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Seminar on Hatchery Management and Practices/Economic Factors of Livestock Production

Milk collection, processing and marketing in the coconut triangle region

Enhancement of milk quality, milk composition, resting, processing and marketing

Prepared by

O.S.P. Yalagala

Seminar Sponsored by

AgEnt Project
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The Agro-Enterprise Development Project
Colombo, Sri Lanka

June 1996

AgEnt

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AgEnt is a dynamic USAID funded private sector agro-enterprise development initiative successfully assisting companies and entrepreneurs with viable business/ marketing plans to expand existing operations or start-up new ventures targeted at both domestic and export markets

MILK COLLECTION, PROCESSING AND MARKETING IN THE COCONUT TRIANGLE REGION

ENHANCEMENT OF MILK QUALITY, MILK COMPOSITION, TESTING, PROCESSING AND MARKETING

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MAY 1996

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A B R E V I A T I O N S

CTMU	-	COCONUT TRIANGLE MILK UNION, WEERAGAMA, KULIYAPITIYA
NDB	-	NATIONAL DEVELOPMENT BANK, NO. 40, NAVAM MAWATHA, COLOMBO 2
AgEnt	-	A DYNAMIC USAID FUNDED PRIVATE SECTOR AGRO ENTERPRISE DEVELOPMENT INSTITUTION
MM	-	MILIMETER
C.C.D.	-	COMMISSIONER, CO-OPERATIVE DEVELOPMENT
J.T.F.	-	JANASAVIYA TRUST FUND
RRDB	-	REGIONAL RURAL DEVELOPMENT BANK
NLDB	-	NATIONAL LIVESTOCK DEVELOPMENT BOARD
ML	-	MILIMETER
L	-	LITRES
SNF	-	SOLIDS NON FAT
SLSI	-	SRI LANKA STANDARDS INSTITUTE

MILK COLLECTING, PROCESSING AND MARKETING IN THE COCONUT TRIANGLE REGION

ENHANCEMENT OF MILK QUALITY, MILK COMPOSITION, TESTING, PROCESSING AND MARKETING

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EXECUTIVE SUMMARY

This report is prepared for AgEnt, a dynamic USAID private sector Agro-Enterprise development initiative successfully assisting companies and entrepreneurs viable business/Marketing plans to expand existing operations or start-up new ventures targeted at both domestic and export markets. AgEnt now wishes to look at the domestic dairy industry with a similar vision, to consider assistance for the increase of domestic milk production, collection through uniform base of producer societies, enhancement of quality of milk through improved milk testing procedures, hygienic standards for milk handling, processing and marketing, improved quality value added milk products. The programme will also encompas the very small rural milk producer to increase the productivity of his one or two cows. The assistance would be considered by AgEnt according to AgEnt criteria, and more specifically on a 50/50 cost sharing basis.

Overview of milk collection, processing and marketing in the Coconut Triangle

According to Sri Lanka livestock statistics of 1991/92, 23% of the Island's neat catttle population and 26% of the buffaloa population is found in Kurunegala, Puttalam and Gampaha districts. The cattle population in these districts have decreased over the years. Approximately 28000 litres of milk per day is collected by major processors such as Milco, Nestles, CTMU, Lanka Milk Foods, Araliyakeła Dairy Development Company and number of small cottage type yoghurt manufacturers. In this context of stiff competition for milk supplies, the quality standards of raw milk purchase and the hygienic standards to be observed in handling a commodity such as milk is completely neglected. The addition of Hydrogen Peroxide to preserve milk quality contrary to the provisions of the Food Act No. 26 of 1980 and subsequent Gazette Notice is tacitly encouraged by the milk processers.

There would be approximately a total of 48000 small rural producers in this region and at any given time only 30% of this number would be supplying milk to the formal sector with an average of two litres of milk per day. 10%to 15% of these farmers milk the cows twice a day, hold the milk over night, after addition of Hydrogen Peroxide. Dairy production combines with other farming enterprises to provide supplementary income.

Thus to improve quality standards for milk acceptance and to introduce hygienic condition in milk handling, a common understanding and acceptance of a code for such practices by all milk procurement agencies in these districts is necessary. The Government should decide a set of key policies to improve the industry and give effect to such policies simultaneously.

Thus the main recommendations in this report are to cover the following areas -

- Rationalise milk collection systems. Introduce mini chilling centres, in distant places specially to preserve milk quality.
- Introduce milk payment to farmers on compositonal quality. Encourage farmers to supply good quality milk, produced under hygienic conditions, by payment of an incentive to such farmers.
- Rehabilitate and refurbish the CTMU milk processing unit to produce milk and fresh milk products as per SLSI standards.
- Develop the market for fresh pasteurised milk and fresh milk products.
- Introduce quality checks on raw milk, processing stages and final products.

1. BACKGROUND TO THE CONSULTANCY ASSISGNMENT

1.1 AgEnt Project

The AgEnt commissioned a desk study an internationally recognized consultant to provide the Project with options for most effectively utilizing the funds which US AID will make available to, the Project for investment in the dairy sector.

The consultant recommended that the Project conduct full project identification studies on the options which are best suited to the AgEnt Project objectives and criteria. This recommendation is the basis for this proposed consultancy.

It has been decided to carry out the consultancy through a two-pronged approach. One element will focus on alleviating the major constraints facing the small dairy farmers in this milk shed, namely the inadequacy of stock and the need for a uniform base of Producer Societies. The second element will focus on the purchasing/processing units in the milk shed since enhanced milk production and regularization of societies cannot be achieved without their full support involvement.

1.2 Terms of Reference for Element Two

Collecting of statistical data on coconut Triangle Milk Union and other small processing units in the Coconut Triangle area to include:

a. Year established, capital structure, current output, sources of milk supply and growth over the past five years.

b. Financial status, debt/equity ratio, assets and liabilities and current projections.

c. Technical and management staff capabilities.

d. Identification of major problems and constraints.

e. Identification of areas of needed assistance.

f. Assessment of the willingness to accept a participatory role by societies.

g. Assessment of capability for 50 percent cost sharing on potential assistance programmes.

1.3 Collection of Statistical Information

Collection of statistical information regarding milk quality enhancement and milk composition testing along with a report detailing methods of payment, provision of recommendations for needed corrective actions.

1.4 Enhancement of Milk Quality and Milk Composition Testing

a. Identification of equipment requirements along with costing and justification.

b. Outlining of product and marketing procedures currently in operation and the provision of recommendations for improved returns (value added products) and raw milk purchases from producers societies.

2. ESTABLISHMENT OF COCONUT TRIANGLE MILK UNION AND ITS PERFORMANCE

2.1 Introduction

Milk Production in the Coconut Triangle

The more acceptable definition of the coconut triangle in the context of rearing cattle under coconut would be the guiding factor on sufficient rainfall for the growth of pasture/fodder and coconut so that both could get sufficient soil moisture. Thus the northern boundry would be defined by the 1500 MM rainfall isohyte i.e. the triangle bounded by Keeriankaliya, Melsiripura and Colombo. This triangle area is tropical in nature. It is from sea-level and 450 meters above sea-level in elevaion. The ambient temperature is from 24' - 30'degrees centrigrade. Annual rainfall ranges from relatively low at 1200 MM and very wet at 4000 MM. The relative humidity is at 60% to 80%. There are reported shortfalls in water supply during the months of July, August and September. Historical data indicates that a significant drought will occur one year out of seven. While coconut growing is the predominant agricultural enterprise, livestock farming has been traditionally a prominent enterprise since the early part of this century. At this early period of time, the larger coconut estates reared crossbred cattle. It was seen that a fair quantity of milk was produced on these estates more or less on an organised basis.

The rural small holdings had the local indigenous cattle and insignificant quantities were produced for organising any collection of milk for the small producers. The National Milk Board established a chain of milk collecting centres in this region during the three decades of 1950, 1960 and 1970.

However, since then the production of milk in this region has shifted from the large estates to small rural milk producers. The larger commercial dairies on these plantations were closed due to the Land Reforms Policy, poor price for raw milk and lack of a coherent policy for dairy sector. There is a vast potential for development of cattle breeding for milk production in this region.

The coconut plantation sector offers opportunities for development as the land could be harnessed for dual purpose of production of agricultural commodities from the traditional mano crop of coconut only. The three districts of Chilaw, Putalam, Kurunegala and Gampaha have a total neat cattle population of 351,800 representing 23% of the Island's cattle population and a buffalo population of 226,400 representing 26% of the Island's buffalo population. Sri Lanka livestock statistics of 1991/92.

The total land area covered by the coconut triangle is 1.1 million acres. Thus these resources should be utilised for development of Dairy husbandry in this region.

2.2 Coconut Triangle Milk Producer's Union Ltd (CTMU) Weeragama Kuliyapitiya

It is in this context that CTMU was born to serve the small rural milk producer in the later part of the seventies.CTMU was established in 1979 under the World Bank assistance programme to collect, process and market milk of small rural milk producers in the coconut triangle. The Union was registered under the Co-operative Act 05 of 1972 and bears the registration number of KU 224 dated 29/05/1981 from the Commissioner of Co-operative Development.

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It is composed of 89 registered societies and 37 unregistered societies.The total membership is estimated at 9000. 67% of the registered spcieties are financially satisfactory. At present it collects approximately 7800 litres of milk per day and process about 1500 litres per day into value added milk products for marketing directly by CTMU and the balance quantity of milk is sold to Nestles Lanka Limited, Pannala.

It is thus observed that over the years CTMU has developed into an organisation capable of collecting milk of a large number of rural milk producers, marketing the quantities collected and thus providing a regular income for these producers, although constrained by lack of technical capability and finances. It has a great potential for further development. The Union is located in an area of most resourceful niche for development of a Milk Industry.

The objectives of the Union are as follows as per co-operative principle contained in the approved and adopted by-laws of the Union.

- To take necessary action to fulfill the objectives of member societies.

- To purchase milk from member societies, other co-operative societies or milk producers, process and market such milk purchased.

- To produce and market, milk products from the milk purchased.

- To take action to improve the economic, social and cultural aspirations of members of the CTMU societies and the societies themselves.

- Map of the area indicating Divisional Secretarial Divisions of Puttalam, Kurunegala, Gampaha and Kegalle, where CTMU has authority to collect milk as per Clause 5 of the adopted by-laws is marked MAP 1. The entire area includes areas outside the coconut triangle.

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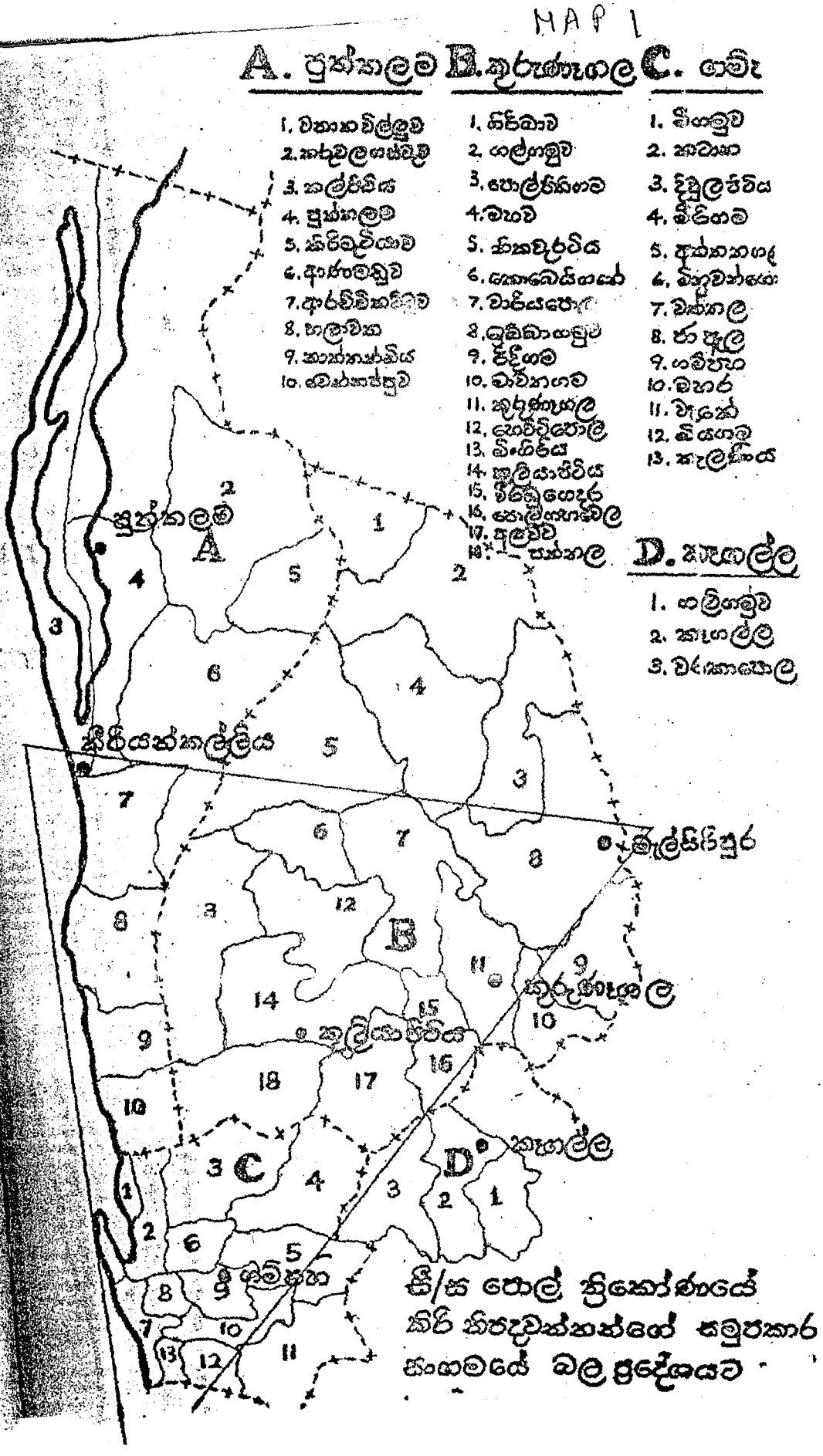
MAP 1



2.3 FINANCIAL PERFORMANCE

The total milk collection over the last seven years are as follows:

TABLE NO: 1

Quantity of Milk Collected Processed and Marketed

Year	Total Milk Collected Litres	Quantity Processed Litres	Quantity Supplied to Nestles	% of Milk Directly Marketed
1989	2448165.0	381157.0	2067008.0	15.569
1990	2963739.0	393294.0	2570445.0	13.270
1991	1979312.0	424065.0	1555247.0	21.424
1992	1930010.0	466654.0	1463356.0	24.178
1993	2242842.0	454965.0	1787877.0	20.285
1994	2899849.0	475153.0	2424696.0	16.385
1995	2851505.0	549163.0	2302341.5	19.258

The above performance has a reflection on the financial performance. Since 1991 the Union has earned a direct annual profit of .2M in 1991,.545M in 1992, .911M in 1993, .305M in 1994 and .143M in 1995. There was a brought forward loss of 1,207,187.53 in 1990. This loss has been completely wiped out by 1995 and has now a carried forward profit of Rs.1,311,217.95. The accounts upto the year 1994 has been audited and the figures for 1995 has been taken from the un-audited accounts prepared by the Union staff.

Since the year 1991 - 25% of the profits of the Union has to be remitted to the Consolidated fund (Clause 45.1 of the By-laws of the Union) and 10% to the Co-operative Development Fund (Clause 45.2 of the By-laws of the Union). CTMU has paid a second bonus payment to milk producers from the profits since 1992 as follows :-

.05 cts/litre in 1992
.10 cts/litre in 1993
.20 cts/litre in 1994 & 1995

Only the 10% to the Co-operative Development fund has been sent and the 25% has not been remitted yet.

It is very creditable to effect a bonus payment to milk producers since 1992. These indicate the current improvements of the Union. About 80% of the milk collected is simply transported to the Nestles plant for processing incurring a loss of Rs.1/=.per litre. This is made up from the profits from processing 20% into value added products and marketing directly by CTMU. The working capital has been built upto Rs.1,625,705/= as at end of 1995. Before this period the working capital has been met from Bank over draft facilities. The following tables indicate the loans obtained since 1990, balances outstanding as at end of each year and installments paid yearly since 1990.

