CHAPTER IV

RESULTS

The source of the cattle in this study was 90% Holstein Friesian breed from dairy cattle farms in Mae Wang District. To determine the bTB status of dairy cattle, 140 heads of dairy cows were tested with bovine and avian tuberculin PPDs and read the results 72 hours later. Based on the objectives of the study, cell-mediated immune responses of PPDs were compared. Detection of positive reactor animals was followed OIE manual for bovine PPD injection at caudal region. Questionnaires were used to investigate the risk factors of disease situation. The results of the study are presented below.

4.1 Comparing cell-mediated immune responses of bovine and avian PPDs

In this study, we compared cell-mediated immune responses of bovine PPD and avian PPD, at caudal region and cervical region according to measurements of skin-fold thickness differences. Three comparisons of skin thickness measurements are:

1. The results showed significant difference ($p < 0.01$), when compared the measurements of skin thickness before and after injections of bovine PPD.
2. Likewise at avian injection site, the results were significant difference in pre and post injections of avian PPD ($p < 0.01$).
3. When comparing the measurements of differences in skin-fold thickness at both injections sites, differences were statistically significant.

4.2 Detection of positive reactors

The interpretation was based on caudal fold test recommended in OIE manual (OIE, 2009). Five cows produced visible swelling at caudal region and measurements of skin swelling differences were ≥ 4mm. These animals were considered positive reactors and one of five positive reactors produced 6mm increase in skin thickness difference and the remaining four animals produced 4mm skin thickness differences. Number of animals which produced positive reactions, inconclusive reactions and negative reactions are described in table 4. Ages, breeds and origins of positive reactor animals are described in table 5.

Table 4: Number of negative reactors, inconclusive and positive reactors animals at bovine injection site

	skin-fold thickness differences	number of tested animals
negative reactors	≤ 2mm	121
inconclusive animals	3mm	24
positive reactors	≥ 4mm	5

Table 5: Measurements of skin-fold thickness differences at Bovine injection sites, ages, breeds and origins of five positive animals

Animals	Skin fold thickness before injection of bovine PPD	Skin fold thickness after injection of bovine PPD	Skin differences at bovine injection site (mm)	Ages	Breeds (%Holstein Friesian)	Origins
Positive reactor 1	5	9	4	1yr 6mths	90.25%	Born in the farm
Positive reactor 2	6	10	4	1yr 5mths	96.5%	Born in the farm
Positive reactor 3	5	9	4	3yrs 5mths	50%	Born in the farm
Positive reactor 4	7	13	6	6yrs 2mths	87.5%	From Lop Buri Province
Positive reactor 5	5	9	4	1yr 9mths	50%	Born in the farm

4.3 Skin-fold thickness measurements at bovine and avian injection sites by percentage

At bovine injection sites, 86% of tested animals produced negative responses for bovine PPD and 4% of animals showed positive responses. 10% of the animals were considered as inconclusive reactors. Three levels of skin thickness differences were classified as ≤ 2mm, 3mm and ≥ 4mm respectively.

