CHAPTER V

DISSCUSSION

Study A

From the result, the duration of dairy farming and the number of total milking cows are two continuous variables which remain in the final model. These are the important herd-level factors affecting microbiological quality of raw milk at the MCC-level. The result indicates that the long duration of dairy farming is the risk factor that affects to have high bacterial count in raw milk at the milk collecting center. Similarly, the number of total milking cows remains in the final model because most of the farms which have long duration of dairy farming are larger in size. These results indicate that most dairy farmers which have long time of experience in dairy farming ignore to pay attention to make good hygienic quality of their raw milk. Moreover, it may be that the farms with many milking cows have to spend more milking time. This can affect to have high total bacterial count in the raw milk (Gran, *et al.*, 2002). However, there is no significant relation between the milking time and the total bacterial count in raw milk at the MCC, and the milking time does not fit in the final model of the logistic procedure.

As same as many reports, healthy dried udder is an important factor reducing the bacterial contamination in raw milk. Premilking udder preparations affect number of bacteria on teats and in milk. Bacterial populations in milk are increased by wetting the udder and teat surfaces without adequate cleaning and manual drying; and procedures that allow water laden with bacteria to drain into teat cups during milking

(Galton, *et al*, 1986; Galton, *et al*, 1982; Jasper and Whittlestone, 1977; Johns, 1966). Galton *et al* (1984) showed preparations that wet both the udder surface and teats result in the highest standard plate counts in milk compared with methods that wet teats only. In addition, Phutikanit *et al* (1997) reported that farm using chlorine solution together with teat dipping and dry the udder properly can highly reduce the bacterial contamination in raw milk. Therefore, manual drying of teats is a significant factor in reduction of total bacterial counts (Pankey, 1989b). However, all of these reports showed factors affecting bacterial contamination at farm bulk tank, so they are different from this study which tries to find the herd-level factors affecting microbiological quality of raw milk at MCC cooling tank.

The milking equipment is also an important factor affecting raw milk quality. In this study, the cleanliness of liner is one of the factors which remain in the final logistic model. The milking machine is an important control point to have a good microbiological quality of raw milk because dirty parts of milking machine can contribute the total bacterial count, coliform and *Escherlichia coli* counts in raw milk (Gran, *et al*, 2002). Moreover, Wongnane *et al* (2001) and Sukorapong *et al* (2003) reported that the microbiological quality of raw milk of the dairy farms with the machine milking system were higher than that of the dairy farms with the hand milking system. Similarly, O'Mahony and Austin (1991) indicated that bucket milking system was associated with a higher bacterial total viable count in bulk farm milk. In order to reduce bacterial contamination in raw milk, utensils used for milking should be rinsed, cleaned using detergent and disinfected immediately after use (Dodd and Phipps, 1994; IDF, 1990). The use of detergents and good quality water for

cleaning the equipment could be expected to remove milk remains, including microorganisms, and thereby affect the microbiological quality of the milk.

Study B

About the microbiological quality, this study indicates that it is not in the range of satisfactory level. There is very high bacterial count in raw milk. Most of the samples have SPC, CC and LPC over the standard limit in Thailand which are 600,000, 10,000 and 1,000 cfu/ml, respectively (Department of Livestock Development, 1999). The responsible person, especially MCC officers and dairy farmers, have to seriously improve the raw milk quality at both farm-level and MCC-level.

From this study, all of three types of bacterial count of each of MCC are significantly different. It may be from either the herd-level factors which have already analyzed in study A or other causes: different area, different incentive program, different controlling program from the dairy plants, which are not included in this study. Furthermore, only CC of each month is significantly different.

In addition, the results of the methylene blue reduction test in this study are very different from the other reports. For example, the number of samples which were in grade 1 in the research of Tangjaipatana *et al* (1995a) are the highest percentage, but the number of grade 1 sample in this study are the lowest percentage. It may be influenced by the different laboratory technique, the different area of the study or the difference of the grading system in this study.

About the milk composition, most of the data of the milk composition are in the range of the standard limit in Thailand (Department of Livestock Development, 1999). In this study, the data of the milk composition of each MCC are not

significantly different, and there is not any seasonal effect on the milk composition of raw milk at the MCC level in Northern Thailand.

