CHAPTER I

INTRODUCTION

The Royal Thai Government is interested in promoting the production and utilization of raw milk in Thailand. There are a number of reasons for the emphasis on increasing the production and utilization of raw milk, these include improving farm income, improving the balance of trade and improving the health of the people in Thailand(1) So, in the Fourth and Fifth National Economic and Social Development Plan for 1977-1986, the goals set for fresh milk production in Thailand are shown in Table 1.1 comparing with the actual tonnage produced.

The capacity and actual production of ready-to-drink milk (fresh and recombined pasteurized milk and fresh and recombined sterilized milk) are shown in Table 1.2

Comparing raw milk production with ready-to-drink milk products produced from 1977 to 1981, raw milk production was only less than 50% of ready-to-drink milks, and changed to 51 and 62% in 1981 and 1982 respectively (2,3)

In 1982, the Dairy Farm Promotion Organization of Thailand (DPO) which is the organization directly responsible for purchasing raw milk from farmers faced problems about the surplus of raw milk. It had also large quantities of milk products in its stock (4,5). This was because the reason that most of the private companies producing milk products through recoming process utilized skim milk powder and butter oil which were cheaper instead of raw milk in their productions. The use of raw

Table 1.1 The goals set for raw milk production in Thailand as the Fourth and Fifth National Economic and Social Development Plan with the actual tonnage produced (2,3)

Unit : Tonnage

YEAR	Goals set for raw milk production as the Fourth National Economic and Social Development Plan(1977-1981) and the Fifth (1982-1986)	Actual Raw Milk Produced	
		Quantity	percentage of goals
1977	18,980	12,197	64.26
1978	28,835	14,337	49.76
1979	43,070	16,337	37.93
1980	64,605	18,857	29.19
1981	96,725	22,352	23.11
1982	32,850	26,425	80.44
1983	38,690	34,075	88.07
1984	45,990	-	-
1985	53,655	-	-
1986	62,780	-	-

milk in 1977-1981 from DPO and the cooperatives was 67-80% of raw milk production while the use in private sectors was only 5-10%.

The demand for raw milk has been less than expected. Thus, the Ministry of Agriculture and Cooperatives has made an effort to solve the dairy problem by asking for cooperation from the Ministry of

Table 1.2 Capacity and actual production of ready-to-drink milk in Thailand (2,3)

Year	Capacity (tonnage)	Actual Production (tonnage)	Rate of production changed (%)	Capacity used (%)
1977	37,578	22,211	-	59.11
1978	37,578	27,352	23.15	72.79
1979	40,349	30,975	13.25	76.77
1980	56,299	40,737	31.52	72.77
1981	90,031	49,826	22.52	55.35
1982	101,331	51,840	4.04	51.16
1983	101,331	54,750	5.60	54.03

Industry, the Ministry of Finance, the Ministry of Commerce and the Ministry of Public Health. Representatives of these ministries met to consider various alternatives in solving the surplus raw milk problem. They agreed with the advice and consent of the cabinet and existing acts that the Ministry of Industry would announce that the dairy processing firms which produced "ready-to-drink" fluid milk, either pasteurized or UHT milk, must use at least an one-to-one ratio of raw fresh milk to skim milk powder (1, 6). In addition, the Ministry of Commerce, with the Importation and Exportation of Product Act B.E. 2522, would announce that firms purchasing imported skim milk powder must first obtain for their permission. Permission is contingent upon the importing firms stating

that the purpose for which the imported milk powder would be used. If it was used for "ready-to-drink" fluid milk, they must guarantee that they would purchase a kilogram of **raw** milk for each kilogram of skim milk powder that they imported for fluid milk and the rate of purchasing had to increase 20% a year. This law was effective in March 1983 (1,4).

The surplus of raw milk was still a problem because private processors still used skim milk powder and butter oil which were cheaper in the production of ready-to-drink fluid milk. So, there were two more announcements from Ministry of Commerce about purchasing imported milk powder : The permission of imported milk powder (No.2) B.E.2526 which announced that the dairy processing firms which produced ready-to-drink fluid milk have to purchase 10 kilograms of **raw** milk for each kilogram of skim milk powder they import for fluid milk and the rate of purchasing had to increase 20% a year, this law was effective in August, 1983 (7); And the permission of imported milk powder (No.3) B.E.2528 which announced that the dairy processing firms which produced ready-to-drink fluid milk had to purchase 20 kilograms of **raw** milk for each kilogram of skim milk powder they import for fluid milk, this law has become effective since June, 1985 (8). In addition, there were announcements from Ministry of commerce about purchasing imported ready-to-drink milk. The permission of ready-to-drink milk, B.E.2527 which defined the ratio of purchasing imported ready-to-drink milk to raw fresh milk in the country is 1:1, this law was effective in October, 1984 (9); And the permission of imported ready-to-drink milk, B.E. 2528 which defined the ratio of purchasing imported ready-to-drink milk to raw fresh milk in the country is 1:2, this law has become **effective in June, 1985 (10).**

From these announcements, dairy processors have to use raw milk instead of recombined milk for pasteurized and UHT milk.