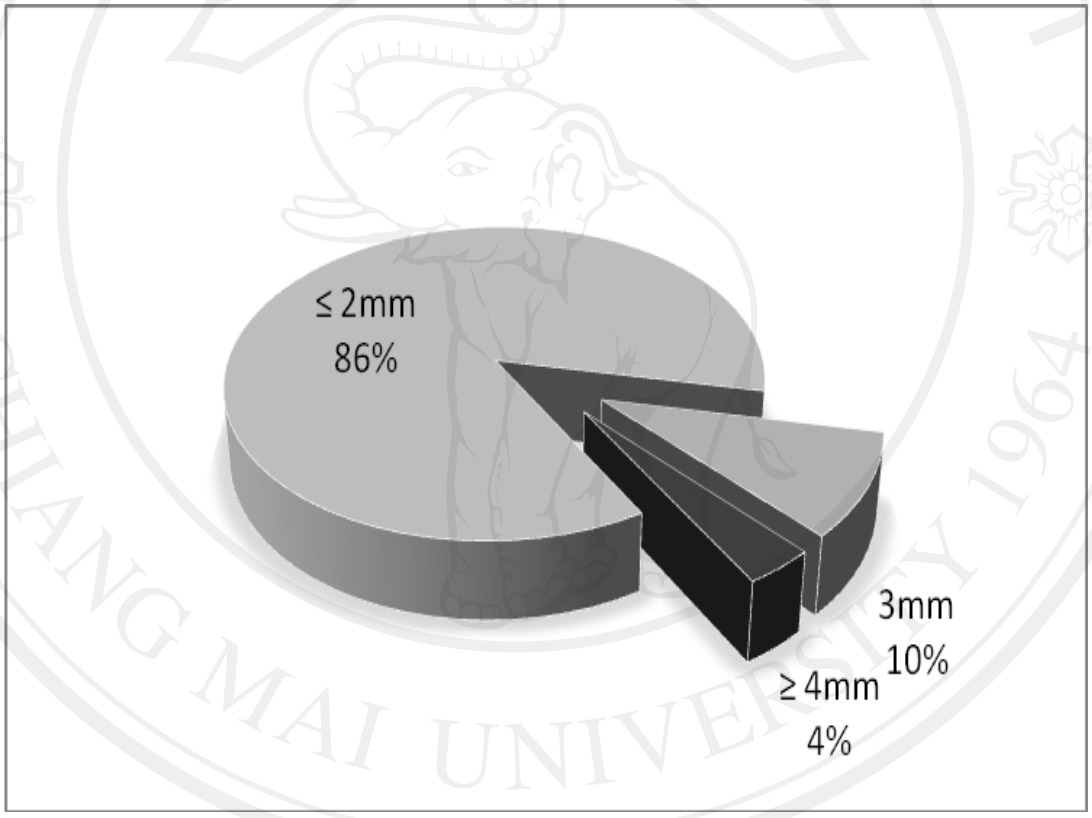

Figure 8: Percentages of Bovine PPD responses by measurements of skin thickness differences

At avian injection site, three classifications of skin measurements were identified as < 4mm, 4-7mm and > 7mm.

112 heads of cattle produced < 4mm skin fold thickness difference (81%), 23 heads of cattle showed 4-7 mm skin swelling difference (16.7%) and 3 heads of cattle produced > 7mm skin thickness difference (2%) at cervical region.