About the somatic cell count, most of the data of the somatic cell count are over the standard limit in Thailand, which is 500,000 cells/ml (Department of Livestock Development, 1999). Similarly, it is not in the satisfactory level of many international standards such as the standard level in EU, New Zealand, Australia (400,000 cells/ml) and Canada (500,000 cells/ml) (Sargeant *et al.,* 1998; Norman *et al.*, 2000). However, most of the SCC at the MCC-level in this area are lower the current national penalty level in the United States which is 750,000 cells/ml and over (Norman *et al.*, 2000). This result indicates that mastitis is a serious problem in this area. It is in accord with a research by Pornwisetsirikul and Kattapan (2001) who indicated that the average BTSCC in Chiang Mai was over the standard limit in Thailand, and about 40% of 5,398 samples were over the standard limit in Thailand. Dairy farmers should pay more attention to control mastitis problem in their farms.

About the antibiotic residue, the positive percentage is very low. This result indicates that the raw milk quality in Northern Thailand still has few antibiotic residues. Similarly, this result does not differ from the research in Khonkaen which showed only 1.77% (5/283) of positive sample of antibiotic residues in raw milk (Nopphol, *et al*, 1994). In contrast, It is different from the research of Tangjaipatana and Vecharungsun (1995b) who surveyed the antibiotic residues in raw milk in Central region of Thailand during March 1993 – February 1994. They found that the antibiotic residue in raw milk equivalent to 0.003 – 0.004 I. U. per milliliter of milk were found 14.28 – 35.49% of milk samples in each month. The residues equivalent to 0.003 – 0.004 I. U. of penicillin per milliliter of milk were evident in 0-10.61% of

milk samples in each month. The legal announcement of the Ministry of Public Health, Thailand indicates that the raw milk must free from antibiotic residues; consequently, it is zero-tolerance of antibiotic residues in raw milk (Ministry of Public Health, 1979). However, because of the specificity of the antibiotic residue test kit used in this study has only 90.5%, these positive samples may be the result of false positive.

Study C

In northern Thailand, all MCCs are similar in a number of ways. For example, they have the same management styles. All MCCs use the alcohol test and MB test to be the test for receiving and the test for grading and pricing, respectively. This result indicates that they have the resembling regulations for their farmer members. Because the alcohol test is the technique to detect the stability of protein, this test cannot indicate the microbiological quality of raw milk which is the serious problem in this area. Moreover, the MCC should consider about the frequency of MB to determine the milk price for farmers.

In contrast, all MCCs in northern Thailand are different in several ways. For instance, there is a small MCC which collect only 1.2 ton/day of milk from 14 members and a large MCC which collect 13.6 ton/day of milk from 161 members. This range is very wide. The small MCC does not usually have a laboratory on site, so they cannot do many laboratory techniques on their own. In addition, a MCC does not use clean in place system (CIP) for cleaning system of the pipe line and the cooling tank. These characteristics do not follow the guideline practices for quality milk at the MCC or the cooperatives (Pratumsuwan, 2001). About the microbiological quality,

the SPC in milk is higher than 400,000 cfu/ml, so it has to be improved (Thai industrial standard institute (TIS), 1987).

This study does not find any significant relationship between any variable and SPC because the number of MCCs is too small. Therefore, the deviation of the data is high, and it is very difficult to find a significant difference between the groups. Moreover, the data of this study was obtained by interviewing, so it may be inaccurate. However, this study is the first study that reports the characteristic of MCC in this area. The information can be use for further studies about MCC in this area.

Conclusion

The microbiological quality and the somatic cell count are two types of the raw milk quality indicator that have to be improved in Northern Thailand. Especially for the microbiological quality, the dairy farmer should pay more attention to milking hygiene and cleanliness of milking equipment when he wants to expand his farm-size. Furthermore, the MCCs in Northern Thailand are varied in size and their raw milk quality is very different. The responsible organization should consider controlling the standard of these MCCs in order to produce the same quality of raw milk before transported to the dairy plant. In addition, MCCs should have the proper method for receiving, grading and pricing raw milk to improve the raw milk quality. However, further study should be conducted to investigate the MCC-level factors affecting raw milk quality especially the difference of grading and pricing system. Moreover, the intervention technique at farm-level and MCC-level should be studied to find the effective action to improve raw milk quality.