MILK MARKETING AND PROCESSING

FEASIBILITY STUDY

Submitted to:

U.S. Agency for International Development

by

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SUMMARY

It was found that potential exists for the creation of a national dairy cooperative organization collecting milk from the various production regions through the operation or 30,000 liter collection and cooling stations which would be capitalized by a systematic retention of approximately one Lempira cent per liter of milk marketed through the system. In some areas it will be necessary to upgrade existing collection and cooling stations while in other areas new stations will have to be organized. The cooling equipment recommended is a standard plate cooling system with an insulated 8,000 gallon tank and systems for producing ice water as well as an electrical generation unit and waste disposal systems appropriate for this kind of operation.

It will also be important to establish uniform standards for testing and monitoring quality of milk received as well as pricing structure based on increased prices for increased butter fat content and penalties for low butter fat content, water and/or other impurities. Additionally, unsanitary cheese and/or milk manufacturing/distribution facilities should be controlled and closed down on sanitary grounds.

Much work also needs to be done on improving the quality of the milk on the farm by upgrading quality of animals, pastures and hygenic practices in handling cattle and during milking. The pricing structure must reward good quality milk, however.

Future consideration should be given to organizing a milk processing industry in the Choluteca area after they are able to successfully operate a plate cooler collection station and volume expands in the producer regions.

The practice of dealing with milk hauling contractors instead of with the producers directly should be phased out. Ideally, truckers should be paid for the amount of milk transported but title should be retained by the producers and/or their association. This can assist direct interaction between the plant and the producers and can also assist in reducing impurities introduced into the milk by the buyers - who are not producers.

by ACDI/Washington

I. INTRODUCTION

This report was prepared following a field study of milk collection systems and visits with producers, dairy leaders and processors in Olancho, Choluteca, San Pedro Sula and the Aguan Valley. The field work was conducted April 11 through April 20, 1983, by Kirby Carpenter, Private Consultant, and John Loken of Land O'Lakes, Inc. The scope of the report is to analyze how milk collection stations might be technically structured and economically organized.

II. AREA STUDIES

In this section the areas of Choluteca, Olancho, Aguan Valley and San Pedro Sula will be reviewed individually along with our recommendations.

a. Olancho

We visited the collection station at Juticalpa, an officer of the cattlemen's association and several plant employees. Tulio Felinares of the Ministry of Natural Resources who has been associated with the station assisted us with the visit.

Observations

1. Milk is being cooled too slowly.

2. Volume at collection station is increasing.

3. Truckers are hauling farmers milk for a fee; they are not milk buyers.

4. Sediment, water adulteration and high acid milk are problems

5. Farmers are beginning to consider themselves as "milk producers" rather than "cattlemen."

6. Dry season volume is one-half that of rainy season.

7. Milk volume and cow numbers could be increased by present farmers through better nutrition and management practices.

8. Olancho had originally been a dairy area, had moved toward meat production during the period of high beef prices but is once again depending on milk production.

9. The collection station uses written marketing agreements with producers that committ the station to buy all of a producer's milk, even in the rainy season. Their policy is not to buy milk from farmers who offer milk only in the rainy season, however, if the station had capacity they would buy this milk at a discounted price.

10. The price of milk is uniform the year around and does not go down in the rainy season and up in the dry season.

Based on what we saw and heard, Olancho will increase milk production and be regarded in the long-term as an important milk production area. Our first recommendation is to add a plate cooler at Juticalpa collection station to speed up cooling. There is already an ice builder operating on the premises which may or may not have adequate capacity to handle the receiving/cooling function. Catacamas seems ripe for milk collection development and reports indicated milk collection potential farther up the valley. Sula and/or a local group are currently discussing the building of a collection station at Catacamas; we support a station there or in that area. The highway from Catacamas to Teguciqalpa is relatively good and would make it feasible to move milk in for bottling as far as time and distance are concerned. The very rapid increase in milk marketing through the collection station, from 1, 329,350 liters in 1979 to 5,165,258 liters in 1982 coincides with the availability of adequate infrastructure.

b. Choluteca

We travelled extensively in the Choluteca area and visited with members of the cattleman's association.