Loans Outstanding:

TABLE NO: 2

	1990	1991	1992	1993	1994	1995
C.C.D.	900000	2150000	2304721	2129163	2129164	1525836
N.D.B.	3000000	2900000	2900000	2639404	3025071	2247112
J.T.F.				1500000	1507576	2045454
R.R.D.B					555333	548217
	3900000	5050000	5204721	6268567	7217144	6366619

Instalment Paid:

TABLE NO; 3

	1990	1991	1992	1993	1994	1995	Rate of Interest
C.C.D.	99999			175558		603327	16%
N.D.B.		100000		260595	616202	777960	15%
J.T.F.					492424	912121	21%
R.R.D.B					46011	196000	16%00
	99999	100000		436153	1154637	2489408	2489408

CTMU has to pay outstanding loans of Rs.6,366,614/= as at end of 1995. The rate of interest are from 16% to 21% On the present performance it will take about 3 - 4 years to settle the current loans.

2.4. Capital Structure

The capital structure of CTMU is composed as follows :

- Share Capital

The primary societies are members of CTMU. A primary society is eligible to become a member by paying an entrance fee of Rs.100/- and purchase at least one share to the value of Rs.500/-. There are thus 96 member societies that have purchased one share each and the annual accounts as at 31/12/94 indicate a contribution of Rs.47,792/= towards the share capital.

- Land and Building

NLDB/CTMU has constructed buildings on the following blocks of land at Weeragama, Kuliyapitiya.

- Chilling Centre building and land

The chilling centre was eswtablished by NLDB on a block of land in extent - 1 acre-0-04 perches. The land is state land, but has not been transferred or leased to CTMU upto now. The building and equipment on this land too has not been transferred or leased to CTMU. A valuation of this property in 1989 indicate as follows:

Building	...	Rs. 900,000.00
Chilling plant and other equipment	...	Rs. 642,000.00
Total	...	Rs.1,542,000.00

(No valuation for land indicated).

Thus these assets have not been taken on to the books of CTMU.

- 20 Primary Society buildings

NLDB has established 20 primary society buildings to facilitate the collection of producers' milk at different locations. A valuation of these assets in1989 indicate as follows:

20 Buildings for Collection of milk,	...	Rs. 400,000.00
Milk cans and other equipment	...	Rs. 956,075.00
Total	...	Rs.1,356,075.00

(No valuation of land indicated)

These assets have not been transferred or leased to CTMU/Primary Societies by NLDB upto now. Hence these have not been taken on to the books of CTMU/Primary Societies.

- A land in extent of 0A-3R-27 perches adjoining the chilling centre building has been taken over by CTMU from Gramodaya Mandalaya (Village Community Board) for establishing the facility for processing milk. This land has not been transferred or leased to CTMU yet. A building of 1960 square feet has been put on on this land and processing equipment installed. This has been done with a loan of Rs.3 million from National Development Bank (NDB). The value of this asset as at 31/12/94 is Rs.5,588,062.50 and is in the books of CTMU. No value of land indicated.

- The office building and Board Room building has been established on land in extent 1A-0R-0P in close proximity to the processing facility. CTMU has purchased this land. The value of this asset as at 31/12/94 in the books of CTMU is Rs.349,728.47. This property has been mortgaged to NDB as colateral for the loan.

Thus from the above information CTMU has to obtain the lands, building and plant machinery on a proper document from NLDB. A fresh valuation of the assets to be carried out by a competent valuer and taken on to the books. This would regularise the ownership of all assets of CTMU and thus the contribution of these assets to the capital structure of CTMU.

2.5 Milk Collection:

It is composed of 58 registered primary milk producer societies and 37 unregistered societies. The total membership is estimated at 9000. Of this membership and non members numbering a total of 3418 in January 1996, 3176 in February 1996 and 3691 in March supplied milk. In addition there are a total of 20 individual suppliers. Some of these individual suppliers collect milk of neigbours. The average supply is two litres per producer per day. 67 of the registered societies are financially satisfactory.

The primary societies are registered, maintains separate accounts and financially independent societies. The individual societies are maintained from the income derived from the sale of excess milk collected. The average collection per day in 1989 was 6707 litres and has risen to 7812 litres per day by 1995.

The milk collection is organized through village collection points and eight main collection routes with sub routes feeding six main routes operate at present. There are 20 milk collecting points established in buildings put up with the initial funds granted by the World Bank. These are permanent of approximately 30 ft. x 17 ft. 100 collecting points are in rented out portions of buildings - Veterinary Office, boutiques, houses, 4 are under trees or by the road side. Table 4 indicates the details of the routes, quantities collected per route, time of collection, cost etc. The transport is hired transport and CTMU pays Rs.6/50 per running mile. The average cost of collection is 0.77 cts. per litre. The average collection per society for the year 1995 is 73.6 litres per day. This is totally uneconomical. Collection points are owned by a primary society and covers a milk collection area of 4 - 5 km. The milking of cows by farmers is done about 1- 1 1/2 hours ahead of the time given for arrival of the vehicle at the particular collection point. It will thus be observed from Table 4 that milk is over 3 1/2 hours old by the time it arrives at either CTMU processing plant or Nestles plant at Pannala. About 8 - 10% of the milk collected is the previous afternoon's milk of farmers. Farmers have been advised to add Hydrogen Peroxide for the previous afternoon's milk, hold it overnight with them and bring it to the collection point along with the morning milk.

TABLE 4

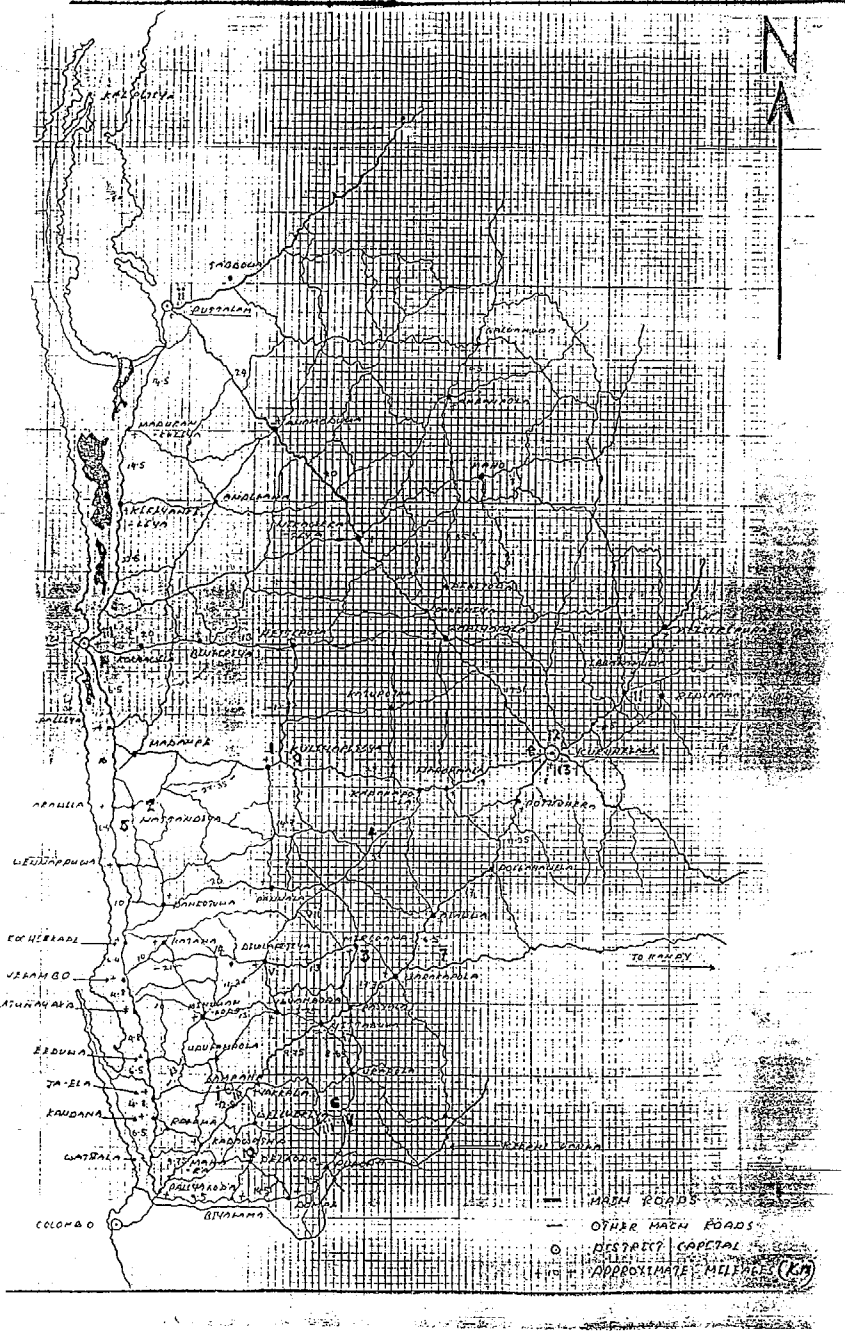
MILK COLLECTION ROUTES

DATA SHEET FOR MARCH 1996

	Name & Route	Total Milk Collected per Month Litres	Time in First point	Time Milk Delivered at CTMU/Nestle	Runing Miles per day	Amount paid per day Rs.	Cts	Feeder Transport Amount Rs.	Cts.	Total Expenditure per day		Transport cost per / L Rs. Cts.
1	Narangalla	36907.0	7,15 a.m.	10.30 (NLL)	66	13299	00	2550	00	15849	00	-/43
2	Badalgama	32235.0	6.45 a.m.	10.45 (NLL)	91	18366	50	-	-	18336	00	-/57
3	Koshena	38645.0	7.15 a.m.	10.00(CTMU)	75	15112	50	9458	50	24571	00	-/64
4	Nikweratiya	28179.5	7.00 a.m.	10.15(CTMU)	111	22366	50	3150	00	25516	50	-/90
5	Atiyawala	13587.0	7.10 a.m.	10.30(CTMU)	84	16926	00	2325	00	19251	00	1.44
6	Serukele	57993.0	6.30 a.m.	10.00(CTMU)	146	29419	00	11500	00	40919	00	-/71
7	Wariyapola	34617.5	7.15 a.m.	9.20(CTMU)	112	22568	00	-	-	22568	00	-/65
8	Kurunegala	22215.0	\6.15 a.m.	10.50 (NLL)	179	36068	50	1600	00	37668	50	1.69
	Average per day										-	.775

Feeder Transport Motor bike or Cart

RUNEGALA GAMPAHA AND PUTTALAM DISTRICT YOGHURT MANUFACTURERS



PRODUCTION PER DAY

OVER 1000 -CUPS-	BELOW 1000 -CUPS-
1. CEETEE - 18000	i. JANAKA - 600
2. MOHOO - 7000	ii. SKYLAB - 400
3. MEHIRI - 6500	iii. DELICIOUS - 350
4. TASTEE - 4000	iv. YORK - 100
5. KINGSJOY - 4000	v. MILKY - 50
6. RUHUNU - 3000	vi. DINUKA - 250
7. CHANAKA - 2500	vii. SNAK - 50
8. PARAKUM - 2000	viii. RUSIRU - 400
9. ROYAL - 2000	ix. CLIO - 400
10. SIYANA - 1800	
11. DASYLAND - 1500	
12. LIO - 1500	
13. LACTO - 1000	
14. JENVI - 4000	

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The milk on all routes arrive by 10.30 a.m.to CTMU plant. Here the milk is bulked, and the requirement of CTMU kept back, Hydrogen Peroxide added to the balance, about 80% of the collected quantity, and then transfered to Nestles Lanka Limited,Pannala.

Map 2 indicates the present milk collection routes. Consultant observed at the collection points visited that the hygienic standards for milk collection are very poor. Washing of milk cans and other utensils used in milk collection and handling are washed with cold water only. Residues of old milk were found on all cans and utensils. No detergents or chemical sterilization of milk cans and other equipment used in milk collection is done at present. This factor along with the time lag between milking of cows and receipt at either CTMU or Nestles Lanka are the main causes for poor hygiene and microbiological quality of milk.

During the field work Consultant visited a number of milk collection points. The general operation and set-up of these points can be indicated as follows -

- Farmers deliver raw, unchilled milk once a day in the morning. Farmers that milk their cows in the evening, add Hydrogen Peroxide, hold the milk over-night with them and supply in separate receptacles to the centre.

- For measuring of supplied quantities,the milk is poured in standardised metal/plastic jars of 4, 2, 1, 1/2 and 1/4 litres.

- The jars are placed in concrete tubs or metal trays with an outlet above the milk collection can.

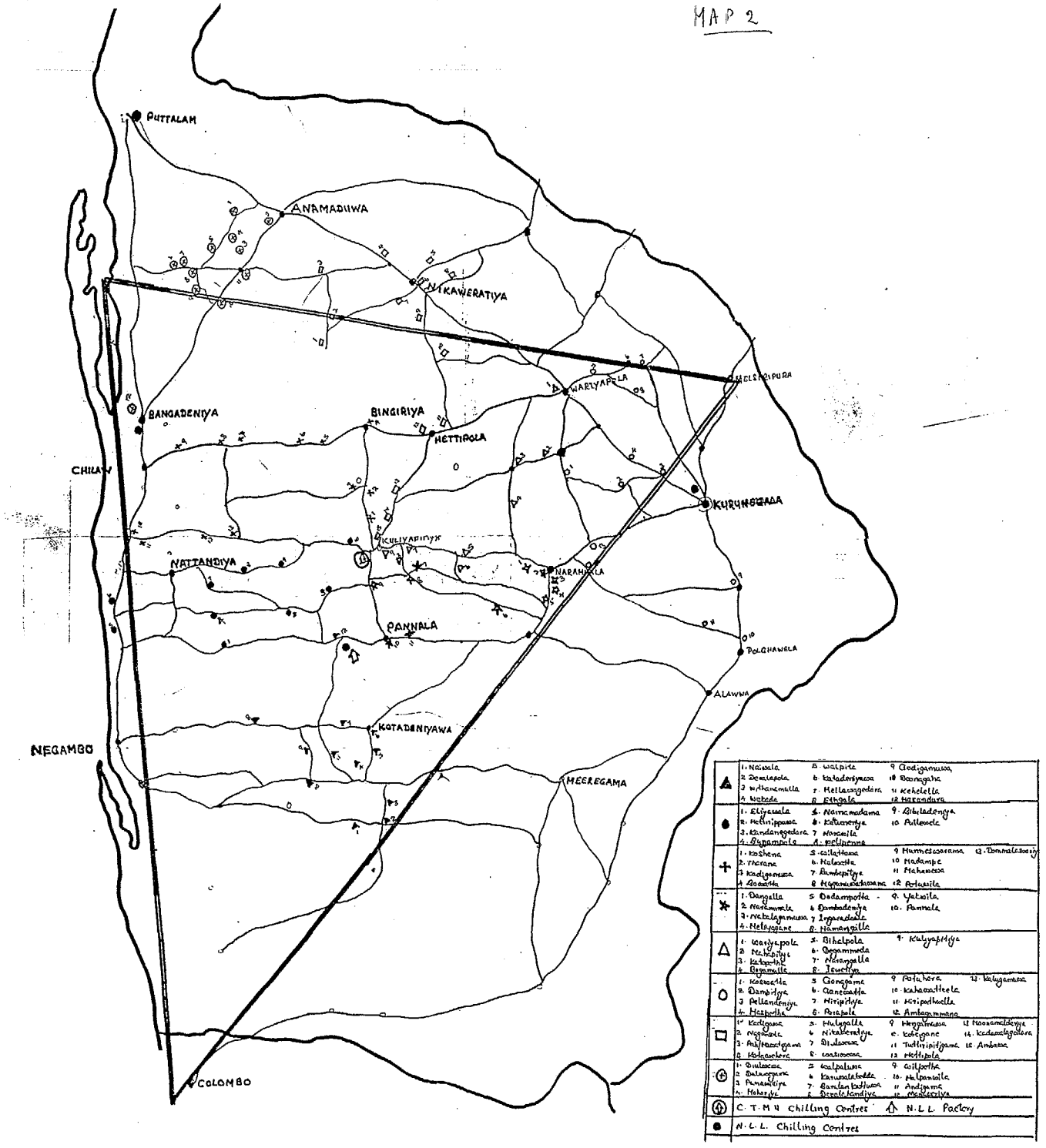
- Density is measured with short-stem lactometer in the jars or in other containers of different size, shape and material.

