fat (2%)	91%	6%	2%	1%
Lowfat (1%)	82%	6%	6%	6%
Fat Free (skim)	84%	11%	2%	3%
Buttermilk	91%	6%	0%	3%
Flavored Milk	79%	15%	2%	3%

Milk Prices

This is probably one of the most important questions marketers need to answer before introducing a new product into the market place. What are consumers currently paying, or what do they think they are currently paying for products they purchase. The data in Table 7 reveal that consumers are paying an average of \$3.56 for a gallon of plain whole milk. The prices they are paying for the other milk products do not vary significantly, with the exception of butter milk which costs about \$2.96 per gallon. Similarly, the prices for ½ gallon containers of milk products are in the \$2.30-\$2.70 per ½ gallon range. Again, these prices may vary due to the respondent's inability to accurately recall the prices they are paying but they offer a good estimation of product pricing. The exception is butter milk which appears to be significantly less expensive than the other milk products.

Milk Product	Gallon	½ Gallon	Quart	Pint
Plain Whole	\$3.56	\$2.42	\$1.50	\$1.29
Reduced Fat (2%)	\$3.67	\$2.31	\$2.25*	\$1.89*
Lowfat (1%)	\$3.46	\$2.36	\$1.79*	\$1.75*
Fat Free (skim)	\$3.47	\$2.68	\$2.31*	\$2.00*
Buttermilk	\$2.96	\$2.17	\$1.80*	\$1.58*
Flavored Milk	\$3.30	\$2.44	\$1.73	\$1.28
* Small sample size <10 respondents, results may be unreliable				

Likelihood to Purchase Milk

The survey respondents were asked how likely they would be to purchase locally produced fluid milk in supermarkets, convenience stores or wherever they shop. It is important to gauge purchase intent when considering a new product introduction. The results indicate that, on average, the respondents were “somewhat likely” to purchase locally produced milk. Another measure to consider is the median value or response to the question. The median value reinforces the data in table 8 and suggests that area residents are somewhat likely to purchase premium locally produced milk.

Likelihood	Percent (n=266)
Very Likely (5)	28%
Somewhat Likely (4)	36%
Neutral (3)	15%
Somewhat Unlikely (2)	9%
Very Unlikely (1)	12%
Mean	3.58
Median	4.00

Over one quarter (28%) of the respondents indicated they were very likely to purchase a premium milk product with an additional 36% reporting they would be somewhat likely. It has been proven thorough research that stated purchase intentions do not match with actual purchase behavior. To address this issue, the data can be adjusted to reflect industry standardization of these responses. According to industry research, it is assumed that 80% of respondents reporting they are likely to purchase a product actually follow through. The percentage falls to 60% for those that respond somewhat likely.

Adjusting the data in Table 9 reveals a more realistic purchase intent. After the adjustment, it is estimated that 44% of the respondents would follow through and purchase a locally produced milk product.

Response	Actual Response	Adjusted Response
Very Likely	28%	22%
Some what Likely	36%	22%
Total	64%	44%

Purchase Preference and Price

The respondents were asked whether they would be willing to purchase a locally produced premium milk product instead of their usual milk. Nearly three-quarters (72%) indicate that they would purchase a locally produced premium milk over the milk they are currently purchasing. However, this question does not get at the pricing of the local milk. A question was asked to determine the respondents willingness to pay more for the locally produced premium milk. The results are encouraging in that 24% of the respondents indicated they would be willing to pay more for a locally produced premium milk product.

Response	Purchase Premium Milk Product	Willing to Pay More
Yes	72%	24%
No	28%	76%

Given the significant number of respondents that are willing to purchase milk products, it is important to derive an estimate of how much more they are willing to pay. If area consumers are not willing to pay more for locally produced milk allowing the dairy to cover the cost of producing the milk, the project will not be economically feasible.

A question was asked of those respondents who were willing to pay more for locally produced milk to determine how much more, as a percentage, they were willing to pay. Interestingly, respondents were willing to pay between ten and nineteen percent more for locally produced milk.

Likelihood	Percent (n=57)
0-9%	40%
10%-19%	26%
20%-29%	11%
30%-39%	12%
40%-49%	5%
50% or more	5%
Mean	10%-19%
Median	10%-19%

However, there are a number of respondents that were willing to pay between zero and nine percent more for locally produced milk. When viewing this range, it is important to remember that only those who indicated they were willing to pay more answered this question. Therefore, it is assumed that a premium milk product could demand a premium of about 15% on average.