Observations:

1. There was much interest in a better milk market, especially since beef prices are so low.

2. Farmers were progressively adopting new and improved practices.

3. The most common cattle genetics were 3/4 Brown Swiss and 1/4 Brahman

4. Dry weather feed is short due to the long dry period and because agrarian reform groups are getting much of the dry weather pastures with no means to buy or manage cattle.

5. Producers want a processing plant to bottle fluid milk in Choluteca

6. Most cows appear to be milked, though volume could be increased through technical information and better cattle nutrition.

7. Several cheesemakers operate in area. Cheese is made under deplorable conditions; they pay L.30/liter in the rainy season, though one producer reported getting L.70 in the dry season.

8. Cattle are abundant.

9. Choluteca is a traditional cattle producing area.

10. Choluteca is a large market for milk and processing dairy products, though not a well-developed market at this point in time. Several farmers reported having a house to house milk route.

Recommendations:

We recommend a collection station with plate cooler be installed at Choluteca as the first part of a long-term plan to establish a fluid milk processing and packing operation. Currently, there is not sufficient milk to both support a bottling plant and supply the cheesemaker's needs. A collection station will stabilize the milk market and price in the area; it will represent an increase in market size to stimulate additional milk production, and could assist Sula at Tegucigalpa in meeting fluid needs in the short run. As milk production comes up, a local bottling operation could be added to the cooling station and the market cycle could be completed in the Choluteca area: production-processing-consumption. The cattlemen's association has grounds and buildings in Choluteca complete with a good well. Informally, members indicated interest in placing a facility on their grounds and in utilizing their well.

Producer leadership in the Choluteca area has resisted previous Sula attempts to ship milk out of the area for the Tegucigalpa market. Producers also indicated they want top prices and a year around stable market, two things which generally do not occur together. Before actual collection station establishment, some sales work needs to be done to show producers that shipping milk out of the area is a temporary measure until milk supply is adequately to build a bottling plant adjacent to the collection station.

c. San Pedro Sula

We visited several parts of the San Pedro production area and had several other contacts in the area. At La Entrada, a local cooperative, COPROLAVE, runs a farm supply and milk collection station. The collection station is running at one-half or less of capacity and does not cool the milk well. Sometimes the milk arrives at the Sula Plant at 20°C. Sula Plant personnel report that the milk is the poorest quality they receive. If the cooling station were running at capacity Sula could afford to send a tank truck to pick up milk. Currently, milk is placed in cans out of the bulk tank and hauled in an open truck to the Sula Plant. Conceptually the COPROLAVE group is ahead of much of the country in promoting milk production with their feed mill, farm supply store, fuel supplier and collection station.

A group of three milk buyers from San Juan visited Sula Plant management while we were present. While San Juan has traditionally been served by the LEYDE Plant at La Cieba, these buyers are seeking a new market. These private entrepreneurs buy milk from farmers; pick up the milk in their trucks, and haul it to La Ceiba. They sell the milk to LEYDE. This is a different arrangement than in Olancho where truckers do not buy the milk, but are only paid for a hauling function. The milk buyers from San Juan indicated that LEYDE was cutting back the amount of milk they could deliver and that left the buyers with excess milk. This was, in fact, not due to excess milk but due to LEYDE's policy of buying only from producers who sold LEYDE milk in the dry season as well as the rainy season. LEYDE indicated the buyer arrangement had been helpful in the formative years, but was a read administrative headache now because LEYDE had no direct relationship with the producer and as a result the milk quality was the lowest being received. The San Juan buyers indicated they could buy and supply more volume than they presently handled; the three now deliver 4,600-6,700 liters per day, and indicate that 12,000 liters per day would be available from the area. We were unable to verify these numbers. San Juan is 160 km. from San Pedro Sula, and 57 km from La Ceiba.

Milk buyers are the party interested in a station at San Juan but producer interest and support is what is really needed to establish a station.

We attended a meeting of milk buyers and farmers in the Quimistan area. One buyer presently hauled for Sula and others for cheesemakers. There is no cooperative umbrella organization to build around in this area. Producers were concerned about having a more stable milk market than they had known in the past. Cattle were primarily Brown Swiss/Brahman cross. Producers indicated they wanted technical assistance and not more credit.