- After acceptance of the milk,for which density is the only criteria, the jars are emptied in the tubs or trays.

- Milk sometimes passes a funnel and strainer placed on the aluminimum milk collection can, mostly with a content of 40 litres.

- Milk is registered per farmer, in litres and observed density in small books or preprinted cards - collection sheets .

MAP 2



▲	1. Naiwala 2. Demlapola 3. Withanemulla 4. Wakada	5. Walpita 6. Kataderiyawa 7. Mellawagedara 8. Ethgala	9. Godigamuwa 10. Boangahe 11. Kehelella 12. Haranduva	
●	1. Eliyawala 2. Hettipparawa 3. Kandanagedara 4. Bingamala	5. Nammadama 6. Kalumenya 7. Nawalla 8. Welipenna	9. Ribiladenya 10. Pallewela	
+	1. Koshena 2. Pacana 3. Kadigamuwa 4. Aladatta	5. Gallatthana 6. Halawatta 7. Ambepitiya 8. Heganawadiwana	9. Hunnelawarana 10. Nadampe 11. Hakwaoya 12. Ambalewela	13. Bommalewaniya
✱	1. Dangalla 2. Nedunwala 3. Nelalagamuwa 4. Nelayagane	5. Dadampotha 6. Dambadeniya 7. Ingoradella 8. Hamangilla	9. Yakwila 10. Pannala	
△	1. Wariyapola 2. Nikaweratiya 3. Katupotha 4. Bogamulla	5. Bihalpola 6. Bogammeda 7. Nikaogalla 8. Jeewaliya	9. Kalugamuwa	
○	1. Kobeyadda 2. Dambadiya 3. Pellandeniya 4. Hapugalle	5. Gonagama 6. Ganewatta 7. Hiriyadiya 8. Parapola	9. Potuhera 10. Kahawatteela 11. Hiripitakwella 12. Ambagammana	13. Kalugamuwa
□	1. Kotigama 2. Nagahawela 3. Ambagaswatta 4. Kahawatte	5. Hulugalla 6. Nikaladeniya 7. Dilduwa 8. Kaduwela	9. Hengamuwa 10. Kotiyagane 11. Tuttiripitigama 12. Hettipola	13. Nawagamuwa 14. Kadawalagollawa 15. Ambawa
G	1. Bulawana 2. Balangoda 3. Pamunugama 4. Hakaliya	5. Kalpaluwa 6. Kanwalatadda 7. Bandarapattuwa 8. Dewalegandiya	9. Gallpotha 10. Pelbanwila 11. Andiyana 12. Maskeliya	
⊕	C.T.M.U Chilling Centres	△ N.L.L. Factory		
●	N.L.L. Chilling Centres			

- Quantities of milk that are less than 1/4 litre are not registered, but are dumped in the milk collection can.

- Gerber fat test is arrived at on the milk received at least once every three days.The payment is based on this result until the next fat test.

- After completion of the reception the point manager totals the litres of milk received and prepares the cans for despatch.

- On arrival of the transport van milk quantity is measured by the Society or Union person in the van. The milk cans are loaded and depatched to CTMU .

CTMU provides a limited extenion and advisory services to farmers. I would state that this service is more or less to maintain good relations with farmers and ensure that the producers do not break from their nett work of collection system. The present service costs =/42 cts. per litre. This covers, salaries of the eight extension staff, their travelling and subsistence. The service provided is to liase with Government, Veteinary Surgeons and other Govenment officials and ensure that the input services to farmers are met. CTMU purchases cattle food and veterinary drugs at wholesale price and pass this benefit to the farmers. The extension staff provides necessary advice to farmers on milk rejections. They monitor rejection of milk, find out the cause for such rejections and advice the farmers accordingly.

2.6 Milk Processing into Value Added Milk Products

CTMU produces the following milk and milk products from about 20%of the milk collected. The production facilities are very poor and could be classified as indigenous not upto any Dairy Technology basic principles of product control on temperatures of heating, hygienic standards in milk handling, manufacture and storage.

2.6.1 Curd

700 x 1000ML and 1000 x150ML curd pots are manufactured daily. The milk is heated in a tank to 90'C and held for one hour, 1% full cream milk powder added, cooled to 45%C, culture added. The milk is poured manually into earthenware pots of above sizes. After the curd has set, the pots are placed one on top of the other in convenient numbers for handling, bundled and placed in the cold room until despatch to the market. The quality of curd produced is satisfactory.

2.6.2Yoghurt

Set Yoghurt of types namely - Plain vanilla flavoured and, Jelly Mixed Yoghurt is prepared - 12000 cups of plain and 1500 cups of Jelly Mixed Yoghurt of 100 ML capacity is made per day.The milk of 6%is heated in a plate heat exchanger to a temperature of 83'C and held for 20 minutes (milk is not pasteurized) and collected in storage vats the flavouring, sugar and vanilla added to the mix (Sugar 13.5 %and vanilla .01%) stirred, allowed to cool. Culture added and cups filled manually and placed in incubator room (tempperature 45'C) for 1/2 hours. When the Yoghurt is set is transferred to the cold room until despatch. Yoghurt produced is of .6% milk fat. Yoghurt is not satisfactory in quality although CTMU product is moving in the market. Quality needs improvement and market share will grow.

2.6.3 Sterilized Milk 190ML bottles

1250 x 190ML flavoured in bottle sterilized milk is processed per day.The flavours are vanilla, strawberry and chocolate with 1.0% milk fat. The milk is heated in the plate heat exchanger to a temperature of 80'C or 30 minutes and collected in storage vats. The flavour and sugar added (Sugar 12%, Vanilla .05%). The milk is filled into hand washed and sterilized 190ML bottles in a hand filling machine and sealed with the crown cork very tightly. Thereafter the sealed bottles are placed in a retort sterilizer for 20 minutes per batch at a temperature of 115'C. Thereafter the sterilized milk bottles are taken out of the retort and transferred to the store-room for despatch to the market. The milk gives a cooked flavour as temperatures are not controlled and the nutrient values are destroyed in this process. The market is limited for this product. this product does not comply with SLSI standards.

2.6.4 Milk Toffees

225 packets each containing 25 pieces is manufactured per day utilizing 1.5% fat milk. Milk is poured into a pan and 25% sugar added. The mixture is boiled on an open hearth fire until the water evaporates.The milk is continuously stirred.When the water is more or less evapourated the resultant mixture is thick in appearance.This product is placed on a table, smoothened with a roller and cut into pieces. The pieces are wrapped with paper, packeted, stored until despatch to the market.

This product is not a conventional dairy factory classified product. There is no nutritive value of the product as it is lost in the boiling process and the addition of 25% sugar.

2.6.5 Butter

Buter is produced from unpasteurised sweet cream extracted from the milk used in the production of yoghurt,and flavoured sterilized milk. The operation is purely a manual operation and falls far short of standared required to manufacture butter upto the requirements of the consumer. The cream is heated in a pan to 90°C for one hour. 8L of cool water added. Mixture cooled in a cold room. Wash again. Butter separated. The butter does not meet the standard set for butter by SLSI. The moisture content is high and the salt added for the butter is of poor quality. The market is limited for this poor quality butter.

2.6.6 Ghee

Ghee is produced from cream of poor quality that is not suitable for butter manufacture. On an average about 65 litres are produced per day. Ghee is marketed in litre, 750ML, 325L and 180L glass bottles.

2.6.7 Frozen milk packets termed "Ice Packets"

CTMU produces 3000 frozen 50ML ice packets. Milk after heat treatment in the plate heat exchanger to a temperature of 90°C is cooled and small polythene satchets of 50ML capacity is filled and sealed. These are placed in a Deep Freezer and frozen. About 3000 of these small packets are produced per day.

2.6.8 The milk processing unit of CTMU is very poor in the following aspects.

- There is no semblance of separate product lines for each product. Labour is used unproductively by cris-crossing the production flow by carrying products for operations in various directions.

- Hygienic standards are far below the norms to be maintained in a dairy processing plant.

  No production control for quality checks are carried out at different stages of production. No batch numbering of products and quality control checks maintained as per batch to trace consumer complaints, to isolate the batches, and to take remedial action in future production.

  The milk is heated to a temperature between 80'C - 90'C in a plate heat exchanger and held between 30 minutes to one hour. thus damaging the nutrient quality. The temperature for pasteurising and sterilizing of milk is set to preserve the nutrient quality of milk. CTMU does not follow this basic principle.

  Water for the processing plant is drawn from a well. This is full of fish. Very highly contaminated with Algae etc.

  Cleaning and sterilizing of the plant and other equipment used in the processing is totally inadequate.

  Staff have not been trained to handle products from milk. Personnel hygiene is far from satisfactory.

  There is no effluent treatment facility. The waste water of the factory together with milk solids etc are run into a marshy land adjoining the premises. This emanates odurs and is an environmental hazaard.

It will thus be seen that the standards are very low and if Sri Lanka Standard Institute and/or the Central Environmental Authority inspects the CTMU premises, Iam certain they will order the closure.

2.7 Quality control of raw milk, Factory Production and processed products

This area is very poor. No quality control standards are adopted.

2.7.1 Raw Milk

The tests carried out at collecting points are, Gerber Fat test once every three days, lactometer reading (short stem lactometer). No Keeping Quality tests carried out.

Raw milk received at the factory is tested for keeping Quality with the Alcohol test using 68% Alcohol. Fat test by the Gerber Fat test method. The SNF value calculated. The average fat and SNF reading of milk received over the last few months are as follows.3.6 - 4% Fat. 7.9% - 8.1% SNF. There is no microbiological test carried out. Only the alcohol 68% test is carried out on the raw milk received as keeping quality test, SNF value of milk received is low.

2.7.2 Factory Production

No test carried out at pre determined points on the various products to ascertain whether the products confirm to standards set for the products by SLSI. No microbiological tests carried out to ascertain whether the products are hygienically manufactured and the total bacterial counts are within limits and specifications. No test carried out to ascertain whether E.Coli are absent.

2.7.3

No tests carried out on final products before despatch to the market. A system of batch numbering and quality control tests in relation to batches are not in place.

2.8 Milk Marketing

As indicated in Chapter 2.3, 19.25% of the milk collected is marketed directly by CTMU. It could be stated that there is no marketing done by CTMU in the strict sense of this word. The functions carried out at present is a distribution of the present processed products to retail outlets. The features of the system are as follows :

- CTMU employs eight sales representatives and one Marketing Executive to supervise the system of distribution.

- Eight vehicles are hired at the rate of Rs.5/- per km. These vehicles report daily at CTMU between 5 a.m. and 7 a.m.

- The sales representatives have a planned itinary to cover the distribution. Accordingly the vehicles are loaded with required quantities of products per route on proper documentation and leave latest by 7.30 a.m. The number of days worked by each sales representative a month is between 22 - 27 days.The distance covered per day per vehicle range between 140 to 220 km. A total distance of between 33,000km to 36,000km are covered per month.

- The sales representatives and Marketing executive, are CTMU employees and in addition to the salary they are paid an incentive on sales volume.

- The total distribution operation cost is met from the sales of Yoghurt. The total cost inclusive of transport works out to between Rs.1.20 to Rs.1.35 per cup per month depending on volume. The factory cost of a cup of yoghurt is between Rs.3.20 to Rs.3.35 depending again on volume per month. Thus the total cost varies between Rs.4.40 to Rs.4.70 each month. The price to retailer is Rs.5.50 per vanilla flavoured 100 ML cup. Rs.6.00 per fruit flavoured 100 ML cup. The difference is thus the profit.

- The rest of the products are sold to retail traders above the ex factory price and thus are earning a profit as the total distribution cost is met from the two varieties of yoghurt. Annexure I indicates the ex-factory price, price to retailers and retail price of products.

- There is no advertising, sales promotions or any marketing strategies worked out to increase sales.

- CTMU sales force covers a total of 1700 retail outlets per month. This includes A, B, C class retail outlets and the majority covered are B and C class retail outlets. The retail outlets covered are outside the North Western Province as well. Thus approximately 1500 retail outlets are covered per month in the NWP. This works out to 12.5% of all the 12,000 retail outlets in these districts. There are approximately 4000 retail outlets in this province with Deep freezer, Refrigerator and Bottle cooler facilities. CTMU covers 37% of such retail outlets. The distribuion is thus poor. It is not intensive coverage of a reasonable radius of the CTMU facility. CTMU sales staff covers on an average 21.17 km per month to serve one retail outlet. The coverage may be once a month, once in two weeks, once weekly or twice weekly. No records are maintained to analyse such coverage. However, it could be concluded that the distribuion is poorly planned, not cost effective and intensive in a defined area. The Sales Representatives are not allocated a defined area for sales development. They are daily sent on different routes. No responsibility could thus be fixed for sales promotion.

- At a meeting the consultant had with all the sales staff, the following were pointed out by them as reasons for poor sales of CTMU product.

- <u>Sterilised Milk</u>

  Demand is poor due to its quality. The quality of sterilised milk of Milco and Smak are superior.

- Toffees
  The margin of CTMU is lower than the margin of competitor products.

- Ice Packets
  The production is low and the demand cannot be met.

- Butter
  Very poor quality and traders are reluctant to purchase.

- Ghee
  Product is for Ayuverdic and other traditional market - and thus market is limited.The requirements of market are met.

- Yoghurt
  Quality is not upto Highland - Market could be improved if quality improves.

3. CONSTRAINS THAT FACED CTMU FOR ITS DEVELOPMENT

3.1 Sri Lanka Dairy Industry Sector Status

This sector remained static witthout a significant increase in milk production over the last 2 or 3 decades as it has been constrained by a lack of both forward plannig and a logical, internally consistent set of policies which would provides the framework, direction and confidence of both public and private sector participation in the industry. Table 5 indicates the purchase price of milk by National Milk Board/Milco since 1967. The price paid for raw milk to the farmer was not economically attractive for farmers to invest and expand milk production. This was a key issue that constrained the growth of the industry. The next major issue after the price that constrained the growth is lack of a programme for the development of feed resources from suitable cultivated grass varieties, legumes tree fodders, treatment of cereal and other crop residues and the supplementary feeds.

These macro level constrains that faced the growth of the industry over the last 2 or 3 decades constrained the farmers of the coconut triangle and thus the development of CTMU.

TABLE NO: 5

Purchase Price of Milk by the National Milk Board / Milco

Year	Rs. per litre
01.01.1967	0.62
01.05.1973	1.06
01.09.1974	1.58
01.05.1977	1.60
01.11.1978	2.21
01.11.1980	2.60
01.03.1981	2.80
01.03.1983	3.80
01.09.1984	4.30
01.04.1988	5.01 (4.3% fat & 8.3% S.N.F.)
10.08.1989	5.51 (4.3% fat & 8.3% S.N.F.)
07.11.1989	5.97 (4.2% fat & 8.4% S.N.F.)
01.06.1990	6.77 (4.2% fat & 8.4% S.N.F.)
15.10.1991	8.50 (4.3% fat & 8.4% S.N.F.)
16.02.1993	9.00 (4.3% fat & 8.4% S.N.F.)
14.04.1993	9.25 (4.3% fat & 8.4% S.N.F.)
01.01.1994	10.00 (4.3% fat & 8.4% S.N.F.)
01.04.1994	10.50 (4.3% fat & 8.4% S.N.F.)
01.01.1996	12.54 (4.3% fat & 8.4% S.N.F.)

Note:

i. Dates in brackets refer to the dates of price revision.

ii. Prices rerfer to those payable at a milk chilling centre/milk factory.

iii. Prior to 1988 purchase price show here is for milk based on 4% fat only. After 1988 price is based on fat and S.N.F.