Product Feature Ratings

Marketing products requires understanding the consumer and what perceptions they have regarding specific products. Respondents were asked to rate the following product features in terms of their importance in influencing milk purchase decisions. The following results indicate that the respondents rank the price of milk as being a very important factor in their decision to purchase milk products. However, consumers always express concern when product pricing is involved.

“Farm fresh” was rated significantly higher with regard to influencing their purchase decision than the other non price product features. This is encouraging and is consistent with the Georgia Grown study results. The dairy may want to incorporate the “Farm Fresh” in the packaging and promotion of any future milk products. The farm fresh phrase elicits a thought of being produced locally and therefore being fresher and better than products that are produced and shipped from outside the area. This especially holds true for perishable products.

Table 12. Importance of Product Attributes in Purchase Decision			
Feature	% Very Important	% Somewhat Important	Average
Price	52%	24%	4.17
<i>Farm Fresh</i>	30%	25%	3.41
National Brand Name	22%	24%	3.21
Produced in Georgia	22%	20%	3.11
Store Brand Name	13%	19%	2.82
Produced on a Family Farm	14%	22%	2.80
Locally Produced	15%	15%	2.77

If the dairy does not use BST, “all natural” can also be added to label and this has provided for additional premiums on a nutritional basis.

Survey Conclusions:

The results from the survey indicate that a significant number of the respondents are interested in purchasing a premium locally produced milk product. In fact, nearly a quarter of the respondents indicated that they would be willing to pay more for a locally produced premium milk product. On average, the respondents are willing to pay about 15% more for a premium milk product. However, stated willingness to pay may not accurately reflect the consumer’s true willingness to pay when they actually are faced with a purchase decision.

The dairy should focus on producing whole milk, 2% and flavor milk products. These products were reported to be consumed and purchased most frequently. The most popular container size is the gallon container and fluid milk is most likely to be purchased at a supermarket or grocery store.

Estimating Moragn/Newton/Rockdale County Area Fluid Milk Market Potential:

The principles of determining market share and market potential are the same for all geographic areas. First determine a customer profile (who) and the geographic size of the market (how many). This is the general market potential. Knowing the number and strength of competitors (and then estimating the share of business you will take from them) will give you the market potential specific to your enterprise. Using this approach, the estimated market potential for fluid milk consumption in three-county is:

Table 13. Three-County Estimated Fluid Milk Consumption by Age (Reported in Gallons Per Capita)			
Morgan/Newton/Rockdale County (Total population in 2005 = 182,210)			
Age Breakout	County Population figures 2004 Census	Gallons Consumed Per Capita*	Annual Consumption (Gallons) by Age
Less than 6 yrs.	12,989	28.4	368,888
6 - 12 years	28,817	25.5	734,846
13-17 years	13,513	23.5	317,551
18-34 years	37,245	12.1	450,666
35-49 years	55,491	10.5	582,657
50-59 years	9,286	8.9	82,649
60+ years	24,868	8.0	198,945
Total estimated Annual Per Capita Consumption of Fluid Milk in Gallons for Morgan, Newton, and Rockdale Counties			2,736,201
* Age group per capita consumption figures were taken from NFO Research Inc published in the International Dairy Foods Association’s <i>Milk Facts</i> , 2003			

Based on estimated fluid milk consumption for the three-county area, there appears to be sufficient volume to allow the dairy to enter the market. Using the adjusted willingness to purchase a premium locally produced milk product figure of 44% found in Table 9, it is possible to obtain a better estimate of what the dairy might be able to sell.

Forty-four percent of approximately 2.7 million gallons of milk annually equates to 1.2 million gallons. Assuming that the dairy can capture 10% of this potential, the dairy *could potentially sell 120 thousand* gallons of fluid milk annually in the three county area. These figures are based on accessing consumers residing within what is assumed to be a reasonable delivery area around the dairy.

Estimated Market Potential Polk County:

2,736,201 Thousand gallons of fluid milk consumed annually
 x 44% of respondents would purchase locally produced premium milk
 1,203,928 thousand gallons of fluid milk market potential

Assuming the dairy can capture 10% of this market potential the dairy could potentially sell 120,393 gallons of fluid milk in the area. Assuming that the milk can be sold for \$4.10 per gallon, the stated current price consumers are paying plus the 15% average premium they are willing to pay, the dairy’s total revenue is estimated at \$493,610 annually on sales of 120 thousand gallons of milk.

Gallons Sold		Price Per Gallon*		Total Estimated Revenue
120,393	X	\$4.10	=	\$493,611

* Retail price per gallon for plain whole milk from Table 7 plus the average stated premium of 15%, Table 11.