Recommendations for San Pedro Sula area:

We recommend upgrading the cooling capacity of Lan Entrada collection station. This would entail purchase of a plate cooler, ice builder, water circulating pump and trading the present generator for one large enough to handle a larger load.

We recommend that a collection station at Quimistan be installed to provide market security and stimulate more total milk production. This will require that the current milk buyers discontinue as buyers and serve only as haulers. We believe all evidence points toward the wisdom of a direct plant/producer relationship. The economic jolt to the buyers from such a move could be partially or totally offset by shorter hauls and the opportunity to serve more producers.

Milk Received from the Collection Centers During the First 3 Months of 1983

PROLACTA, S. de R.L.	6,250	104,662	104,844	124,964	334,470
Planta Rec. Hicaque	8,000	100,382	106,002	149,802	356,186
COPROLAVE	6,500	89,592	78,181	84,836	253,609
J. Colindras Reyes	3,000	25,248	22,247	23,607	71,102
Centro Rec. San Manuel	1,250	823	1,311	3,000	5,134
Asoc. Agrop. Cholomena	8,500	136,082	145,501	182,813	464,396
Centro Rec. Villanueva	8,300	41,886	40,467	44,637	124,990
Liters		498,675	499,553	613,659	1,611,887

d. Aguan Valley/Olanchito

We visited Olanchito and were briefed on the livestock situation and Swiss projects in the area by a Swiss representative and a representative of Ministry of Natural Resources at Olanchito.

The Swiss currently have a small cheese plant operating at Santa Barbara and are building a new cheese plant at San Lorenzo. LEYDE was procuring milk as far as the Sava. From Sava to San Lorenzo the milk moved into cheese. The Swiss had originally planned a complete processing plant in the upper Aguan Valley, but had settled instead for smaller cheese only plants. The Swiss have also implemented a technical assistance program involving agronomists and livestock specialists. Despite these efforts the cattlemean adhere tightly to their tradition as beef producers. Most of the land is used for grazing and was dry when we visited. We were told it was a normal dry season. The milk production response to a formal market has not been as positive or significant as in Olancho.

Much of the milk producing area serving La Ceiba has a milk flow pattern opposite that of the remainder of Honduras. In this area milk flow is highest in the dry season, since the rainy season is so wet that pasture production is reduced. This reverse cycle is a real asset to the entire country. LEYDE has a base of 25-30 large producers and about 265 smaller producers most of which are served directly by LEYDE. Three milk buyers from the San Juan area bring milk to LEYDE. LEYDE indicated they were short of cream as was the case with Sula.

Recommendations for Aguan Valley/Olanchito

Based on the presence of the Swiss and their readiness to expand processing as soon as milk is available; and based on the farmers perception of being beef producers, we recommend no collection station development beyond Sava at this time. However, there may be an opportunity for a collection station in the Sava area as LEYDE's need for fluid milk grow. A farmer controlled station could relieve LEYDE of the procurement function while still providing needed milk. This need could develop within 1-3 years.

III. COLLECTION STATION RECOMMENDATIONS

We recommend collection stations that utilize plate cooling technology with 30,000 liters capacity for the reason that cooling is performed more rapidly than in refrigerated tanks and they lend themselves easily to expansion via the addition or enlargement of the storage tank. Secondly, at volumes somewhere around 20,000 liters per day capacity, plate cooling systems represent the same investment as the bulk tank alternative. Plate cooling systems offer more assurance of achieving ample cooling based on our observations.

While present volumes do not demand 30,000 liter per day capacity in any 50 km. diameter area we visited, the investment is only slightly more than 10,000 liters daily capacity of "bulk tank" style design.

It is our opinion that the best use of USAID funding would first be to upgrade present collection stations to achieve cooling below 5°C. This in reality would upgrade the quality of milk received by bottling plants which would asist them to be more profitable and/or pay more for milk. The upgrading of collection stations would involve purchase and installation of a plate cooler $7,500, an ice builder $29,300, a circulating pump $1,800, electrical and piping hook-ups, and perhaps upsizing the generator.

Cost alternatives for both 10,000 liter and 30,000 liter capacity are on page 10 and 12.