Source: National Milk Board/Milk Industries of Lanka Co.Ltd.

3.2 Financial Resources/Equity Capital

CTMU is a farmer based organization. Operating with adopted by-laws by the Union of members and approved by the Commissioner of Co-operative Development Membership fee is Rs.100/- per member. The total value of shares collected as at 31/12/95 is Rs.47,700/=. The capital required for the establishment of facilities for milk collection, testing, processing and marketing has thus to depend on International Grants/Aids or borrowing. Initially a sum of Rs.9.2 million has been received by the National Livestock Development Board from World Bank for estalishment of these facilities. CTMU has been created subsequently. CTMU has borrowed the following capital since its establishment for capital development and working capital.

TABLE NO; 6

Loans obtained by CTMU
and the Purpose

	Amount	Interest	Purpose
1.C.C.D.	Rs. 900,000.00	16%	For working capital
2.N.D.B.	Rs.3,000,000.00	15%	New building and processing facility
3.J.T.F.	Rs.1,500,000.00	21%	Farmers - Purchase cattle, put up cattle sheds
4.R.R.D.B.	Rs. 555,333.00	16%	Farmers - Purchase cattle, put up cattle sheds only Puttalam District

These borrowings have been at interest rate indicated against them. The funds obtained have not been judiciously and prudently managed.This therefore was a constrain for the growth and development.

3.3 Dairy Technology Expertise

CTMU lacked to a very great extent the infusion of expertise knowledge in dairy technology to produce good quality milk and milk products to the market. There is not a single officer at CTMU who has the basic knowledge on the subject of Dairy Technology. This is evident clearly from the manner and procedures adopted in milk collection, processing, quality control and marketing.

3.4 Decision making process and overall Management

The present organisational structure and the decision making process and overall Management lacks quick, effective decision making with dairy technology background knowledge. This has affected the growth of CTMU and has reflection on the market shares and its product image in the market.

3.5 CTMU is a Co-operative Sector Organization

CTMU is registered as a milk producers' Co-operative Union with the Registrar of Co-operative Societies. It is administered as per a set of by-laws adopted by the members and approved by the Comissioner of Co-operative Development. These do not provide for the following -

- Flexible decision making needed to handle products such as milk and value added milk products in a competitive environment.
- All major issues of the Union needs approval of the Commissioner of Co-operative Development.
- There is no mention about the standard to be adopted in purchase of cows/buffalo milk, processing, quality control and market. Technical standards to be maintained are not included.
- By-laws do not provide specifically recruitment of technically qualified staff for key technical positions of the organization.

The above observations of consultant was a constrain for the development of CTMU.

3.6 Marketing Expertise for marketing liquid milk and fresh milk products

CTMU very clearly lacked this marketing expertise to develop the market for fresh liquid milk and value added fresh milk products.

4. PROPOSAL

The following are Consultant's views on developing the proposal. Any organization should have a corporate goal and objectives on which to build the corporate and business plan.

4.1 Corporate Goal

To procure cows milk and buffalo milk of good quality within the CTMU area as per clause 5 of the adopted by-laws, process into fresh pasteurised milk, sterilised milk and other fresh milk products, market these products to otain a satisfactory return to farmers.

4.2 Objectives

- To procure cows milk in an economical manner from the defined area and transport to the plant efficiently.

- The milk is clean, not adulterated and upto required chemical and microbiological standards stipulated by SLSI.

- The milk producers' milk is accurately measured and recorded.

- The milk producers' milk is subjected to quality checks as per standards laid down by SLSI.

- The milk producer is paid regularly and given an incentive for production of milk of good quality.

- To assist the producer to receive the input services to increase productivity of the herd.

- To process the milk received into pasteurised milk, sterilised milk and fresh milk products as per principles of dairy technology, observing correct temperatures in processing and maintaining the necessary hygienic standards.

- Strict chemical and microbiological checks to be carried out at stipulated points on the production line.

- The packaging and labelling of the products to conform to the Consumer Protection Law of Sri Lanka.

- The products to be marketed according to set principles and strategies of CTMU from time to time.

- All staff employed in milk collection, processing and marketing to be educated and trained in dairy technology in the principle and practice of hygienic handling of milk and milk products and maintenance of personnel hygiene.

The above goal and ojectives form the basic requirement of a facility to collect, process and market milk. The improvement of the facility taking into consideration the present facility of CTMU could be expressed as follows :-

4.2.1. To improve the capability to process good quality dairy products for the market utilising the present total collection and future increases at the improved facility of CTMU.

4.2.2. To develop and expand the market for dairy products, focus on marketing of higher value added dairy products by introducing modern marketing techniques and develop the chain for distriution of chilled and frozen dairy products.

4.2.3 To rationalize the milk collection to achieve economics by citing strategically located mini milk chilling units. This will facilitate to improve chemical, microbiological and hygienic quality of milk. Facilities for FAT keeping quality and SNF testing to be in place at these cntres. Farmers to be encouraged to milk cows twice daily.

4.2.4. Improve technical, financial, marketing and overall management of the organisation in keeping with the key objectives of CTMU.

4.2.5. Provide input services to farmers to improve productivity of the herd inclusive of Farmer Training programmes.

4.2.6. To pay the milk producers on the chemical composition of milk and bonus payments to be effected for supply of milk of good chemical, microbiological and hygienic quality.

5. PROPOSAL FOR IMPROVEMENT OF QUALITY OF RAW MILK AND PROCESSED MILK PRODUCTS

5.1 Improvement of Quality of raw milk received at collecting points

Milk has to be fresh and of high hygienic quality for processing into pasteurised milk, sterilized milk and value added milk products of CTMU to meet the quality demand of consumers in a competitive market environment as at present. Accordingly the main aim of quality control at reception in the chain of milk Assembly are as follows -

- Assessment of freshness
- Assessment of hygienic quality
- Assessment of composition

The milk price fixed by CTMU should encourage farmers to produce milk of the quality standard stipulated by CTMU. Education and training of farmers are thus a key factor to achieve the objective of quality of milk stipulated by CTMU. There are two groups of quality control tests that are to be carried out at milk reception. The first group of tests are to assess the freshness and hygienic quality of milk. The staff here has to be fully trained on organoleptic tests and they should gain experience. Hence the staff will require time to acquire this experience to enable them to carry out the tests competently. The second group of tests are to measure the compositional quality of the milk to detect fraudulent adulteration. Here again the staff at primary collecting points, secondary collection point and the milk reception point at the factory have to be fully trained. The training and education of the different categories has to be handled separately and the courses prepared accordingly. Annexure II indicates

- Methods for assessing milk quality carried out at reception in the presence of milk producers (no laboratory needed).

- Methods for assessment of milk quality for which a simple laboratory is needed.

It is an important factor to carry out these tests in the presence of farmers, as it will in the first instance, build confidence and secondly, this is the best form of education and training for the farmers. They should be able to compare the results of the milk with other farmers and be aware of colour changes in the 10 minute Resazurine test. Information on quality tests and on possibilities to distinguish between good and bad milk is useful only when given in combination with clear instructions on how nilk of good quality can be obtained. The quality of milk collected depends on correct quality control and on the instructions given to Milk Producers.

5.2 Maintenance of Quality of Milk from Milking through the milk collection system upto the time of reception at milk processing plant.

Chapter 2.5 in the present existing collection system quality checks carried out and Table 4 indicates the time of collection and age of the milk at reception time. The system does not meet the requirement to maintain the standards of quality. Hence the system has to be revised.

The introduction of a system of payment on quality of farmers milk according to composition and quality, in principle, is a posiive step towards dairy development, to encourage farmers to produce good quality milk and to act as a deterent for adulteration. The introduction has however created several problems.

- The first is related to the application of the system as such. There is no uniform "method" of tests for fat and solids - non - fat adopted within the entire vertical column within the dairy industry.

- The small quantities of milk involved per farmer hardly alter any system without adding considerably to the cost of milk collection, and thus decreasing the farmers' revenue.

- The official government standard specifications for Raw and Processed Milk - Standard 181 of 1983 prescribes the Ross Gotleib method for determination of fat content.

- Very old method - The drying method is described for determination of the total solids content. These methods are completely unsuitable for the present system to pay the farmers. Thus there is no standardised test method officially announced for Fat and solids - non - fat determination to be adopted by the entire vertical column of the industy to be adopted for recommended system of payment.

Annexure II gives the consultant's recommendations of methods for testing, taking into consideration cost of tests, quantities of milk supplied by individal farmers. The staff has to be fully trained to carry out these tests and regular supervision and strict monitoring of the system is necessary to achieve the envisaged results.

5.2.1 Milk transport through pick up points collecting centres to milk processing plant

The handling of milk through these stages should be quick in clean sanitized cans and following all hygienic practices outlined in the report. Time factor is vey important to achieve a low bacterial count of the milk at the milk reception point of the factory/ chilling centre. This factor linked with clean sanitized receptacles/cans for handling milk, together with education of all concerned in the chain of milk handling will achieve the desired results of receipt of good hygienic milk, with a low bacterial count. There is a phase immediately after milking, before bacterial multiplication begins - 3 - 3 1/2 hours, within which period milk should either be chilled to 4'c or heat treated and cooled to 4'c. The quicker the milk can be cooled the better the quality and in the ideal system milk is cooled immediately after milking to 4'c. Under these circumstances milk can be held for quite long periods without bacterial degradation. These conditions do not exist in Sri Lanka as the industry stands today. The system has to be revised and a more effective system introduced to achieve the standards.

5.2.2 Containers for milk, during milking collection and transport to milk processing plant

Containers used for handling milk should be the right type in metal. Construction should be such that they lend themselves to easily clean and sanitize - Annexure III gives the detail of containers for use in milk.

5.2.3 Cleaning and sanitization of containers used in milking, transport at collecting points

It is evident from the field visits and inspection of collecting points, and CTMU processing unit, cleaning and sanitizing of containers used in milk handling and transport are very poor.

Annexure IV gives the procedure for cleaning and sanitization of containers used in milk handling.

Innovative thinking has to go into this area to develop and evolve the best system to achieve the quality standards required.

5.3 Capital Cost and Justification

The primary Co-operative Society has to be upgraded to handle milk supplies of farmers in keeping with the technical requirements to preserve the quality of milk until the milk is processed at CTMU plant. For this purpose a detail study has to be made of the present milk collection and a decision made to the number of mini chilling centres to be established and the collecting points closer to CTMU equipped with the required laboratory equipment . A mini chilling centre will operate from rented premises. Each will be equipped with a small Farm Tank of 500L capacity, an automatic fat tester, measuring equipment, other laboratory equipment and cans. The total cost would be Rs.750,000.00 per centre. A society of this nature could handle 182500 litres per annum. Of the total investment possible financial option of 50% should be by a grant and the balance 50% equity contribution of Rs.500.00 per member. A typical society of this nature would have 200 members.

50% grant	...	Rs.375,000.00
Membership fee for 200 members	...	Rs.100,000.00
Loan	...	Rs.275,000.00
		Rs.750,000.00

The operating cost of a centre of this nature for labour, (rate per litre - part time work) electricity, milk testing, consumables would be Rs.120,000.00 per annum, loan repayment with interest Rs.35,000/= per annum. The total expenditure would be Rs.155,000/= to Rs.160,000/- per annum. A charge of Re.1/= litre would be Rs.180,000/= income per annum. The charge of Re.1/= per litre could be met by either the farmer or the farmer -/50 cts./litre and the Union -/50 cts./litre. The investment on collecting points without a mini farm tank would be Rs.350,000/=. This is for the laboratory equipment, an automatic fat tester and cans. This could also be financed on a similar basis as above and the financial commitment is less. The justification for the establishment of the collecting centres on this basis are as follows:

- The milk has to be collected and transferred to CTMU for processing into a marketable product, accepted by consumers.

- The SLSI standard for raw milk purchased and standardised for marketable products to be maintained.

- To pay the producer of milk on compositional quality of milk.

  If this principle is acceptable to AgEnt, CTMU and its primary societies, a more detail financial model of each unit and a total financial plan could be worked out on a separate assignment.

5.4 Quality Control on Processed Milk Products

Sri Lanka Standards Institute has published standards for all processed milk and milk products. It is therefore legally necessary for manufacturers to follow these standards and ensure that products marketed conform to these standards. For this purpose quality checks have to be introduced at predetermined points on the production line and after the production is completed, to draw samples and check the final product and ensure that they conform to SLSI standards. Thus the laboratory at CTMU has to be equipped to carry out these tests.

6. PROPOSAL FOR INTRODUCTION OF DAIRY TECHNOLOGY PRINCIPLES FOR PROCESSING OF MILK AND MILK PRODUCTS

Chapter 2.6 and 2.7 explains the present processing and quality control status of CTMU. It is thus asolutely necessary that in the first instance the contemplated development programme takes into consideration the technical requirements for processing milk and develop the sequence of introduction of the different milk and milk products on a planned phased out programme depending on the cash flow.

6.1. Milk and Fresh Milk Product Range

Consultant has analysed the market and taken into consideration all relevant factors and recommend the deelopment of the processing facility for the following products. The total processing capacity is to be limited to 20,000 litres of milk per day to be achieved by year 7.

TABLE NO:7

Recommended Processed Milk Products and Fresh Milk Products

Product	Pack Sizes	Year 1 Litres	Year 7 Litres
1. Pasteruised Milk	1/2 L. Plain 200 ML flavoured bulk supply	1500	9000
2. Sterilised Milk	Flavoured only 190ML	250	2500
3. Ice Cream	80ML cup 1L, 2L 4L packs	250	3500
4. Yoghurt	100ML-500ML plain	1500	3500
5. Milk Popsicles	50ML - 100ML	250	750
6. Curd	900ML - 175ML	250	750
Extraction of Cream 1. Butter 2. Ghee		100kg 65kg	400kg 300kg

The processing facility has to be developed by first installing a 4000 litres per hour pasteurizer. For processing of all products milk has to be first pasteruised and thereafter drawn for processing of other products.The installation of product processing lines for ice cream, yoghurt and milk popsicles could commence subsequently.

Until then the present processing methods to continue for yoghurt, curd, toffees "Ice Packets". The production of toffees to be discontinued as the market for above products improves, mainly from nutritive point of view. Cows have produced milk for good nutritional quality for human consumption. Therefore these nutrients should not be destroyed by the present processing method adopted for toffees. "Ice packets" to be replaced by milk popsicles in due course.

6.2 Required Alternations and Additions for existing building

At present there are two buildings on on the site where the processing facility is sited. The two buildings have been put up on land that does not belong to CTMU. The original building where the chilling centre has been established is owned by Government and is in extent 1A-OR-4P. This building is 4830 sq. ft. The second building is 40 ft. behind the first building and is 1960 ft. in extent. Thus the CTMU has 6790 sq. ft. of building, housing the present facility. The second building is on a block of land belonging to the "Gramodaya Mandalaya" - a village community development organization. There is not even a lease agreement for the land on which these buildings have been put. The following would be a logical method of approach to introduce the desired changes.

- CTMU to obtain a long term lease of the two blocks of land.
- The present two buildings to be connected by erecting a building. the total square feet to be approximately 12000 sq.ft.
- This will pave the way to establish the necessary production lines for the different products and to commence establishment of planned production norms utilising the labour productively.

The existing laboratory to be equipped to all necessary chemical microbiological tests on raw milk, production line tests, finished products, water supply, plant, consumer complaints on quality product development packing material, chemical and detergents used on the plant.

- The packing material, stores, cold rooms, freezer rooms to be so placed to enable uniflow system of product flow from milk reception to despatch. This will enable labour to be productively used.

- Floors of production area, milk reception area, cold rooms to be layed with acid and alcohol resistant tiles to enable proper maintenance and hygienic standards to be maintained.

- The walls to be simultaeously paved with tiles to maintain hygienic standards.

- The water supply to be studied, well thoroughly cleaned and relayed according to the new requirements.

- The electricity supply to be similarly gone into and relayed according to requirements and standards laid down by Ceylon Electricity Board.

- The refrigeration unit to be refurbished. It has the capacity to meet the requirements of the envisaged processing throughout.

- Steam generator to be assessed and updated.