This retail revenue estimate assumes that the dairy can produce the 25 thousand gallons per year as well as that all sales are of plain whole milk by the gallon. However, the dairy will receive a wholesale price for their milk products if they sell through established retail outlets and not directly off the farm.

Gallons Sold		Estimated Wholesale Price Per Gallon*		Total Estimated Revenue
120,393	X	\$3.28	=	\$394,889

* 80% of retail price per gallon for plain whole milk from Table 7.

Assuming the dairy is able to produce and sell roughly 120 thousand gallons of milk, it can expect to earn a total of \$394,889 annually. Remember, this does not represent a profit but total revenue with no deductions for cost of production and marketing.

Annual sales of 120 thousand gallons (or approximately one million pounds) of milk for the estimated \$394,889 translates into roughly \$38 per hundredweight (cwt) of milk compared to the average southeast federal order price of about \$16. On-farm processing should be viewed as a separate enterprise from milk production. Additional financial analysis is required to determine whether the additional \$22/cwt is sufficient to profitably cover all processing costs.

Likelihood to Take Farm Tour

Survey respondents in the original survey were asked how likely they would be to participate in a farm tour of a working dairy. The results indicate that, on average, the respondents were somewhat likely to participate in a working dairy farm tour. Again, the adage that “build it and they will come” does not necessarily apply. Therefore it is important to gauge interest in an agritourism operation before starting. The median response to the question likelihood to participate reinforces the data in table 15 and suggests that area residents are somewhat likely to participate in the working dairy tour.

Likelihood	Percent (n=267)
Very Likely (5)	24%
Somewhat Likely (4)	39%
Neutral (3)	14%
Somewhat Unlikely (2)	8%
Very Unlikely (1)	15%
Mean	3.49
Median	4.00

Approximately one-quarter (24%) of the respondents indicated they were very likely to take a working dairy farm tour with an additional 39% reporting they would be somewhat likely. It has been proven through research that stated purchase intentions do not match with actual purchase behavior. To address this issue, the data can be adjusted to reflect industry standardization of these responses. According to industry research, it is assumed that 80% of respondents reporting they are likely to purchase a product actually follow through. The percentage falls to 60% for those that respond somewhat likely.

Adjusting the data in Table 16 reveals a more realistic purchase intent. After adjusting the data, it is estimated that 42% of the respondents would follow through and participate in a working dairy farm tour.

Response	Actual Response	Adjusted Response
Very Likely	24%	19%
Some what Likely	39%	23%
Total	63%	42%

The Morgan County farm is already in the business of conducting school tours at a rate of about two to three tours per week. The average tour consists of about 30 students and costs \$5 per student for a total of \$300 - \$450 per week. With approximately ? schools within ? miles of the farm, there is a possibility of between ? and ? tours per school year based on the above likelihood of an actual response.

Financial Analysis

Financial Evaluation

Due to a limited amount of information about potential markets for the dairy at this time, and the drastic differences in equipment costs for small-scale dairy processing and bottling, a very broad financial evaluation is being presented. The evaluation attempts to present some general directions of start-up, variable and operating costs for some given scenarios. It also provides a general indication of the market requirements (sales) for operating at a break-even level. The general format for this evaluation was developed through a computerized spreadsheet and revisions can be made to better model potential outcomes as more and better information becomes available.

General Financial Numbers in Dairy Processing

Determining financial projection in the dairy processing industry is extremely difficult. This is due to the wide range in the costs and profitability between individual firms within the industry. This range is attributed to the economies of scale associated with the milk processing and bottling, and a firm's ability to penetrate the market.

The dairy industry ranges from extremely large, low-cost processors to small high-cost processors who utilize niche markets in order to provide the firm with the necessary gross margin to stay in business. The large low-cost processors normally produce on a small profit margin with the volume decreasing their fixed costs per unit, and giving them a competitive advantage. The smaller producers develop the niche market through packaging (glass bottles), taste or some other form of product differentiation. It is also important to understand that processors who market retail products attempt to increase the number of product lines that they sell in order to better penetrate the market.

Since most raw milk costs the same for the processors, the only way for a small firm to pay for the increased cost of processing their milk, is to be able to pass that cost on to the consumer in the form of a higher price. This requires the producer to find the market that provides for the larger gross margin needed. For this analysis, it was assumed that the processor/dairy paid the dairy enterprise the current market value for the raw milk being processed. If the dairy processed the raw milk instead of selling it, it is giving up the opportunity to sell the milk at the current market rate, and thus is an opportunity cost for the entire farming operation.