IV. MONITORING MILK QUALITY

Milking is done almost exclusively in a fenced area where a cow and her calf can be tied together to stimulate milk let-down. At the best of times conditions are dusty, and during the rainy season mud and manure fall from the cow and milker into the open milk bucket. We saw no strainers being used on the farm and as evidence of that, signs posted in collection stations requested farmers to strain milk on farms. Screens and filters at collection stations were literally clogged with sediment, foreign material and mastitic milk. It should be noted we visited one farm and drove by another in San Pedro Sula area where cows are milked on concrete in stanchions after being washed off. Farmers lacked understanding of the why's and how's of producing clean milk; some lacked motivation as well. Part of this is a lack of technical education but another part is self perception. To a farmer who perceives himself as a cattleman, selling milk is a way to pick up some money on the side. To a farmer who looks on himself as a milk producer there is a desire for technical production information and assistance as a point of pride and out of commitment to the milk production industry.

At collection stations we found the alcohol test being used to detect high acid milk before it is dumped and spot use of the lactometer to detect added water. LEYDE used a cryoscope to check producers' milk for added water on a regular though not constant basis. They used a light refraction device to test every producers milk at time of delivery for added water. Water adulteration seemed to be a problem in all areas. Sula makes a deduction of 20% when added water is found and this has provided sufficient incentive to keep producers from deliberately adding water. Sula checked both producers who deliver direct and collection station shipments for acidity level by titration and for bacterial activity by methylene blue. On the day of our visit, 5% of Sula's incoming volume was high acid and it was reported to be more of a problem in the rainy season. The methylene blue test should be five hours or more (indicating low bacterial levels and activity); reports at the Sula plant showed a few over three hours and many below one hour, not uncommonly down to 10-15 minutes.

High acidity and poor methylene blue tests indicate bacterial activity. Bacterial contamination begins on the farm due to dusty or muddy conditions in the milking area. Many milk cans are in poor condition from rust and dents and are not cleaned well. No soap or detergents were in evidence in any collection stations and if cans were cleaned at collection stations all too often it was with a cold water rinse and a rag. Milking can take several hours at the farm and the trip to the collection station takes up to five hours. The common radius serviced by a station was 25-40 km. although we found milk traveling 145 km. to a collection station. These long intervals at high milk temperatures further incubate and multiply bacteria. Collection stations were not able to cool milk as quickly as desired, resulting in bacterial increase and introduction of air from extended agitation. At Juticalpa, cooling was completed 7 hours after the first milk arrived at the plant; from La Entrada station the Sula Plant has received 20°C milk due to poor cooling and the practice of putting cooled milk into cans for the trip to the Sula Plant. All of the collection stations visited used unmodified farm bulk tanks for cooling and storage and the usual cooling time was 4-5 hours to achieve 3-7°C. The school herd at El Zamorano had 2 cooling systems: a cooling plate and a modified farm bulk tank. Their bulk tank was ordered from the manufacturer to be filled 100% in 2-3 hours and was to complete cooling 1 hour after filling; management reported it took 1-1½ hours to cool after filling. They did not use the cooling plate in conjunction with the modified farm bulk tank. The cattlemen in Olancho operate a small cooling station at San Francisco de Becerra that employs a plate cooler using ground water with a farm bulk tank completing cooling. We could not verify the effectiveness of this system.

Our findings regarding the ability of collection stations to rapidly cool milk parallel those of earlier studies - the stations fall far short of the hour desired cooling time and in some cases do as much harm as good with the constant agitation and slow cooling. Excess agitation introduces oxygen to milk and causes butterfat to become rancid.

Although some earlier reports indicated farmers were being paid on the basis of butterfat content, we did not find that per se, butterfat is considered in the "A-B" classification at Sula. The Sula Plant pays 4½ cents per liter more for cold milk than for warm milk and considers acid, methylene blue, butterfat and sediment in classifying milk either as A or B. Sula also deducts for added water as mentioned above.

We visited one cheesemaking operation at Chuluteca and found cheese being made in concrete vats, flies were everywhere, plastic pipes were used for milk distribution; they can not be washed. Conditions are generally unthinkably dirty and unsanitary for food processing. This type of low overhead food handling in a unsophisticated market makes it more difficult for clean, properly equipped milk processing plants to compete at the farmer level for milk.