- Worker toilets, changing rooms, lunch rooms to be sited away from main milk processing plant.

- Site Plan No. 1 indicates the present position of the facility and Site Plan No.2 indicates the proposed changes.

6.3 <u>Required Plant and Machinery</u>

The following are the items of Plant and Machinery :-

1. Pasteuriser complete with pumps connecting S.S. pipes (-) TSS - 4000 L/hour.

2. Pasteurised Milk Satcher filler - 2 Nos - 750 - Satches/hour (one filler could be installed initially and the other subsequently).

Site Plan No: 1

Site Plan No: 2.

The following plant and machinery could come in stages as the cash flow permits.

1. Yoghurt cup filler and sealer 1 No - 3000 cups per hour unit initially. Another later.

2. Ice Cream freezer - 1 No - continuous freezer - 500L/hour.

3. Ice cream cup filler 2 x 1000 cups per hour filler and sealer machine. One filler could be initially installed and the other subsequently as market improves.

4. Milk Popsicle freezer bath and trays.

   3 Units - each unit to handle 250 litres per day. Initiall one unit to be purchased and subsequently as market picks up the balance 2 units.

5. Sterilised milk bottle washer 1250 x 190ML bottles/hour capacity to be washed and sterilized.

6. Sterilised milk bottler filler 1250 x 190ML bottle filler and sealer with crown corks.

7. Butter - 1. Butter churner - 50kg/batch
   2. Butter working table
   3. Butter cutter and wrapper 400x 200g pack/hour

6.4 Capital Cost and Justification

Chapters 2.6 and 2.7 explains the present status of the milk processing facility and quality control. It is thus a key factor to rehabilitate and refurbish the CTMU facility to process milk and to introduce standard testing procedure for raw milk, at predetermined points on the production line and the final products.

The capital cost could be spread out over a period of five years to fall in line with a financial and technical plan. The programme could commence with the utilisation of cash deposits of CTMU totalling Rs.8.7 million for the CTMU 50% share.
The approximate cost would be as follows :

1.	Civil works inclusive of rehabilitation of water systems and new cold water pipe lines	Rs. 5,000,000.00
2.	Supply of plant and machinery in stages as per para 6.3 Supply and installation of 4000L/hour pasteurizer and pasteurised milk satchet filler	Rs. 7,000,000.00 Rs.12,000,000.00
3.	Provision of improved laboratory facilities	Rs. 1,000,000.00
4.	Steam generator and electrical wiring	Rs. 2,000,000.00
5.	Cold room for pasteurised milk	Rs. 1,500,000.00
	Total	**Rs.16,500,000.00**

The above would form the first step of the development plan.

The following stages of development to be planned out depending on the improvement to cash flow and or any other available grants to be utilised.

Plant and machinery to be purchased are -

Yoghurt cup filler, Ice cream freezer, Ice cream cup filler, Milk popsicle baths, sterilised milk bottle washer and filler and butter churner and worker, cutter and wrapper.	Rs.20,000,000.00
Effluent treatment plant	Rs. 2,000,000.00
Total	**Rs.22,000,000.00**

The justification of this investment is as follows -

- CTMU collects milk at present on an average from 3500 rural small farmers. These farmers depend on the sale of milk for their livlihood. The CTMU facility to process milk has to be technically updated to ensure the farmers' incomes are maintained and in fact improved.

- To market an improved quality of fresh milk and fresh milk products as per standards of SLSI and then gain an increased share of the market. The market for these products exist and is growing.

- To create direct and indirect employment by expanding the industry.

7. DEVELOPMENT FOR MARKET FOR PROCESSED MILK AND FRESH MILK PRODUCTS

7.1 Conclusions from Market Survey

The Sri Lanka milk market has grown from a per capita consumption of 15.3 litres per person per annum in 1975 to 34.8 litres per person per annum in 1994. However, this is yet far below the per capita consumption of milk in developing countries and more particularly to that of India and Pakistan.

TABLE NO: 8

Market for Milk and Milk Products
1992 - 1994 (Million litres - LM Basis)

Product	LME Factor	1992	1993	1994
A) From Local Manufacturers				
Pasteurised Milk	1.0	8.4	7.8	8.1
Sterilised Milk	1.0	5.4	5.3	5.3
Condensed Milk	2.1	9.5	9.5	9.5
Whole Milk Powder 1/	7.6	63.8	62.3	63.1
Butter/Ghee	6.6	3.2	2.5	2.7
Cheese	6.6	0.8	0.9	1.1
Others(Curd/Yoghurt/ Ice Cream)	1.0	13.0	14.3	15.8
Sub Total:		**104.1**	**102.6**	**105.6**
Less Imported LME's used		25.0	25.0	25.0
Local Milk		**79.1**	**77.6**	**80.6**

Product	LME Factor	1992	1993	1994
B) From Imports				
Whole Milk Powder	7.6	196.5	244.1	274.5
Skim Milk Powder	7.6	25.8	26.4	66.8
Infant Milk Powder	7.6	0.4	0.2	0.1
Cheese and Curd	6.6	2.3	2.5	4.3
Butter and Butter Oil	6.6	14.9	6.3	6.5
Others (Yoghurt/UHT/ Cream etc).	1.0	0.1	0.1	0.2
Condensed Milk	2.1	0.5	0.1	0.9
Sub Total		240.5	279.7	353.3
TOTAL A 7 B (MILLION Litres-LME)		319.6	357.3	433.9

Note 1/ Stock variations of milk powders at the end of each year affect apparent consumption. Includes imported skim milkk powder and butter oil. (Source ADB Report 1995).

It could be estimated that the market for milk will grow at 5.2% on the assumption of a population growth of 1.7% and a GNP growth rate of 3.5% (GNP for the last three years has averaged 5.7%). Market has grown at 5.6% 1984 - 1995.

The formal market is made up of a around 20% from local milk and 80% from imports. The principle source of milk in Sri Lanka is whole milk powder (WMP). This represents around 75% of the formal market. Pasteurised and sterilised milk accounts for around 3% of the formal market. The survey carried out in the districts of Gampaha, Kurunegala and Puttalam indicate the following:

- The population and number of housing units in these three districts are -

TABLE NO: 9

Population and Housing Units

District	Population	Housing Units
Kurunegala	1,481,702	316069
Puttalam	625,574	139709
Gampaha	1,695,728	360991
	3,803,004	816761

These three districts have 21.73% of the Island's population.

The consumer survey carried out on 600 households out of 816761 housing units in these three districts represent a sam[ple size of 0.073%. This sample is a very representative for product consumption and pattern for purchase by different income groups. For example, the total consumption of yoghurt by the sample group indicated 1355 cups per day. This works out to 2.25 cups per month per household. Thus for 816761 housing units per day indicates 61257 cups. This amount very closely equals the production and quantity marketed in this region daily. The following tables indicate the details :-

Table 10A Yoghurt consumption pattern and brand preference.

Table 10B Ice cream consumption pattern and brand preference.

Table 10C Flavoured sterilised milk consumption pattern and brand preference. Only Milco sterilised milk available in the market. About 4000L sold per day in the districts surveyed.

Table 10D Curd consumption pattern and brand preference.

The consumer survey indicates the following :

84% of the household consume yoghurt and consumption pattern indicates more or less equal numbers for daily, once a week, once in two weeks, and once a month.The consumption is higher in income groups of over Rs.2000/= per month.

71.33% of the household consume ice cream. Consumption pattern indicates the consumption is highest, once a week and once in two weeks and is higher in income groups of over Rs.2000/= per month.

Only 18.61% of the sample survey consumes flavoured sterilised milk. Consumption is low due to its non availability. Hence no firm conclusion could be made.

Curd is consumed by 41.33% of the sample Lower income groups too consume curd.

Map No.3 Indicates the location of Yoghurt manufacturers in these districts.

Map No.4 Indicates curd and Ice cream manufacturers in these districts.

The survey carried out for availability of yoghurt, ice cream, curd and flavoured sterilised milk in retail shops indicate

There are a total of 12000 retail outlets in these three districts.

TABLE 10 A

YOGHURT CONSUMPTION PATTERN AND BRAND PREFERENCE

				Frequency of Purchase					Brand						
	Urban	Rural	Yoghurt	Daily	Onee a Week	Once In two week	Once a Month	Qty. Per Monthly	Highland	Ceetee	Tastee	Kothmale	Parakum	Ranwan	Others
Sample Size -600	54	447	504	112	136	134	122	1355	207	72	47	32	06	26	137
Percentage	**26 %**	**74 %**	**84 %**	**18.66 %**	**22.66 %**	**22.33 %**	**20.33 %**								
Income Level															
Below Rs. 1000	09	38	24	-	-	09	15	33	01	03	01	-	-	-	19
Percentage			**04**			**1.5**	**2.5**								
Rs. 1000 - 1500	14	49	45	-	07	18	20	77	08	12	04	09	-	-	12
Percentage			**7.5**		**1.16**	**03**	**3.33**								
s. 1500-2000	03	22	15	03	01	09	02	66	-	-	-	-	03	04	08
Percentage			**2.5**	**0.5**	**0.16**	**1.5**	**0.33**								
. 2000 - 3000	37	80	96	04	22	25	45	273	37	14	10	12	-	02	21
Percentage			**16**	**0.66**	**3.66**	**4.16**	**7.5**								
. 3000 - 4000	40	145	158	38	72	29	19	391	67	14	08	04	-	-	69
Percentage			**26.33**	**6.33**	**12**	**4.83**	**3.16**								
ver Rs. 4000	51	133	166	67	34	44	21	515	94	29	24	07	03	20	08
Percentage			**27.66**	**11.16**	**5.66**	**7.33**	**3.5**								

TABLE 10 B

ICE CREAM CONSUMPTION PATTERN AND BRAND PREFERENCE

				Frequency of Purchase					Brand					
	Urban	Rural	IceCream	Daily	Onee a Week	Once In two week	Once a Month	Qty. Per Monthly	E. H.	Highland	Woodland	Alarie	Kothmale	Others
Sample Size -600	154 **26 %**	447 **74 %**	428 **71.33 %**	75 **12.5 %**	123 **20.5 %**	138 **23 %**	91 **15.16 %**	248 (L)	178	92	40	30	34	142
Income Level														
Below Rs. 1000 Percentage	09	38	12 **02**	-	03 **0.5**	03 **0.5**	06 **01**	04	-	-	-	-	-	12
Rs. 1000 - 1500 Percentage	14	49	60 **10**	02 **0.33**	14 **2.33**	29 **4.83**	15 **2.5**	16	06	06	-	-	10	38
s. 1500-2000 Percentage	03	22	20 **3.33**	-	03 **0.5**	05 **0.83**	12 **02**	38	03	14	03	09	-	13
Rs. 2000 - 3000 Percentage	37	80	92 **15.33**	04 **0.66**	19 **3.16**	45 **7.5**	24 **04**	49	29	06	04	07	03	10
. 3000 - 4000 Percentage	40	145	112 **18.66**	35 **5.83**	36 **06**	26 **4.33**	15 **2.5**	67	51	39	14	07	12	39
ver Rs. 4000 Percentage	51	113	132 **22**	34 **5.66**	48 **08**	30 **05**	19 **3.16**	74	89	27	19	07	09	30

TABLE 10 C

FL. STER. MILK CONSUMPTION PATTERN AND BRAND PREFERENCE

				Frequency of Purchase				Qty. Per Monthly	Brand	
	Urban	Rural	Fl. St. Milk	Daily	Onee a Week	Once In two week	Once a Month		Highland	Ceetee
Sample Size -600	154 **26 %**	447 **74 %**	112 **18.66 %**	18 **03 %**	20 **3.33 %**	38 **6.33 %**	29 **4.83 %**	187 (Bot)	114	
Income Level										
Below Rs. 1000	09	38	-	-	-	-	-	-	-	
Rs. 1000 - 1500	14	49	-	-	-	-	-	-	-	
Rs. 1500-2000 Percentage	03	22	09 **1.5**	-	-	-	09 **1.5**	09	09	
Rs. 2000 - 3000 Percentage	37	80	23 **3.83**	-	04 **0.66**	11 **1.83**	08 **1.33**	32	23	
Rs. 3000 - 4000 Percentage	40	145	38 **6.33**	04 **0.66**	08 **1.33**	19 **3.16**	07 **1.66**	52	40	
Over Rs. 4000 Percentage	51	113	42 **07**	14 **2.33**	08 **1.33**	15 **2.5**	05 **0.83**	94	42	

TABLE 10 D

CURD CONSUMPTION PATTERN AND BRAND PREFERENCE

				Frequency of Purchase					Brand			
	Urban	Rural	Curd	Daily	Onee a Week	Once In two week	Once a Month	Qty. Per Monthly	Ceetee	Tastee	Kothmale	Others
Sample Size -600	154 **26 %**	447 **74 %**	248 **41.33 %**	25 **4.16 %**	61 **10.16 %**	80 **13.33 %**	82	257	61	42	50	151
Income Level												
Below Rs. 1000 Percentage	09	38	12 **02**	-	-	-	12	16	02	-	-	10
Rs. 1000 - 1500 Percentage	14	49	13 **2.16**	-	-	03 **0.5**	10	24	01	01	-	11
Rs. 1500-2000 Percentage	03	22	29 **4.83**	-	11 **1.83**	04 **0.66**	14	34	14	02	08	05
Rs. 2000 - 3000 Percentage	37	80	52 **8.66**	04 **0.66**	06 **01**	11 **1.83**	31	40	07	19	14	40
Rs. 3000 - 4000 Percentage	40	145	55 **9.16**	02 **0.33**	07 **1.16**	37 **6.16**	09	64	24	11	17	21
Over Rs. 4000 Percentage	51	113	87 **14.5**	19 **3.16**	37 **6.16**	25 **4.16**	06	79	13	09	11	64

The survey covered 800 outlets representing a percentage of 6.66% as the sample. The survey further revealed that 36.25% had a deep freezer and a refrigerator, that means a total 4350 retail outlets had this facility.

Table 11A Yoghurt indicates quantity available in A, B and C Class retail outlets together with the brands and the percentage.

Table 11B Ice Cream quantity available and the brand of ice cream.

Table 11C Flavoured sterilised milk quantity available and the brand.

Table 11D Curd - brand availability.

The survey carried out to ascertain the availability of freezer and refrigerator facilities in these districts.

Table 12 Indicates the results of this survey and is expressed as a percentage. The best results were indicated in a combination of Deep Freezer and Refrigeration facilities and represents 36.25%.

- Raw Fresh Milk Market

Preliminary investigations carried out in the urban areas of these districts indicate that there is no organised raw fresh milk marketed to either households/Tea kiosks/Restaurants etc. by producers themselves.The evidence indicate only a very few producers sell their produce to neighours after meeting their home consumption. The urban households and other users of milk as a tea whitner have no confidence in the quality of raw fresh milk marketed by producers themselves to create a demand for building up such a market.

TABLE 11 A

GAMPAHA - KURUNEGALA AND PUTTALAM DISTRICT BRAND AVAILABILITY OF YOGHURT IN RETAIL OUTLETS

YOGHURT	GAMPAHA DISTRICT		KURUNEGALA DISTRICT		PUTTALAM DISTRICT		HIGHLAND		CEETEE		TASTEE		RANNWAN		MEHIRE		KINGSSJOY		ISLAND		MICHICO		OTHERS	
e Size		%		%		%		%		%		%		%		%		%		%		%		%
	340	42	307	38	135	17	437	55	227	28	107	13	73	09	52	07	46	06	17	02	50	06	296	37
ass	11	03	06	02	-	-	09	01	04	0.5	-	-	-	-	-	-	-	-	-	-	-	-	04	05
s	58	17	44	14	26	19	67	08	45	06	05	01	-	-	04	0.5	06	0.75	01	0.125	05	0.625	20	2.5
ass	271	80	257	84	109	81	361	45	178	22	102	12	73	09	48	6.5	40	5.25	166	1.875	45	5.375	272	31

rom the consumer and retail shop survey following were concluded - Established, proven quality brands Highland is available in 55% of the retail outlets - Next Ceetee 28%

ı class retail outlets only the established brands of highland & Ceetee was available.