Costs associated with processing a gallon of milk include raw milk (an opportunity cost to the dairy), labor, supplies and packaging, utilities and plant (building and equipment) costs. Currently, raw milk prices are around \$18.00 per hundred weight or around \$1.55 a gallon. These costs have varied greatly during the last two years with the range being between \$12.00 and \$22.00 per hundred weight.

Labor costs generally go up per gallon as the plant size decreases. Labor costs for medium to large size plants range from \$.07 to \$.17 per gallon. We are assuming a labor

cost of \$.20 per gallon for this facility. Labor costs have been shown to vary more with plant efficiency than wage rate.

Packing supplies generally range from \$.07 to \$.10 for containers assuming sufficient plant size for them to be blown on site. Due to the small size of the plant under consideration, it was assumed that container cost would be around \$.20 from the higher shipping costs for bringing in the containers.

Utility costs vary depending on location and plant efficiency. On a per gallon basis they range from just under \$.02 to \$.0425 so a very conservative estimate \$.05 a gallon was used for this analysis.

Plant costs are difficult to estimate due to the variation in the costs of the plants already in production and the different depreciation methods used by those firms. The cost of a building and equipment for processing milk can range from \$250,000 into the millions, depending on the efficiency of the equipment and whether it is new or used. For this analysis, three different plant costs will be considered. An example of the processing and bottling system that is on the high cost end is demonstrated below in Table 17.

Table 17. Start-up requirements for milk processing and bottling	
Equipment and estimated costs necessary for fluid milk processing	Cost
1. Raw Milk Silo	\$50,000
2. Separator/Clarifier/Standardizer	\$250,000
3. High temperature/short time pasteurizer on skid	\$225,000
4. Homogenizer	\$150,000
5. Intermediate Storage Tanks	\$50,000
6. Filler (half and full gallon)	\$100,000
7. Code Dater	\$10,000
8. Chiller	\$40,000
9. Pumps & Valves and Misc. Plumbing	\$125,000
10. Casers, Stackers, and Conveyers	\$200,000
11. Refrigeration Storage	\$100,000
12. CIP System (Cleaning)	\$40,000
10. Installation	\$300,000
Approximate Total	\$1,640,000
As discussed with John Wandryk of Crouch Engineering, Fort Worth, TX and Ginny Mathis, Crouch Dairy Systems, Knoxville, TN	

It is important to note that the above costs do not include the cost of constructing a building for both retailing the milk product and one for processing the milk product. It should also be noted that the type of building used for processing must meet a 3A hygienic standard which makes it more expensive to build.

Additional costs that must be considered are the cost of marketing the processed milk. This would include both the physical aspects of getting the milk to the marketplace as well as promotional considerations as well. However, if the processor chooses to sell the milk on-site, then a delivery system would not be required. These costs can be significant for the smaller producer and range from a low of \$.04 a gallon to \$.30. It will be assumed for this analysis that the milk is to be sold at a farm store, on-site, and that there is no promotional budget.

Break-even Analysis

The break-even analyses presented here are based on a number of cost estimates and random price variations for the retail products. Given the very limited amount of information and production "specifics" available to conduct this analysis, three different analyses of costs were made - referred to as the "over-estimate", "estimate" and the "under-estimate." First, best estimates were made in the process design and assignment of costs for the processing equipment. After receiving a range of estimates, the high and low were averaged to come up with the "estimate". The high was used for an "overestimate" with the low being used for the "under-estimate". The processing and retail facilities cost was also estimated and then a twenty percent cushion was added for the "over-estimate" and subtracted for the "under-estimate".

START-UP COST ESTIMATES:

Retail Facility	\$80,000.00
Processing Facility Construction	\$100,000.00
Milk Processing Equipment.....	\$880,000.00

Similarly, annual costs to run the retail shop were assumed to be \$43,000 (estimate). The high and low estimates were \$51,600 and \$34,400 respectively which came from a twenty percent buffer on each side of the estimate. Estimates were also made on a per unit (gallon) basis for on-farm processing and co-packing for milk utilizing the expected production level of the farm of 100,000 gallons per year.

PER UNIT COST ESTIMATES: (including estimates for overhead)

Annual Retail Facility Overhead.....	\$43,000.00
On-Farm Milk Processing.....	\$2.00/gallon

The estimates for the start-up costs were derived from a combination of sources. Similarly, per unit cost estimates were also based on best guesses and available data. While useful, the cost estimates here should be used only as a direction rather than an exact representation. Co-packing was another option that was looked at for small dairy producers instead of on-farm processing. For this study co-packing was defined as having the raw milk processed and bottled by another off-farm processor, while preserving the identity of the milk product. It ends up that co-packing prices were impossible to obtain because no other processors wanted to deal in the small quantities that would come from a 50 to 100 cow herd, while keeping the identity of the milk.