The receiving standards at LEYDE set it apart from other plants we visited. Every producer's cans of every delivery are checked for sediment and acid milk. Every shipment is checked for added water with a light refraction tester. Further, a sample is taken from each producer's shipment, immediately iced and taken to a central lab at the La Ceiba Plant for methylene blue, cryoscope and whiteside tests. These tests are made for both collection stations and for direct delivery. Also, milk found to have high acid at the receiving area is double checked by acid titration. This was definitely the best administered, quality monitoring of raw milk we found. Dr. Carlos Cerna DVM is in charge of quality control at LEYDE.

Conclusions

1. The farm milking environment is generally poor and heavily contaminates milk.

2. Long travel times in rusty, poorly washed cans, contribute to high bacterial activity.

3. Agitation and slow cooling at stations further contribute to the bacterial problem and deterioration of milk quality.

4. Water adulteration is a universal temptation and problem.

5. Queseros have a distinct competitive advantage to buy milk due to very low investments and unsanitary processing conditions.

Recommendations

1. That uniform standards be adopted by the dairy industry and actually practiced.

   a. To reward the dairymen doing a good job and provide incentives to the poor producer to upgrade quality.

   b. To upgrade the quality of milk supply.

   c. To upgrade the quality of dairy products produced.

   d. To avoid unfair competitive advantages that could accompany helter skelter adoption of standards.

      Those standards to include:

      1. Recognition by milk buyers of the value of butterfat (and/or solids) in establishing price to the producer.

      2. A testing and quality monitoring system for raw milk modeled after that used by LEYDE.

         Farmers should receive a report of tests done and understand what the tests indicate and what standards are expected.

         Minimum standards should be established; the industry should adopt the practice of refusing milk testing below minimum. These minimums and a phase-in program for producers would best be determined by present dairy industry leaders and government enforcement agency representatives sitting together to plan their own program.

3. The industry should work in a phased program and in concert to raise minimum standards for milk over a period of time. Individual plants should be encouraged to set up payment incentives for milk above minimum standards.

Example of Pricing Scheme Recognizing Butterfat

B.F.	PRICE
3.9	Base Price + .07 lps/liter
3.8	Base Price + .06 lps/liter
3.7	Base Price + .05 lps/liter
3.6	Base Price + .04 lps/liter
3.5	Base Price + .03 lps/liter
3.4	Base Price + .02 lps/liter
3.3	Base Price + .01 lps/liter
3.2% B.F.	Base Price
3.1	Base Price - .01 lps/liter
3.0	Base Price - .02 lps/liter
2.9	Base Price - .03 lps/liter
2.8	Base Price - .04 lps/liter
2.7	Base Price - .05 lps/liter

These price differentials may not properly reflect the value of butterfat, the table is included only to illustrate the concept of base point pricing and not to suggest the amount of differentials.

V. COST ALTERNATIVES - COLLECTION STATION

A. ALTERNATIVE ONE

10,000 liters/day

This is an attempt to minimize investment using the simplist technology possible and to apply it to the smallest daily quantity (10,000 liters) appropriate for bulk truck movement to a central processing plant. Three 1,000 are farm bulk tanks are utilized, however, they are equipped with large compressors selected to cool a full tank of milk. Filling is expected to take three hours or more and cooling will be completed in one hour or less after filling is complted. Each tank would be equipped with 2-3 h.p. compressors for an electrical loan of 13,600 watts. These refrigeration units also utilize a special heat exchanger designed to increase efficiency and heat water as well, thus the need for an insulated tank ahead of the water heater.

We have recommended the use of a scale mounted dump tank which would weigh each producers total shipment after dumping the cans and provide an opportunity to get a representative milk sample for testing purposes. This $3,000 expense and the 1 h.p. pump are not absolute requirements to permit the cooling station to function. Use of the pump permits faster and simultaneous filling of all three tanks so that maximum cooling rate is achieved.

Can washing is done manually using 3 vats. The first vat is filled with cold water and is simply a pre-rinse to keep the second vat from loading up with milk so quickly. The second vat is filled with hot soapy water and is equipped with a large motorized brush over which the can is placed and washed. The third vat is a rinse solution containing a dairy santizer.