Most of the cottage industry type manufactures products available in all C class retail outlets.

outlets the amount available was less than C class outlets

nsumer prefer to buy established brands.

TABLE 11 B

GAMPAHA - KURUNEGALA AND PUTTALAM DISTRICT BRAND AVAILABILITY OF ICE CREAM

ICE CREAM	GAMPAHA DISTRICT		KURUNE-GALA DISTRICT		PUTTA-LAM DISTRICT		ELEPHA-NT HOUSE		HIGHLAND		WOOD-LAND		ALARICS		AGRE SOYA		KOTH-MALEE		ROSE RIBAN		OTHERS	
Sample Size		%		%		%		%		%		%		%		%		%		%		%
- 800	294	**37**	138	**17**	59	**07**	206	**26**	168	**21**	102	**13**	98	**12**	85	**11**	60	**08**	32	**04**	138	**17**
A Class	08	**01**	04	**01**	-	-	04	**0.5**	05	**01**	-	-	01	**0.5**	02	**0.5**	03	**01**	01	**0.125**	02	**0.5**
B Class	59	**07**	29	**04**	10	**01**	47	**06**	35	**04**	09	**01**	18	**1.5**	09	**1.5**	14	**02**	09	**0.875**	20	**02**
C Class	227	**28**	105	**12**	49	**06**	155	**19.5**	128	**16**	93	**12**	79	**10**	74	**09**	43	**05**	22	**03**	116	**14.5**

(1) Preference to Established Brands.

(2) Distribution of the established brands poor. Therefore new brand of good quality could enter the market.

(3) Coverage is poor in distant retail outlets. Ice cream not available although there is a demand for ice cream

TABLE 11 C

GAMPAHA - KURUNEGALA AND PUTTALAM DISTRICT AVAILABILITY OF FLD. STER. MILK

FLD. STR. MILK	GAMPAHA DISTRICT		KURUNEGALA DISTRICT		PUTTALAM DISTRICT		HIGHLAND		CEETEE	
Sample Size		%		%		%		%		
- 800	**224**	**28**	132	**17**	72	**09**	428	**53.5**		
A Class	**09**	**01**	13	**02**	-	-	22	**03**		
B Class	**67**	**08**	30	**04**	-	-	97	**12**		
C Class	**148**	**19**	89	**11**	72	**09**	309	**38**		

Demand for flavoured sterilised milk exist. But supply is poor .

TABLE 11 D

GAMPAHA - KURUNEGALA AND PUTTALAM DISTRICT AVAILABILITY OF CURD.

CURD	GAMPAHA DISTRICT		KURUNEGALA DISTRICT		PUTTALAM DISTRICT		CEETEE		TASTEE		HIGHLAND		ISLAND		OTHERS	
Sample Site		%		%		%		%		%		%		%		%
- 800	87	**11**	101	**13**	22	**03**	96	**12**	42	**5.25**	20	**2.5**	06	0.75	49	**6.5**
A Class	03	**0.375**	09	**1.5**	-	-	06	**0.75**	02	**0.25**	01	**0.125**	-	-	12	**1.5**
B Class	22	**2.75**	06	**0.75**	08	**01**	14	**1.75**	05	**0.625**	02	**0.25**	-	-	07	**0.875**
C Class	62	**7.875**	86	**11**	14	**02**	76	**9.5**	35	**4.375**	17	**2.125**	06	0.75	30	**4.125**

TABLE 12

FREEZER AND REFRIGERATOR FACILITIES AVAILABLE AT RETAIL POINTS GAMPAHA - KURUNEGALA AND PUTTALAM DISTRICT

		CLASS	%	DEEP FREEZER	%	REFREGE-RATOR	%	BOTTLE COOLER	%	DEEP FREEZER REPREGE-RATOR	%	DEEP FREEZER BOTTLE COOLER	%	REFREGE-RATOR BOTTLE COOLER	%	DEEP FREEZERS REFREGE-RATOR BOTTLE COOLER	%
Sample Site - 800 DISTRICT)				06	**0.75**	343	**43**	05	**0.625**	290	**36.25**	40	**05**	72	**09**	33	**4.125**
Gampaha Sample Site - 345	**43.12 %**	A- 11	**3**	-		03	**0.375**	-		03	**0.375**	01	**0.125**	01	**0.125**	03	**0.375**
		B- 58	**16**	06	**0.75**	08	**01**	01	**0.125**	28	**3.5**	07	**0.875**	08	**01**	-	
		C- 276	**82**	-		132	**16.5**	-		109	**13.625**	-		21	**2.625**	14	**1.75**
Kurunegala mple Site - 314	**39.25 %**	A - 06	**1**	-		-		-		-		-		02	**0.25**	04	**0.5**
		B- 44	**14**	-		-		04	**0.5**	23	**2.875**	07	**0.875**	08	**01**	02	**0.25**
		C - 264	**85**	-		143	**17.875**	-		79	**9.875**	25	**3.125**	17	**2.125**	-	
ttalam ample Site - 130	**16.25 %**	A -	**-**	-		-		-		-		-		-		-	
		B - 26	**20**	-		-		-		09	**1.125**	-		07	**0.875**	10	**1.25**
		C - 104	**80**	-		57	**7.125**	-		39	**4.875**	-		08	**01**	-	
		789 - **98-625**															

ercentage of availability of D.F. B.C. Ref. in A' retail outlets are law due to the overall number of these type A class retail outlets are very ew.

: class retail outless are the major component of retail shops - but the D.F. B.C., Ref. in these class of retail outlets vary.

- Pasteurised Milk

There is no pasteurised milk marketed in these districts. There is a very good demand for pasteurised milk in the principle towns of Kurunegala, Negombo, Gampaha, Chilaw, Katunayake, Ja-Ela, Kandana and other urban areas, free trade zone factories, housing projects etc.

- Sterilised Milk

Sterilised milk marketed in these districts are Milco 500 ML plain milk, 200 ML flavoured milk and 190 ML flavoured milk of CTMU. Of the total milk market this represents less than 1% in these districts. The demand is more for flavoured sterilised milk. Sterilised milk is available only in urban towns in this region and that too close to the Colombo district. Puttalam town does not get sterilised milk.

- Yoghurt

Set Yoghurt - vanilla flavoured and fruit mixed are marketed by a number of manufacturers. The total quanitity marketed per day could be estimated at 65,000 cups per day. the cup size ranges from 80 ML to 100 ML and could be estimated that 50% of the market is with 80 ML cups and the balance 50% with 100 ML cups. 75% of the market is with plain vanilla flavoured yoghurt and 25% with fruit mixed yoghurt.

Map No.3 indicates the location of 23 yoghurt manufacturers in these districts. Table 13 indicates the manufacturers' price, retail price, cup size and whether from locally produced fresh milk or imported whole milk powder. In addition to this about two brands are marketed from manufacturers located outside these districts. The popular brands being Highland, Ranwan.

Curd

Curd is traditional, cultured milk product of Sri Lanka and is prepared from buffaloa milk. The survey conducted estimates that 3500 pots of one litre curd are manufactured in these districts and is predominantly consumed in the area. In addition about 2200 pots are marketed in this region but manufactured in outside areas such as Kantalai,Polonnaruwa, Kekirawa, Anuradhapura etc. The production is purely on a cottage industry basis. Map 4 indicates the location of these manufacturers in these districts and Table 13 indicates the pack sizes, manufacturers price and retail price. The demand for curd cannot be met due to the constrain of availability of buffaloa milk. Curd manufactured from neat cattle are not popular and thus curd manufacturers do not use neat cattle milk.

Whole Milk Powder

The principle source of milk in these districts is whole milk powder (WMP). Every retail outlet visited is stocked with all popular brands of whole milk powder. It is estimated that 90% of the formal market for milk in these districts are met from imported and locally manufactured whole milk powder. 90% of the milk produced in these districts are drawn by Milco and Nestles and taken out of the districts. A total of 28000 litres is collected. Milco does not send an equal qantity of milk back to these districts, and similarly Nestles. Thus the consumer has to depend on the imported brands of whole milk powder. The tea whitner market visited in the principle towns indicate the use of imported milk powder.

Ice Cream

Small quantities are manufactured in the district. Map No.4 indicates the location, and Table No.14 indicates the details of the manufacturer. However, the ice cream market in these districts is dominated by manufacturers outside his area such as Highland, Elephant House, Alerics, Kothmale, Woodlands. The consumer demand is for the established traditional brand.

MAN FACTURERS OF YOUGHURT AND CURD

TABLE 13

NAME AND ADDRESS	TYPE OF PRODUCT	NO. OF EMPLOYEES	PRODUCTION OUTPUT PER DAY		BRAND NAME	PACK SIZE YOGHURT	WHOLESALE PRICE		RETAIL PRICE	
			YOGHURT	CURD			PLAIN VANILLA FLAV. RS.	FRUIT RS.	PLAIN VANILA FLAV. RS.	FRUIT RS.
CTMU, Kurugalpotha, Kuliyapitiya.	Youghurt, CURD, F. Sterilized M.	10	18,000	1800	Ceetee	100 ml	5.50	6.00	6.50	7.00
L.M.C. Jayathilaka Kuliyapitiya Rd, Natthandiya.	Yoghurt, Ice Cream.	70	7000		Michico	100 ml	5.50	6.00	6.50	7'50
Nimal Wijewardana Mihiri Farms Merigama.	Yoghurt	50	6500		Mihiri	80 ml	5.50	6.50	7.00	8.00
T.M. Gunawardana No. 214, Kurunegala Road, Dambadeniya.	Yoghurt Curd	15	4000	100	Tastee	100 ml	5.25	5.75	6.25	6.50
M.A.M. Bandara No. 46, Colombo Rd, Dunagaha.	Yoghurt	23	4000		Kingsjoy	80 ml	5.25	5.50	6.50	7.00
R.M. Somapala No. 16, Diula Rd, Natthandiya.	Yoghurt	10	4000		Ruhunu	80 ml	6.00	6.50	7.50	8.00
H.G. Piyal Mahinda 16/27, Nugahena Watta, Kiridiwela.	Yoghurt	02	3000		Chanaka	80 ml	5.50	6.00	7.00	7.50

NAME AND ADDRESS	TYPE OF PRODUCT	NO. OF EMPLOYEES	PRODUCTION OUTPUT PER DAY		BRAND NAME	PACK SIZE YOGHURT	WHOLESALE PRICE		RETAIL PRICE	
			YOGHURT	CURD			PLAIN VANILLA FLAV. RS.	FRUIT RS.	PLAIN VANILA FLAV. RS.	FRUIT RS.
Poperalahame Sisira, Morawaka, Nelumdeniya.	Yoghurt	20	2500		Parakum	80	4.50	-	6.50	-
W.A. Somasena No. 41/7, Negombo Rd, Kurunegala.	Yoghurt	03	2000		Royal	100 ml	5.00	5.50	6.50	7.50
S.M.S.M.S. Kumara Kirigahapitiya, Elukhena, Kuliyapitiya.	Yoghurt Curd	10	2000	30	Siyane	100 ml	5.25	6.25	7.00	8.00
T.A.G.J. Somapala 135, Kanduboda, Dilgoda.	Yoghurt	07	1800		Daisyland	80 ml	4.25	5.00	7.00	7.00
Anura Manikdewela Kiridigalla, Ibbagamuwa.	Yoghurt	03	1500		Lio	80 ml	4.50	-	6.50	-
Ananda Samarasinghe 40, Sumangala Mawatha, Kurunegala.	Yoghurt	03	1500		Lacto	80 ml	5.50	6.25	6.50	7.00
K.M. Madannayaka 338/6B, Kandy Rd.	Yoghurt	03	1000		Jenive	80 ml	5.50	6.00	6.50	7.00

TABLE 14

MANUFACTURERS OF ICE CREAM

DISTRICT	NAME AND ADDRESS	TYPE OF PRODUCT	DISTRIBUTION AREAS	NO. OF EMPLOYEES	PRODUCTION OUTPUT PER DAY Ice Cream
Puttalam	L.M.C. Jayathilaka Kuliyapitiya Rd, Mathanweya.	Ice Cream	Chelaw, Puttalam, Kurunegala, Giriulla, Kuliyapitiya.	70	3500 Litres
Gampaha	S.S. Jayasinghe "Sisila" Mirigama Rd, Pasyala	Ice Cream	Direct Consumer (Mobile Van)	02	20 Litres
Gampaha	R. Ranasinghe Walawwatha Merigama	Ice Cream	Mirigama - Giriulla Wrakapola, gampaha - Ja-Ela, Minuwangoda, Divulapitiya.	12	60 Litres 600 Cup

Two large ice cream manufacturing plants are being established in this region. They are "Chilled House" and Uniliver plant - the world famous Walls Ice Cream. These plants will be on imported raw material and not on fresh milk produced in the area.

The ice cream market is a competitive market somewhat restricted by limited deep freezer facilities at retail points.

- Butter and Cheese

These are available in the market and have strong competition at all levels from both local and imported products.

- Condensed Milk

The market in this region is estimated at 3% and is static.

7.2 Strategies for the Development of the Market

Strategies for the development of a market for liquid processed milk and fresh milk products has to be created over a period of time by observing and reacting to consumer preference and demand. People prefer to use fresh milk of good quality from reputable manufacturers provided the quality is maintained and daily the milk is available when the consumer requires same. In Sri Lanka consumers have over the last two decades developed a preference for whole milk powder due to its convenience in purchase, storage at household and usage whenever the need arises. Also whole milk powder was cheaper than locally procurred and processed milk - Table No. 15 indicates the relative economics. The non-availabilty of good quality pasteurised milk, sterilised milk and UHT milk contributed to the development of the market for whole milk powder. The present cost of 400 grams of milk powder in the market works out to between Rs.25.00 to Rs.28.00 per litre of milk. Annexure V indicates the cost of 1/2 litre of pasteurised milk at the current purchase price of raw milk by CTMU. The retail price thus would be Rs.12.00 per 1/2 litre pouch, which is economical than the current imported whole milk powder. Thus there is a great potential for development of the market for pasteurised milk in urban towns of Kurunegala, Gampaha and Chilaw Puttalam districts. The potential for the market as indicated in Table 7 could be achieved by year ?

TABLE NO; 15

Relative Retail Prices of
Pasteurised Milk and WMP

Year	Pasteurised Milk a/	WMP b/	Price Relativity Pasteurised Milk /WMP as a %
1978	2.46	1.59	-35.4
1979	2.46	1.74	-29.3
1980	3.52	2.80	-20.5
1981	3.80	3.78	-0.5
1982	4.20	3.78	-10.0
1983	5.80	6.18	+6.6
1984	7.50	7.66	+2.1
1985	7.50	7.66	+2.1
1986	7.50	7.66	+2.1
1987	7.50	7.66	+2.1
1988	7.50	8.18	+9.1
1989(Nov)	11.20	11.35	+5.1
1990	12.50	14.74	+17.9
1991(Oct)	14.50	13.6	-9.2
1992(July)	15.80	14.74	-1.7
1993(Dec)	17.00	15.52	-8.7
1994(Apr)	19.00	14.73	-22.5
1995(Nov)	21.00	16.31	-22.3

a/ Up to 1988 on pint bottle covered to litre, then based on 500 ml sachet - MILCO prices.

b/ Lakspray converted to LME at ratio of 7.6

Notes:

Prices changed during the year in many cases so average prices were used.

- The main thrust to achieve the objective will be to market a substantial portion of the CTMU collection as pasteurised milk packaged in pouches of 1L, 0.5L and 0.250ML sizes.

- Pasteurisation is the simplest and lowest cost processing technology. Besides, destroying pathogenic organisms in the milk, it also substantially reduces total bacterial numbers with the result that shelf life is extended.

- Packaging for pasteurised milk is considerably cheaper than sterilised milk and UHT milk.

- Pasteurisation has the least impact on the natural milk flavour.

- Experience has shown that consumers offered efficiently processed sterilised and pasteurised milk of equal quality will strongly favour the lower priced pasteurised milk. In the operation flood programme in India, for example over 96% of liquid milk sales are as pasteurised milk - in spite of a considerable number of UHT plants being installed. Many of the UHT plants in both India and Pakistan have not been viable.