The production of pasteurized and UHT milk in Thailand increases every year from 1977 to 1983 as shown in Table 1.2 (This data was about 30% of pasteurized milk and 70% of sterilized and UHT milk) (11). The dairies produced ready-to-drink milk in Thailand and their market shares were shown in Table 1.3.

Table 1.3 Market share and dairies produced ready-to-drink milk in Thailand (3)

Unit : Percentage

Dairies	1976	1977	1978	1979	1980	1981	1982
Dairy Farm Promotion Organization of Thailand	36.2	37.0	34.9	36.3	34.5	28.7	28.0
Kasetsart University Dairy Plant	2.0	1.7	1.5	1.6	1.4	0.6	NA
Chiengmai Cooperative	2.6	2.2	2.2	2.4	2.0	-	NA
Nong-Po Cooperative	19.5	18.5	18.9	18.4	15.6	18.9	16.0
Nakorn-pathom Cooperative	1.2	0.6	0.4	0.5	0.4	0.8	1.0
Ayudthaya Cooperative	0.8	0.6	0.7	0.9	0.7	7.1	10.0
Foremost Dairy Company(Bangkok)	15.1	14.8	15.6	15.4	13.4	10.0	8.0
Bangkok Dairy Plant Co.,Ltd.	12.3	10.2	12.4	10.7	8.4	3.2	7.0
Nestle' (Thailand)Co.,Ltd.	7.8	12.1	11.4	11.2	9.5	17.2	16.0
Thai Dairy Industry Co.,Ltd.	-	-	-	-	12.1	10.7	9.0
Chitladda Royal Palace Dairy Plant	0.7	0.9	0.9	0.6	1.1	0.7	NA
Minor	1.8	1.4	1.1	1.0	0.9	2.1	NA

NA = not available

Because the trend of using raw milk for pasteurized and UHT milk is increasing every year, in the past two years, there were some researches studied on quality of raw milk in Thailand which emphasized on microbiological quality and the way to improve raw milk quality. The quality of milk products especially pasteurized milk which has to be kept properly during handling, transportation and storage has not yet been studied. In this study, effect of storage temperatures and time on the qualities of pasteurized milk was studied which would help public to have information needed for ready-to-drink milk as daily food.

The objectives of this research were:

1. To estimate shelf-life of pasteurized milk at various storage temperatures between 5 and 20°C in order to find out the appropriate shelf-life of pasteurized milk in Thailand.

2. To study the qualities of raw and pasteurized milk produced in Thailand.

3. To study the post-pasteurization contamination of pasteurized milk from each dairy.

4. To study the quality changes of stored pasteurized milk at various temperatures.

5. To obtain the relationship between microbiological properties and time of storage.

The scope of this study was to evaluate the qualities of raw and pasteurized milk produced from local raw milk at various storage temperatures and times. The study was carried out from 5 dairies in Thailand by their differences in raw milk transportation, sanitation condition, packaging material and market share.

Table 1.4 Dairies selected to evaluate the qualities of raw and pasteurized milk by their differences in raw milk transportation, packaging material, market share[+] and sanitation condition.

Dairy	Place	Raw milk supplier	Raw milk transportation	Packaging material and its treatment	Sanitation condition*
1. Foremost Dairy Company (Bangkok)	Bangkhen, Bangkok	DPO	Truck tanker	Paperboard with electronic heater	good
2. Kasetsart University Dairy Plant	Bangkhen, Bangkok	Nong-Po	Aluminium Can	Paperboard with electronic heater	fair
3. Dairy Farm Promotion Organization of Thailand (DPO)	Muag Lek, Saraburi	Own farm	Truck tanker	Polyethylene sachet with UV light and electronic heater	fair
4. Nong-Po Cooperative	Nong-Po, Rachaburi	Own farm	Aluminium Can	Polyethylene sachet with UV light and electronic heater	fair
5. Chitladda Royal Palace Dairy Plant	Dusit, Bangkok	Nong-Po	Aluminium Can	Polyethylene sachet with UV light and electronic heater	good

] + refer to Table 1.3 P.5

* sanitation condition judged by observing about cleaning of place, equipments and care of milk processing

The benefits from this study were

1. To make known to public the qualities of raw and pasteurized milk produced in Thailand.

2. To make known the quality changes of pasteurized milk according to temperature and time.

3. To be source of data for dairy processors to use the appropriate storage time and temperature for pasteurized milk and urge the processors to pay more attention in improving processing as well.