Power is provided by a 75 kw. diesel powered generator, full running load in the plant is expected to be 43,000 watts. The generator would be housed outside the building but under a lean-to roof.

An allowance of $4,100 for laboratory equipment is included which should permit each station to perform those tests outlined in other sections of this report. No doubt the least cost route to testing would be centralized testing if samples can be kept cold and moved to labs quickly. Central processing plants could provide this service since samples could be carried along with bulk milk trucks. Establishment of a central lab system would reduce both investment and operating expenses and improve quality of test results.

The labor requirement would include one person at the dump to sample, weigh and dump, and two people in can wash area, 7 days per week. Beside having a receiving function this group would provide maintenance and clean-up functions. If full laboratory functions are provided at the collection station level, the lab would require a full-time person five days per week and probably have time to assist in bookkeeping activities. The manager would assist with the receiving test (acid, sediment, water) and perform and oversee clean-up and maintenance as well as back-up for other plant workers.

ALTERNATIVE ONE

MILK RECEIVING STATION

10,000 Liters/day

Costs are Listed in USA $

Equipment Needed:

3	-	1,000 gal. farm bulk tanks each with 2-3 h.p. compressors and optional water cooled condensing unit to assist in cooling milk and providing hot wash water. U.S.$ 12,300 each	$ 36,900
		Wiring for above tanks	3,000
1	-	Receiving milk pump, 1 h.p.	1,300
1	-	Oil or wood fired water heater	1,000
		1,000 gallon insulated water storage for water heated by milk cooling units	2,000
1	-	2 h.p. milk load out pump	1,500
1	-	Galvanized vat with motorized brush for can washing, used	200
2	-	Galvanized vat, 36" L, 24" w, 18" deep, for pre-rinsing and santizing can rinse, 70 gal capacity	300
1	-	Can dump tank suspended on dial scale with surge tank, (may be available used) New	3,000
1	-	Diesel powered generator 60-75 kw.	14,500
1	-	Fuel tank for generator	1,500
		Misc. milk and water piping	3,500
		Misc. wiring, including main service	1,000

Building:

	32' x 52' (1,664 sq. ft.) at 12.00 ft.	$ 19,968
	Office furniture, etc.	1,000
	Laboratory equipment (full complement)	4,100
	Well	3,600
	Septic tank, 1,000 gal.	2,000
		$ 100,368

ALTERNATIVE ONE: Annual Operating Statement

Potential Annual Capacity = 3,650,000 liters
Assumed Annual Capacity = 1,800,000 liters

	U.S.A. $
Income:	
1,800,000 liters milk received at $0.25	$ 45,000
Total Income	45,000
Expenses:	
Depreciation 7 years	$ 14,285
Interest - average of years 1 thru 5	9,738
Manager/lab person wages at $6/day x 300	1,800
4 full-time labor at $3/day x 260	3,120
Misc. plant supplies: soap, brushes, gaskets	600
Fuel at 3.5/gal/hr. ave. x 8 hrs. x 365 x $2.00 gal.	20,440
Insurance	600
Laboratory supplies	1,200
Office supplies	600
Generator supplies, oil, filters, etc.	360
Total expense	$ 52,743
	$ .0293/liter
Interest and Debt Service	$ 30,293 per year or $ .01679/liter

B. ALTERNATIVE TWO

30,000 Liter/day

This proposal includes a scale hung dump tank for weighing/sampling/receiving, a pump to move milk through an ice water cooled plate and into an insulated 8,000 gallon tank. The tank, as priced, includes refrigeration coils installed but does not include a compressor as it is not expected to be needed where milk will be removed every day. A large unloading pump is included to speed outloading time.

We have included an allowance for a well and for a septic tank which may or may not be needed and the allowance may or may not be adequate.

Ice water is derived from an ice builder which runs throughout the cooling cycle and into the evening. The cooling plate is rated at 40 g.p.m. (154 liters per min.) and can cool full tank capacity in 3.2 hours. A 3 h.p. pump is used to circulate water from the ice bank through the cooling plate.

Can washing is expected to be done manually as in Alternative I. A second wash line may need to be installed as the plant nears capacity, and space should be provided at time of equipment installation to accommodate this need.

A generator is provided for by a wood or oil fired hot water heater with the primary use of hot water being can washing and equipment clean up.