- The market for yoghurt is already established. With improved quality of packaging and a more efficient distribution system to cover at least 75 - 85% of the retail outlets, the market will improve. The market survey clearly indicates that the present quantity could be increased by at least another 50 to 60%. Year by year market will grow.

- The market for ice cream and milk popsicles have to be developed. The consumer demand for these products exist.

- An efficient distribution system has to be organised for each product taking into consideration the profile of the product and its demand pattern. The system evolved should be under constant review to ensure the product moves as per preference of the consumer.

- An advertising programme by way of point of sale material, leaflets, handouts etc. to cover only the area of operation to be in place. These should clearly bring out the theme of "Quality of Product".

8. COTTAGE TYPE YOGHURT, ICE CREAM AND CURD MANUFACTURERS IN THE COCONUT TRIANGLE

Map No. 3 and Map No. 4 indicates the cottage type yoghurt, curd and ice cream manufacturers in the coconut triangle.

- There are 14 yoghurt manufacturers producing over 1000 cups each per day. There are nine manufacturers below 1000 cups each day. 50% of the manufacturers use locally collected milk for production and the balance imported whole milk powder. No.1 Ceetee is CTMU product. The production in all cases is purely on cottahge industry basis. Milk is boiled in open pan, cooled, culture added, flavourings. Poured into cups manually. Incubated in an improvised incubator. Thereafter placed in a refrigerator or bottle cooler until despatch to Market. Table No. 13 indicates the main manufacturers.

- Curd - There are 14 curd manufacturers. Number of pots vary between ten to 500 pots/day. The production is from buffaloa milk collected.

- Ice Cream - There are three very small ice cream manufacturers. They use imported raw material.

The production of these small manufacturers are marketed in close vicinity of the production facilities. almost all of these manufacturers are family business and no properaccounts are maintained. The organisations are not registered.. The product brand name is only registered in the name of the Head of the family. Hence I cannot comment on capital structure and financial status of these small cottage type organisations. these do not qualify for consideration for AgEnt assistance schemes on ythe basis of 50% capital needed in a participatory role. However, over a period of time if they could meet the following conditions they could be considered.

- Only manufacturers using locally produced milk to be considered. The milk to be purchased from a registered primary co-operative society.

  - SLSI standards for purchase of raw milk and standard for the fresh milk products to be manufactured to be adopted.

  - The organisation to be registered so that it forms a legal entity. Accepted norms for the maintenance of prime documents of a legal entity for a business of the nature to be adopted.

  - Principles in Dairy Technology to be adopted in the manufacture of the fresh milk products to preserve the nutritive quality and flavour of milk.

Thus I recommend that the above should be pre-conditions to qualify for AgEnt assistance for small scale manufacturers to dairy products.

Mr. D.R.Subasinghe of Araliyakela Dairy Development Company Limited informed me on 16/05/96 that he is not in favour of AgEnt assistance for his project. He requested me not to inspect his business for this purpose.

9. ASSESSMENT OF THE WILLINGNESS TO ACCEPT A PARTICIPATORY ROLE AND CAPABILITY FOR 50% COST SHARING ON POTENTIAL ASSISTANCE PROGRAMME

9.1 C.T.M.U - CTMU has the following deposits in the banks

1.	Fixed Deposit Bank of Ceylon	...	Rs. 3.5 million
2.	Savings Account Bank of Ceylon	...	Rs. 5.0 million
3.	R.R.D.B. - Kuliyapitiya	...	Rs. .2 million
	Total	...	**Rs. 8.7 million**

These deposits could form the required 50% contribution from CTMU for the first stage, provided CTMU is fully aware of the terms and conditions of 50% assistance of AgEnt. The Board of Directors of CTMU has to make a decision and a document outlining the proposal has to be prepared for their consideration. A detail financial liability plan and a proposal has to be made.

9.2 Primary Societies - The primary societies have no approved deposits in banks. The 67% societies that are financially satisfactory have between Rs.5000/= to Rs.30,000/= to their credit in the Banks. I have made a proposal in Chapter 5.3 for consideration of AgEnt, CTMU and the primary societies.

9.3 Cottage type Yoghurt, Ice cream and Curd Manufacturers

I have made a proposal in Chapter 8 as preconditions that Agent should adopt for 50% assistance to these units. At present none of these units qualify according to these preconditions.

I have received an application from Wanni Milk Foods, Konottawa, Kuliyapitiya to consider recommendation to AgEnt for assistance. This company is yet to be incorporated. The company has sufficient Assets to the value of Rs.2.87 million. It is recommended to consider this application after the company has been incorporated and a detail technical and financial feasibility study is made. The application is forwarded under separate cover.

ANNEXURE 1

CTMU Products, Pack sizes, Ex-factory Price, Retailer Price and Consumer Price

	Pack Size	Ex-Factory Price Rs.	Distri-bution Cost Rs.	Total Cost Rs.	Price to Retailer Rs.	Retail Price Rs.
1. Yoghurt Vanilla Flavoured	100 ML Cup	3.24	1.30	4.54	5.50	6.50
2. Yoghurt Fruit	100 ML Cup	3.54	1.30	4.84	6.00	7.00
3. Flavoured St. Milk	190 ML Bottle	3.43	-	3.43	7.00	8.00
4. Milk Toffee	Packet of 25	18.16	-	18.16	22.50	25.00
5.Ghee	750 ML	-	-	-	150.00	165.00
	325 ML	-	-	-	80.00	90.00
	180 ML	-	-	-	50.00	60.00
	1 L	146.96	-	146.96	165.00	175.00
6. Butter	225g	30.00	-	30.00	35.00	40.00
	113g	15.06	-	15.06	20.00	22.00
7. Curd	1000 ML	-	-	-	40.00	45.00
	500 ML	10.38	-	10.38	15.00	20.00
	175 ML	5.02	-	5.02	8.50	9.00

1. Ex-Factory price is average of January, February and March 1994.

2. Distribution cost is average of January, February and March 1994.

ANNEXURE II

Methods for assessing milk quality carried out at Reception in the presence of milk producers (No Laboratory needed)

The following are some of the common tests to check freshness, hygienic quality and composition. Appropriate tests for a given situation could be carried out.

Methods to assess freshness and Hygienic quality of Milk

Sensory Test

Principle of Method	-	The general appearance, cleanliness, colour and smell of milk are tested before emptying the transport containers.
Material	-	Spoon
Procedure	-	The technical person accepting milk opens each transport 'can' and assesses appearance, colour, cleanliness and smell of the milk before emptying the 'can'. If the smell of the milk is different from that of normal milk, taste and flavour are tested by taking a spoonful of milk into the mouth.
Assessment of Result	-	If the milk contains visible dirt, straw or manure, it has been milked and handled in an unhygienic way and should not be accepted. The colour of 'cows' milk' should be slightly yellowish - white, that of buffalos white.Difference in colour are signs of defective milk.If the colour is reddish, the milk may contain blood, if it is yellow, it may contain pus. Such milk is most probably from infected udder (Mastitis) and should not be accepted. Milk with a smell, which is different from that of fresh, normal milk has been kept under unhygienic condition and/or is no longer fresh. If the smell is slightly sour, the milk has undergone bacteriological deterioration. These types of defective quality milk should not be accepted.

Sensory tests are quick, cheap and with growing experience of the assessor, very reliable. Since practically no equipment is needed, the sensory test can be carried out any where and anytime. There may exist individual differences between assessors. The values cannot be expressed in figures or in any other exact way.

CLOT-ON-BOILING TEST

Principle of method	–	A smal portion of milk is heated to boiling point in a test-tube for checking whether it can withstand heat treatment without clotting.
Materials	–	Test-tube
	–	Wooden trays for test-tube
	–	Gas or alcohol burner
Procedure	–	Approximately 5ml of milk are placed on a test-tube and heated upto boiling under slightly shaking over a gas or alcohol flame. The open end of test-tube should be held in such a way that it does not point in the direction of the person.
Assessment of Result	–	If the milk clots on boiling, it is sour i.e. it contains at least 0.1% W/V lactic acid. The milk cannot be heat treated. Such milk should be rejected. Milk which does not clot on boiling contains no lactic acid or less than 0.1% W/V.
Accuracy & Short Coming	–	The clot-on-boiling test is quick, very simple to perform and cheap. If carried out in the presence of milk producer, the result is readily understood and accepted. The test can be carried out by untrained personnel. A negative clot-on-boiling test does not indicate whether the milk is fresh or slightly sour. One does not know how long such milk can be kept before it clots on heating. The test, therefore, should always be carried out in combination with the sensory test.

ALCOHOL TEST (SIMPLE AND DOUBLE)

Principle of Method	-	Milk with increased acidity flocculates after addition of an equal or double volume of alcohol. Fresh milk can be diluted with alcohol without flocculation.
Materials	-	Test-tubes with marks at 3, 6 and 9ml Ethyl - alcohol 68% V/V absolutely free of acid.
Procedure	-	Milk is filled into the test-tube upto the first mark. While slightly shaking the test-tube an equal amount of alcohol is added and the mixture checked for flocculation. If no flocculation is vissible, another portion of 3ml alcohol is added (upto the third mark) and the mixture checked again for flocculation.
Assessment of Result	-	If no flocculation is vissible after addition of 6ml alcohol, the milk is fresh or it's acidity is only very slightly increased. If coagulation occurs only after addition of the double quantity of alcohol, the milk is no longer absolutely fresh. If flocculation occurs after addition of the first portion of alcohol, the increase in acidity is distinct, but such milk may not yet - clot on boiling. If the clot-on-boiling test is negative, the milk has to be heat treated as quickly as possible.
Accuracy & Short Coming	-	The alcohol test is quick easy to carry out and rather cheap. It allows a detection of increased acidity of milk before it clots on boil. Milk with a negative simple, but positive double alcohol test can still be kept for a limited period of time before heat treatment.

The short coming here under Sri Lanka condition is that this test cannot be applied to buffaloa milk as it contains a higher content of calcium. Also some farmers mix buffaloa milk and cow milk. Hence, it is necessary before a decision on the test is made to ascertain this position.

QUICK TITRATABLE ACIDITY ASSESSMENT

Principle of Method – The titratable acidity of milk is determined by titrating 10ml of milk in a test-tube with 1/9N sodium hydroxide solution using a 10ml hand-burette (calibrated 1/10ml).

Material
- Test-tube with mark at 10ml
- Hand-burette 10ml calibrated 1/10ml
- 1/9 Sodium hydroxide solution
- 2% phenolphalein in alcohol

Procedure – Milk is filled into the test-tube upto 10ml mark. After addition of 3 drops of phenolphthalein solution the milk is titrated with 1/9N NaOH under continuous shaking of the tube. As soon as a pale pink colour appears the amount of NaOH used is determined.

Assessment of Result – The result is either expressed in degrees dornic i.e. 1/10ML NaOH used being equal to 1 degree dornic (DO) or in % lactic acid, wherby 1/10 ml NaOH used is equal to 0.01% W/v lactic acid.

Accuracy – The assessment of the freshness of milk by use of a test-tube and of a hand-burette is quick and cheap. However, the accuracy is limited to the small quantity of milk titrated.

Lactometer Test - Specific gravity determination on milk samples is widely used for detecting adulteration.This test is not reliable and is even miss-leading, as a rule there are lactometers in use of different makes and kinds. Normally the lactometers are built for use to take the reading of milk at a particular temperature. The milk of very small producers vary widely in fat content - sometimes 2 - 6% according to milking method. Various practices of feeding calves before milking and after milking give vary wide fat % readings and thus effects lactometer readings. The method is correct only when carried out at the correct temperature and when combined with the butterfat test.

Methods for assessment of milk quality for which a simple laboratory is needed

Small laboratories and well trained technical staff are needed to carry out the tests described hereunder. These tests cannot be carried out in the presence of milk producers. However, if the farmers wish they should be shown the laboratories and the work performed there. They should also be well informed of the tests and the significance of the results obtained. Mutual trust between farmers and the milk testing staff is needed for improving quality of milk.

Methods for assessing the freshness and the hygienic quality of milk

Titratable Acidity - Freshness of milk is expressed as a function of its lactic acid content. 100ml (or: 50ml and burette reading multiplied by 2) of milk are titrated with sodium hydroxide and phenolphthalein as indicator.
(Note- the initial acidity of absolutely fresh milk, corresponding to 0.16% W/V lactic acid, is entirely due to the buffering capacity of milk between the ph of fresh milk (6.6 to 6.8) and the ph at which phenolpahthalein changes its colour (8.4).

Material	-	Blow out pipette 50ml
	-	Blow out pipette 2ml
	-	Conical flask 150 - 200ml
	-	Burette calibrated 1/10ml (burette combined with plastic reservoir bottle for 1/9 NaOH are available. That combination offers protection against carbonation of sodium hydroxide).
	-	Alcoholic solution of phenolphthalein 2%
	-	Sodium hydroxide solution 1/9 normal
Procedure	-	Milk samples are kept in a water bath of roughly 20'c (add afew ice cubes if necessary and available) 50- 100ml of milk are measured into the conical flask with the help of the blow out pipette, 2ml penolphthalein solution are added and the milk is titrated under continuous shaking with 1/9 N NaOH to a pale pink colour. The end point of the titration is reached as soon as the milk sample remains pink for 30 seconds while standing. The amount of NaOH solution used is carefully noted. When 50ml milk are titrated, the burette reading has to be multiplied by 2.
Assessment of Results	-	1 ml of 1/9 N NaOH used corresponds to 0.01 of lactic acid. Titratable acidity is expressed in ml 1/9N NaOH used for titrating 100 ml milk and called degrees Dornic (D). If the D are divided by 100, the lactic acid content of the sample in % (W/V) is obtained. In order to arrive at the true lactic acid content of the sample 0.16% has to be subtracted. (Note - the amount of 0.16% is only correct for unadulterated milk with unchanged dry substance. Adulteration also changes the concentration of buffering substances and thereby the "Acidity" of freshmilk).

Accuracy of Method	–	The determination of titratable acidity is the most reliable and the quickest method of checking the freshness of milk. However, the method gives good results only if absolutely accurate 1/9 N NaOH solution is used, the temperature of milk sample is correct, carbonation of NaOH is prevented, titration is quick and careful and if the burette reading is accurate.

METHYLENE BLUE AND RESAZURIN REDUCTION TEST

Principle of Method	–	The reduction test with Methylene blue or with Resazurin measures the bio-chemical activity of micro-organism in milk. A common feature of microbial activity is the reduction of hydrogen and the subsequent enzymatic reduction of other substances, e.g. lactic acid bacteria reduce pyruvate to lactic acid in this way. When adding substances such as methylene blue or Resazurin, which are easily reduced. These substances complete with the natural hydrogen acceptors of milk. They also will be reduced after a certain time. Methylene blue and Resazurin change or lose their colour when reduced. Quick reduction of a given quantity of dye means high microbiological activity and vice versa.

Materials	–	Test tube with ring mark at 10 ml
	–	Pipette 1 ml
	–	Incubator* – or water bath adjustable to 38°C. * (An insulated wooden cup-board, equipped with a container holding hot water for heating may also serve as incubator).
	–	Methylene blue tablets/Resazurin tablets

Procedure	–	Add 1 ml aqueous methylene blue / Resazurin solution to the test tube and transfer milk from each churn or sample bottle with a sterile dipper or pipette to a test tube, filling it up to the mark. The test tubes are closed with clean rubber stoppers and placed in the rack of the water bath or incubator. Discoloration or change of colour has to be checked at regular intervals and the time for discolouration is noted for each sample. At each control the test tubes are inverted for redistribution of cream.
Assessment of Results	–	Generally the time required for reduction of the dye is inversely proportional to the number of bacteria present in milk. However, there are bacteria with high and others with low reduction potential. Furthermore, mastitis milk reduces the dye, especially Resazurin, as well. The time necessary for discolouration depends on the concentration of dye, the number and activity of the micro-organism and the amount of somatic cells (leucocytes) present in milk. While introducing the reduction test it is recommended to establish in each case the time limits for "good" "acceptable" and "non-acceptable" milk by simultaneous checking of the discolouration time, initial titratable acidity, total count.
Accuracy	–	The dye reduction rests are relatively quick easy to carry out and rather cheap. They allow quality assessment of milk which does not already have obvious defects at collection. It therefore is a method which helps to improve milk quality only after having reached a certain quality standard in the proposed milk collection area of the company. To use dye reduction methods makes sense only when milk producers are thoroughly educated on how to produce clean milk and differentiate of price payable on quality is possible.