The break-even charts that follow provide information on quantities needed to break even at different retail price levels. The break even represents the quantity (gallons) of milk that must be sold to cover the estimated annual cash repayment on start-up costs, the estimated annual operating costs for running the retail outlet and the estimated per unit cost of production.

According to the break even tables, it is obvious that to be competitive with existing dairy product prices, at a sales price of \$3.50/gallon, somewhere between 33,000 and 234,600 gallons of Applicant's Farm milk must be sold each year to break even. At higher sales prices (\$4.00, \$4.50 & 5.00 per gallon) fewer total units must be sold to break even. However, historically, the market potential tends to decrease as the sales price gets higher.

If it is assumed that 100,000 gallons of milk will be processed and sold each year then we can also calculate the break-even price. For the over-estimate in equipment costs the break even price would be \$4.98. For the estimate and under-estimate the break even price would be \$3.61 and \$2.22 respectively. These prices are all well with-in the current market for milk in Georgia with the price for a gallon of milk at the retail level being between \$3.50 at Walmart and \$5.03 at Pet. However, the current milk market is volatile and these current prices may not hold long enough for decision making purposes and historical prices should probably be utilized.

**BREAK EVEN ANALYSIS
---MILK--**

OVER-ESTIMATES

Table 18. Break Even Sales for Processed Milk				
Sales Price Unit Cost	\$3.50/Gallon	\$4.00/Gallon	\$4.50/Gallon	\$5.00/Gallon
\$2.40 Fresh	234,603 gal.	161,290 gal.	122,887 gal.	99,255 gal.

Annualized investment Costs for Fresh: \$206,464, Annualized investment Costs for Co-Pack: \$13,349, Annual Retail Facility Overhead: \$51,600

ESTIMATES

Table 19. Break Even Sales for Processed Milk				
Sales Price Unit Cost	\$3.50/Gallon	\$4.00/Gallon	\$4.50/Gallon	\$5.00/Gallon
\$2.00 Fresh	107, 277 gal.	80,457 gal.	64,366 gal.	53,638 gal.

Annualized investment Costs for Fresh: \$117,915, Annualized investment Costs for Co-Pack: \$11,124, Annual Retail Facility Overhead: \$43,000

UNDER-ESTIMATES

20. Break Even Sales for Processed Milk				
Sales Price Unit Cost	\$3.50/Gallon	\$4.00/Gallon	\$4.50/Gallon	\$5.00/Gallon
\$1.60 Fresh	32,976 gal.	26,106 gal.	21,605 gal.	18,427 gal.

Annualized investment Costs for Fresh: \$28,255, Annualized investment Costs for Co-Pack: \$8,899, Annual Retail Facility Overhead: \$34,400.

**MARKET POTENTIAL & FINANCIAL BREAK EVEN ANALYSIS
COMPARISON**

Market & Financial Comparison

Although the cost estimates are "rough estimates" at best, the analysis provides significant insight to the significant costs, volatile market and risky proposition at hand. Managerial ability, marketing savvy and the negotiation of "good deals" have the potential to minimize the risks, costs and market challenges.

High start-up costs (\$250,000 - more than \$1 million) require huge sales (18,500 to 176,500 gallons) at premium prices (more than \$3.50 per gallon for milk) For example, Mayfield ice cream has an estimated 1.3% of the entire ice cream market and Breyer's, a national company, has 19.8% of the market.

If the applicant decides to pursue this venture, it is suggested that "specific" production or co-packing plans be made, cost estimates should be obtained and marketing plans developed. Then, a complete financial analysis (3-5 years cash flow and income statement) should be performed.

Conclusion:

There appears to be sufficient market potential for the proposed on-farm milk processing milk products. However, it will be important to package the products according to consumer preferences and have them retailed where shoppers go to purchase milk products, i.e., grocery stores and convenience stores. The project looks to be feasible if the dairy can sell approximately 80,000 gallons of milk at a retail price of around \$4.00 per gallon.

The Center for Agribusiness & Economic Development



The Center for Agribusiness and Economic Development is a unit of the College of Agricultural and Environmental Sciences of the University of Georgia, combining the missions of research and extension. The Center has among its objectives:

To provide feasibility and other short term studies for current or potential Georgia agribusiness firms and/or emerging food and fiber industries.

To provide agricultural, natural resource, and demographic data for private and public decision makers.

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J. Scott Angle, Dean and Director