A generator is provided for power and is adequate for full operation. Fuel consumption is expected to average 4.5 gal. per hour of operation.

Building costs are based on those experienced by the Olancho Cattleman at their Becerra Station.

ALTERNATIVE TWO
Milk Receiving Station
30,000 Liters/day

Can dump with scale	$ 3,000
2 milk pumps, $1,500 ea.	3,000
Plate cooler, 40 g.p.m.	7,500
8,000 gal. storage tank	23,000
Piping for milk	2,000
25 h.p. ice builder	29,300
3 h.p. ice water pump	1,800
Cleaning water plumbing	300
1 - used brush vat, motorized	200
1 - can wash tanks	300
0,1 or wood fived water heater, 116 gal. per hour	1,000
100' well	3,600
Septic tank, 1,000 gal.	2,000
Bathroom fixtures	200
100 kw. diesel generator	18,000
1,000 gal. fuel tank	1,500
(10,000 gal. fuel tank $5,000)	
1,600 sq. ft. bldg. at 12.00	19,200
Misc. electrical	5,000
Office	$ 1,000
Laboratory	4,100
Total	$ 126,000

ALTERNATIVE TWO
Annual Operating Statement

Potential Annual Capacity = 10,950,000 liters
Assumed Annual Capacity = 5,475,000 liters

	USA $
Income:	
5,475,000 liters received x $.025	= $136,875
Expenses:	
Depreciation, 7 year	$17,429
Interest, average of years 1 thru 5	11,970
Wages:	
Manager/lab person at $6/day x 300	1,800
5 full-time labor at $3/day x 260	3,900
Misc. plant supplies, soap, brushes, gaskets	1,800
Fuel at 4.5 gal/hour ave. x 12 hours/day x 365 x 4.00	39,420
Insurance	800
Laboratory supplies	1,800
Office supplies	900
Generator supplies	500
Total expense	$80,319
	$0.1467/liter
Interest and ($11,970) Debt Service ($25,250)	$37.220 year or $ .007 liter

VI. ORGANIZATIONAL STRUCTURES

Two organizational structures seem to offer the most opportunity for developing a framework to encourage dairy activities in Honduras. One would be the organization of local groups, most likely cooperatives, which could be formed into a national federation. The local entities would manage milk collection in a particular area. Further, the base groups could provide additional services to members; farm input sales or milk marketing or processing would be natural activities. It is doubtful that some smaller local cooperatives would support substantial technical assistance to its members. The formation of local leadership and the development of professional management capacity would be two of the challenges presented by this approach. Current practical realities of Honduran politics require that agrarian reform groups be taken into account in any model. As a practical matter, it is difficult to envision agrarian reform groups meshing smoothly into a cooperative of independent producers. Milk collection, in a local cooperative situation, might tend to be organized along historical or political lines rather than in terms of transportation efficiencies or proximity to the greatest amount of raw material. A second level organization could provide a framework for technical assistance to local cooperatives and for a conduit for credit. Processing operations and industry standards could also be attributes of a national cooperative.

A variety of organizations have operated in local areas of milk production. Some milksheds operate without any formal organization. Cattleman's associations are to be found in some locales. In some cases, they were originally formed to resist the agrarian reform. Producer's groups may be active socially and some sponsor events such as livestock exhibitions. There seems to be some degree of flexibility in these organization; they have changed their shape according to their needs. For instance, the group from Olancho is organized as a cooperative to pursue milk processing functions, such as cheesemaking. The same group is organized as a private business for purposes of its milk collection activities. The Choluteca cattleman's association has formed a private enterprise to pursue business ventures. These groups may tend to represent the larger producers, and they most certainly support the interests of independents rather than the interests of agrarian reform groups.

There are some local cooperatives functioning in the livestock sector and in milk collection. Balanced livestock feed production and farm supply sales are related areas in which some cooperatives have ventured. One such group is COPROLAVE at La Entrada, 130 kilometers southwest of San Pedro Sula. This cooperative has a bulk milk cooling station, markets milk, and operates a feed mill.