METHODS FOR THE DETERMINATION OF BUTTER FAT AND SNF

Butter Fat Test

- The payment for milk to the producer is on composition and butter fat is one component. This test could be carried out by either the "Gerber butter fat test" or by Milko-tester minor. The advantages and disadvantages of adopting one of these test methods for regular determination of fat is discussed below.

Gerber Test

- The cost is prohibitive to be carried out daily on small milk producers that deliver 2 - 3 L/day. (App. cost per sample Rs.2.50)
- Accurate results possible only with trained technicians.
- Accidents are possible if no strict precautions are taken (protective goggles, plastic apron).
- If the test is to be carried on composit samples, security of samples to the satisfaction of farmers is necessary.

Milko-Tester-Minor

- A Danish Firm Foss Electric has developed a semi automatic cheap and less complicated model of Milko-Tester III known as Milko-Tester-Minor (MTM). This instrument is presently built under licence in India.
- Accuracy is the same as Gerber Fat Test method.
- Advantage over Gerber method is speed, safety and cost. The cost per sample is Rs.0.15.The quality of milk required is 0.5ml.
- Very suitable even for daily testing of small milk producers milk.
- Good functioning depends on accurate calibration and maintenance. An extremely careful maintenance is required to keep the instrument in working condition.
- Well trained staff needed.
- Should have sufficient stock of spare parts as wear and tear is rather high.

BUTTER FAT TEST (GERBER TEST)

Principal of Method	–	Fat globule membranes and proteins of the milk are hydrolysed with concentrated sulphuric acid in order to break the emulsion and to set the fat free. The volume of fat from a given amount of milk is measured in a specially designed glass recipient (Butyro meter).
Materials	–	Standard Gerber butyro meters
	–	Rubber stopper or lock stoppers for butyro meters
	–	Blow out pipette for milk 11 ml
	–	Measuring pipette or automatic measure for acid 10 ml.
	–	Pipettes or automatic measure for Amyl alcohol 1 ml.
	–	Stand for butyro meters.
	–	Centrifuge working at 1,200 r.p.m.- 40 – 60 c.m. diameter, electric or hand operated.
	–	Water bath adjustable to 65'c.
	–	Concentrated H_2SO_4 technical grade, specific gravity 1.820 to 1,825 (to be kept in tightly closed container).
Procedure	–	Adjust milk sample temperature usually to 20'C. Mix milk carefully and avoid mixing air in to the milk. Add 10 ml sulphuric acid to the butyro meter and then add 11 ml milk carefully down the side of the butyro meter without mixing milk and sulphuric acid. Add 1 ml Amyl alcohol. Fix stopper. Invert butyrometer several times and shake vigorously while holding it with a dry cotton wool or wooden pad until all protein is dissolved and no white particles can be seen. Place butyro meter in water bath of 65'C for 5 minutes with stoppers downwards. As soon as sufficient butyro meters are ready centrifuging takes place for 5 minutes at 1,200 RMP. Then place butyro meters back into the water both for 3 minutes and read the fat column from the lowest point of the meniscus at the interface of fat and acid.

Sometimes the fat column has to be brought up or by pulling it slighly down. The lower end of the fat column is brought down or pushed up to the next main graduation. Replace butyro meter in water bath for a further 3 minutes and read again.

Assessment of Results	–	The butyro meter reading gives the result directly in fat %.
		Accurate results can be obtained by experienced technical staff only.

FAT TEST BY MILKO-TESTER MINOR

Principal of Method	–	The MTM works on the principle of scattering of light by milk-fat globules. The light transmitted through the milk mix is in inverse proportion to its fat content. Light transmission is measured photometrically and read directly as fat percentage in milk samples on digital display.
Material	–	Milko-Tester-Minor
	–	Beaker for milk sample
	–	A diluent
Procedure	–	First prepare diluent, mix 1 litre hot clean water with 45 g EDTA plus 7.6 g NaOH. Add 1 ml Titron x 100 liquid and 0.5 ml antifoam liquid and mix well. Add water to make a total of 10 litres and mix well. The diluent is ready for use.
	–	Read instructions of manufacture of MTM and feed well mixed sample of milk under this milk intake tube. Push the milk intake button in. With this action, milk along with a definite quantity of diluent is sucked in (7.0 ml). Place the mix out beaker under the milk intake tube. Push the mix out button.Initially, the milk will come out followed by the diluent which ensure proper mixing of milk and diluent. Operate the pump handle up and down three times with a steady motion and then allow the handle to rest in bottom position. Read out the results i.e. the fat percentage of the milk sample appearing on thedisplay and record it.

Accuracy	–	According to uses of MTM the accuracy of the instrument is approximately the same as the Gerber fat-test
Determination of Dry Matter of Milk	–	A fairly accurate value of dry mater in milk can be obtained by calculating dry matter % with the help of Fleischmann's formula using the fat and density obtained with the methods mentioned.
Procedure	–	Insert values for fat %and density in the formula of Fleischmann's.

$$DM = a \times \frac{(100 \times d) - 100}{d} + b \times f$$

15'C	a	=	2.675	b	=	1.200
20'C	a	=	2.738	b	=	1.311

DM = Dry matter (total)

F = Fat %

d = density

Assessment of	–	From Fleischmann's formula, special slide rule or table, dry matter (DM) in % is obtained.
Accuracy	–	The accuracy of DM obtained by calculation is practically equal to direct DM determination by standard drying method, provided values of fat % and density are accurate. To obtain accurate results trained technical staff are needed.

ANNEXURE III

Containers for milk, during milking, collection and transport to milk processing plant

Material used to fabricate milk containers

Milk being an ideal medium for microbial growth, should never be brought into contact with containers which are not absolutely clean. Certain materials used for making containers are easy to clean and sterilize; others can hardly be freed from microbial contamination. Containers used in handling milk include those used during milking, bulking herd's milk, handling milk through pick-up points, collecting centers, collecting and cooling centers and finally delivering it to the processing plants. Some of the types of materials used in containers that are at present in use in Sri Lanka include, earthenware pots, plastic containers, porcelain jugs, metal and other material.

Earthenware pots

These do not have a smooth surface and are porous to a degree. Thus they cannot be cleaned and sterilized and maintained in a manner to handle milk without microbial contamination. They should be discouraged.

Plastic containers

These have become a very common sight. They should be discouraged from being used as milk containers at any stage, if not specially made for that purpose. Most plastic containers have characteristics which make them unsuitable for milk, namely:

a) They scratch easily and thus provide hiding places for bacteria during cleaning and sanitization.

b) Plastic is a poor conductor of heat and hence will hinder effective sanitization by heat.

c) Plastics are sensitive to heat and may not withstand the necessarily high temperature required to achieve sterilization for many repeated operations. They may change shape during heat sterilization or become brittle.

d) Some plastics transmit flavours to milk either from themselves or from surroundings.

Porcelain and glass containers should be discouraged

These are of unsuitable design for ease of cleaning, sterilization and inspection. Clear glass bottles expose milk to ultra violet rays and such milk may develop oxidised or sun flavour.

Metal containers

Metal is the most commonly used material in the manufacture of milk containers both for use on the farm and during milk collection. Milk containers are usually made from alloys because no single metal has all the characteristic required for satisfactory performance. Characterisitc required include, high mechanical strength, that allows light-weight design, high functionality, economy, durability, high standards of sanitation. Metals that come into direct contact with milk have to meet the following requirements, namely :-

a. be non-toxic and should not transmit flavours into milk;

b. not to effect keeping quality of milk;

c. be resistant to corrosion by milk constituents, washing and sanitising solutions especially within the critical temperature range and concentration;

d. be easy to wash and keep clean, with a bright surface, both inside and outside that is easy to maintain;

e. have mechanical strength, allowing lightweight design and fabrication resistant to rough handling and scrubbing;

f. have good heat transfer characteristics;

g. have attractive appearance throughout a long working life;

h. withstand sudden and drastic changes in temperature - from below freezing to about boiling point of water;

i. remain non-absorbent to milk and water;

j. be economical to buy.

Design of milk containers

Milk containers must be designed in such a way that all the parts of a container are accesible for cleaning, sanitization and disinfection. The container must have protection to milk from mechanical damage, light, penetration and contamination. Milk should not spilll from a full can. The mouth of the can should be wide enough to hold it stable in an inverted position during draining or drying. All corners of a milk can should be accessible for cleaning, sanitising and inspection.

Milk containers used in the milk shed

Milking in cattle sheds or in the open in developing countries is usually done by hand. For milking, wide mouthed buckets are used. This causes aeration of milk. The environment in milk sheds or in the open is not dust free or of required hygienic surroundings. Milk is thus liable for contamination from dust borne micro-organisms of various types. Thus special containers of the description given in the preceeding paragraph with partly covered (hooded milking pails) may have to be considered to keep the bacterial counts in the initial stage to a low level. The milkers have to be specially trained to follow hygienic milking procedure, cleaning and sanitising of all equipment used in the milking of cows. The milking pails should thus be of a type that can easily be cleaned, sanitized and dried to avoid contamination of milk with the residues of detergents, milk and sanitizing solutions. After milking the herds milk is pooled into one or two milk cans. Milking should be done in such a way to avoid filtering at the point of milking. As far as possible it is best to ensure that a full can is made up at this point so that milk sweep minimum surface and minimize agitation.

Containers for collection at primary collection point and at secondary collection pint

Almost 95% of the milk produced in Sri Lanka is by small milk producers. The process of collection therefore has two functions - bulking the milk into economic quantites and transferring it from the small farmers containers into standard containers for easy handling by the processing plant. It is thus advisable for these small milk producers to acquire container fabricated from approved material. Most reputable manufacturers produce containers of standard sizes ranging from 5 litres to 40 -50 litres. Milk processing plant/farmers organisation should thus assist the small scale farmers to acquire milking pails, milk cans of approved designs, sizes and etc.This would ensure protection of milk in terms of keeping quality, chemical composition, microbiological quality, taste and flavour.

Standard container in terms of size, capacity and tare weight make handling much easier. Reception of milk at pick-up point, collection/chilling centers and the processing factory is made much easier. Standard container allow the use of mechanical device in conveying, tiping, washing, sterilizing, interchanging of lids, loading and unloading. The most important factors to be considered at a pick up point are the speed of handling the milk and ensuring that it is of good quality before accepting and bulking it with other farmers milk. Delays at pick-up points should be avoided by the use of standard cans, equipment and set procedure to quickly check chemical, keeping quality and microbiological quality. Intermediary milk chilling center would assist to a greater degree to accept milk twice a day and to maintain good chemical quality and microbiological quality of milk.

ANNEXURE IV.

Cleaning and sanitization of containers used in milking, transport at collecting & chilling points

Effective cleaning

The cleaning of equipment used in milking, collecting and chilling centres in Sri Lanka is done by hand. With properly designed equipment, it is easy to devise an effective and appropriate washing and sanitizing procedure. The basic steps in cleaning include the removal of soiling material, the removal of detergents used, final rinsing and sanitising of the surfaces.

In cleaning, we aim to provide sufficient energy in the cleaning solution to overcvome the forces that hold the soiling material on the surfaces of equipment at the above mentioned points where milk is handled, cleaning by hand with the help of a good scrubbing brush is recommended. The type of detergents and concentrations used must be safe in contact with the skin.

Basic rules for cleaning of containers used inmilking, transport and at collecting and chilling centres

Rinse with cold water and remove all residues; scrub with a scrubbing brush using a compounded detergent. Preferable if this is done with hot water to remove fats andminor deposits.

Rinse with water and remove all detergent used completely. Thereafter, rinse with water containing a weak solution of chlorine to sanitize the surfaces, or rinse with boiling water. A commercial washing solution formulation could be developed by a firm for use in milking points, collecting points and chilling centres. This solution is usually an alternative formulation with at least 200 ppm of available chlorine. However, we could encourage farmers to sun-dray the equipment, as ultraviolet rays of the sun are effective sanitizers of a well cleaned surface. The desirable properties in a detergent for the washing of dairy equipment should have the following characteristics.

- Readily soluble in water at working temperature.
- Non-corrosive to equipment surfaces, odurless.
- Bio-degradable.
- Non-toxic and non irritant to the workers.
- Economic in use
- Readily rinsable from equipment surfaces
- Stable during long storage.

Preparation of a suitable disinfectant and detergent

It is of particular importance the provision of detergents and disinfectants for milking points, transport cans and other appliances required in the milking shed pails, transport cans etc. In the absence of cheap and equally useful alternative, farmers frequently resort to expensive household detergent and subsequently try to economize on the same because of high cost.

A cheap alternative is the distribution of a stock solution of NaOCL, which the Manager of the milk collection centre can easily manufacture by using the following metthod.

1. Prepare solution A containing 5 g/l calcium hypochlorite
2. Prepare solution B containing 200 g/l soda ash (calcinated sodium carbonate)
3. Mix 5 volumes of solution A with 1 volume of solution B and leave for calcium carbonate to precipitate overnight in the following reaction.

   $Ca(OCL)2 + Na2\ Co3 - 2\ Naocl + \underline{Ca\ CO} + C12$

   v

4. Siphon off the clear stock solution of NA OCL + NA CO3 and preserve in stoppered bottle. The initial content of 3800 ppm available chlorine in the stock solution preserved for 3 months at room temperature (20-29 deg C) in a dark stoppered container reduced to 3400 pm only. Its sodium carbonate content amounts to 3.0%).

Still cheaper and equally suitable raw materials are :

1. Crude soda ash with 93-97% purity.

2. Bleaching powder, the most common water disinfectant in warm countries, containing, Ca (OCL)2 AND CAOC12, CaCL2, AND Ca(OH)2 with 30-35% available chlorine.

If bleaching powder is used instead of pure calcium - hypochlorite, the above mode of preparation is applicable with the following modificatiion. 10g bleaching powder for 1 litre water to obtain solution.

A The resulting stock solution contains 2500-3000 p pm available chlorine and 2.5% NACO3. It is recommended to use a solution of 250-30 ppm available chlorine and 0.25 sodium carbonate on the farm. Such a solution is obtained by mixing 1 litre of stock solution with 9 litres of water.

A similar preparation is recommended by NDDB in India, which runs as follows :-

1. Add 800 gms of bleaching powder with 30-35% of available chlorine to 10L of water.

2. Add 1.500 grams of soda ash - mix thoroughly in a standard glass or plastic container.

3. Allow to settle for 12 hours.

4. Decant the supernantant NaOcl solution containing approximately 16,000 ppm available chlorine. Preserve in stoppered bottle.

For thorough sanitizing of utensils, a solution 400 ppm available chlorine is recommended.

Thus, the utensils should be designed, constructed and maintained to avoid hygienic hazards and to permit easy, thorough cleaning. disinfection and visual inspection.

Clean Milking Procedure

This is the very first stage, and thus, it is absolutely necessary to introduce hygienical milking procedure.

Cleaning of cow sheds

The milking is normally done in the cow shed. Milking in the "open" under trees should be discouraged as this is liable to pick up dust and other wind borne particles of dirt etc. The cow shed should be washed down with water, dung removed,and the atmosphere made dust free as far as possible.

ANNEXURE V

COST STRUCTURE FOR PASTEURISED MILK PER LITRE

Milk Producer Price	13.00
Margin Milk Collection, Operation of Mini Chilling Centre and Centre of Extension	1.50
CTMU Procurement Price	14.50
Processor Procurement Overhead	.20
Price at CTMU Factory	14.70
Packing Material Milk Processing and Packaging Labour Factory Variable Overheads Factory Fixed Overheads	1.60 .30 .20 .70
Total Processing Cost	2.80
Administration Selling and Distribution Advertising and Promotion Losses 3% of Price ex Factory Defence Levy (3% of retail price) Processor Margin Retail Margin	.40 1.00 .50 .53 .72 1.85 1.50
Retail price per litre	24.00