An alternative to the cooperative/federation concept is the formation of a national dairy cooperative. A country wide cooperative would permit direct membership both by independent producers and by cooperative groups. This approach would adapt easily to the supply side of the production, processing, marketing, consumption chain. A national dairy cooperative would provide technical assistance and production inputs directly to producers. Standards for milk quality could be established by this group and would be enforced at the point of milk collection. Centers for milk collection would be established at key points; quality of all stations would be monitored. Marketing would be effected directly through this system and would be facilitated by a producer owned plant or plants. The Sula Plant, whose divestiture is being studied by the government, would complement the processing and marketing goals of a national dairy cooperative. The administration of the milk collection and marketing activities would be centralized and would operate through a processing plant; this arrangement could provide for greater control, for efficiency and for economies of scale. A national dairy cooperative would fit into the current mode of milk production faster than would the cooperative/federation alternative. If a country-wide approach were not taken, then local cooperatives would have to be formed where none exist, and

independent producers would be formed into cooperatives. Further, agrarian reform groups could affiliate directly with the national cooperative; they would not be forced to join a local cooperative of independent producers.

A national dairy cooperative has sufficient merit to be considered as the preferred alternative to the cooperative/federation approach. An outline of some of the organizational details of a national dairy organization would seem appropriate as a preface to the specifics of the financing of local collection stations. Direct members would be entitled to one vote; they would participate with local cooperatives in the election of area and district steering committees. These area or district groups should be formed to provide communication with the national cooperative and to address local problems. In all cases, only active milk producers would be eligible for membership. Profits would be divided and capitalization would be levied on the basis of activity. In this context, activity is taken to mean the number of liters of milk marketed by a member in a given time period.

Cooperatives who were members of a national dairy cooperative would receive votes in relation to the activity of direct members. For instance, it could be determined or estimated during the first year that the average direct member marketed ten thousand liters of milk. Thus, a cooperative would be entitled to one vote at the national level for each ten thousand liters of milk being marketed. Cooperatives whose basic activities were outside of the mainstream of dairying could affiliate and participate on the basis of the milk they produced. Profits would be distributed and capitalization would be addressed on the basis of activity as in the case of direct members. Agrarian reform groups or cattleman's associations could join on the same basis as cooperatives.

Local collection stations would be financed in basically the same manner whether they were a part of a national dairy cooperative or a part of a local cooperative. The financial requirements of the collection station for operation expenses including debt service and a margin for profit would be determined and the producer price for milk would be credited that amount. In the case of the thirty thousand liter station, 1.5¢ per liter would be required. This is well within the current premium being paid for refrigerated milk and would allow for amortization of the station over five years.

The financial security of the organization would be based on member capitalization. Ten percent of a member's capital requirements would have to be paid in before services were made available. Again, it is suggested that members capitalize on the basis of their activity. Actual production figures, would be used to determine the amount of dairyman would be assessed for capitalization per liter of milk marketed. For example, it might be determined that it was desirable for a member's equity to be forty percent of assets. The ventures would be capitalized by figuring each member's activity as a percentage of the equity to assets ratio. The formula would apply to a national dairy organization or to a local cooperative. The unpaid balance to be capitalized would be deducted from the milk as it was marketed at a rate which would fully capitalize the member in two years.

EXAMPLE OF CAPITALIZATION
30,000 Liter Collection Station
Operating at 50% of Capacity on Annual Basis

Assume members equity should be 40% of total needed assets.

Total assets	=	$126,250.00	x 40%	=	$50,500.00
10% of $50,500.00	=	$5,050.00 "up front" capital			
45% of $50,500.00 in 12 months	=				
$22,725 ÷ 5,475,000	=	.004¢/liter			

Therefore, it is recommended that member capitalization be .005 cents per liter until members fair share is met or approximately 24 months.

10% of $50,500.00	=	up front capitalization	=	$ 5,050.00
.005 per liter shipped first 12 months				$27,375.00
.005¢ per liter shipped second 12 months				$27,375.00
Potential 24 month capitalization			=	$59,800.00

Recommendations

The formation of a national dairy cooperative would be beneficial. The organization would provide a framework for milk collection and for a variety of other activities including processing, marketing, and technical assistance.

Milk collection stations are feasible. Stations currently operating should be brought up to par with new stations. The cost of the station is reasonable compared to the benefit derived both from an economic and health standpoint.