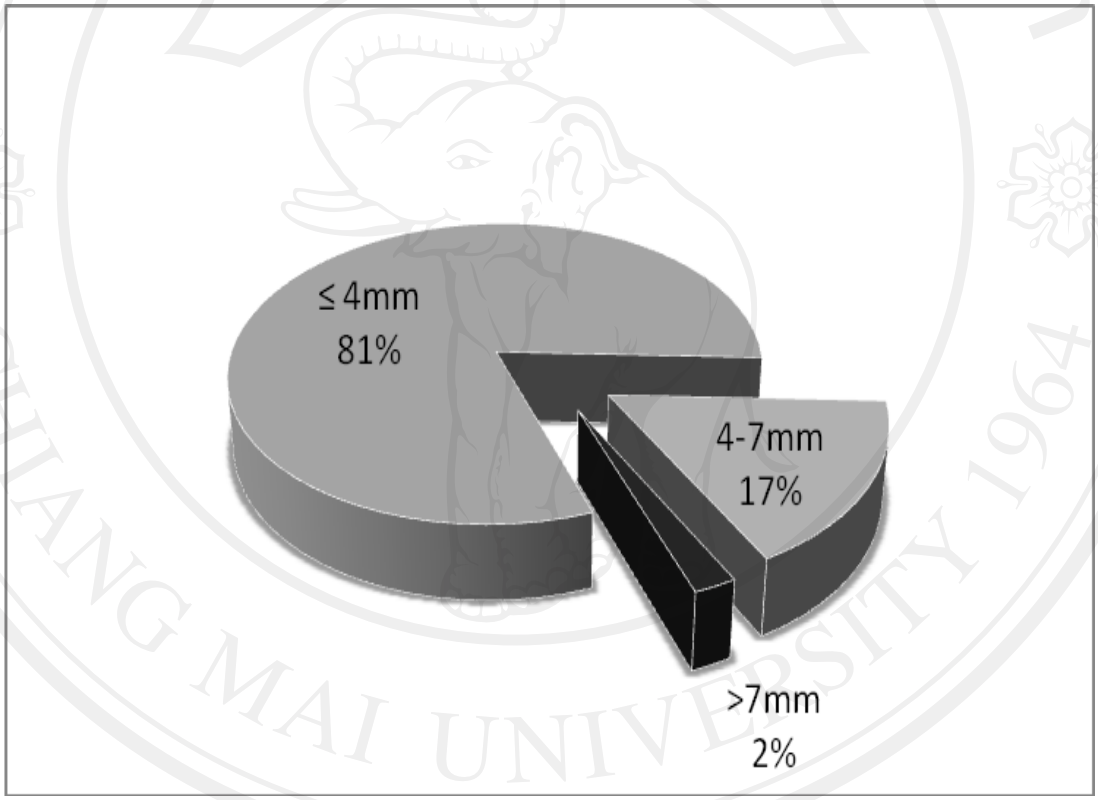

Figure 9: Percentages of Avian PPD responses by measurements of skin thickness differences

4.4 Risk factors assessments by questionnaires

Forty six farm owners were asked with questionnaires to assess bTB risk factors in study area. Some cattle owners answered all of the questions but the others skipped some questions. However, there was little number of uncompleted questionnaires and basic information was received to analyze bTB status. Although investigation of risk factors associated with bTB were not determined, general information of dairy farm, feeding and farm management, vaccination program, current disease situations, bTB knowledge and biosecurity status were described by percentage in our results.

4.4.1 General information of the dairy farm owners

4.4.1.1 Education level and farm experience of farmers

Based on general information of questionnaires, 85% of cattle owners were male and the remaining 15% were female. 76% of the farmers were educated from Dairy Farming Promotion Organization of Thailand (DFPOT). 7.4% were trained by DLD and 2.4% were educated by Chiang Mai University.

40% of farmers had primary school level, 19% had secondary school level, 9% had high school level education and 33% were graduated and professional.

For dairy farming experience, 47% of the farmers had ≤ 2 years farm experience. 33% had 2 to 4 years experience and 20% had 4- 9years farm experience. More than 90% of the farmers answered the question concerned about education level and farm experience. The categories and variables are shown by percentages in table 6.

Table 6: Gender, education level and farm experience of farm owners in study area

No.	CATEGORIES	VARIABLES	No. of farms	(%)	Total answered
1	Owner (Gender)	Male	39	85	46
		Female	7	15	
2	Education Level	Primary school	17	40	43
		Secondary school	8	19	
		High school	4	9	
		Graduated or Professional	14	33	
3	Farm Experience	1-2yr	20	47	45
		2-4yr	15	33	
		>4yr	9	20	
4	Dairy Farming Education	yes	4	9.5	42
		yes, DLD*	3	7.4	
		yes, CMU**	1	2.4	
		yes, Saraburi	1	2.4	
		yes, School	1	2.4	
		yes, DFPOT***	32	76	

DLD* Department of Livestock Development

CMU** Chiang Mai University

DFPOT*** Dairy Farming Promotion Organization of Thailand

4.4.2 Management System

4.4.2.1 Farming system

Dairy cattle farms were set up open house type, concrete floor and cows were kept in semi-intensive farming system. Milking place was separated with barn and most of the farmers used milking machine. Milking time was 2 times per day (morning and late afternoon). 6% of the farmers stored manure in the tank and 33% directly used for vegetation. 21% used pressure pump for manure cleaning. We found that 40% of the farms had good drainage system.

4.4.2.2 Feed and water management

Manual feeding system was used in all dairy farms and dairy cows were fed 2 times per day. 86% of the farmers fed mix feed with concentrated feed and roughage for the cows. 11% of the farmers fed only concentrated feed. 98% of the farmers mixed feed outside of the barn. We found that feed storage condition was poor in 35% of the farms, moderate storage condition in 29% and good storage condition in 36%. Feed storage condition, feed types and feeding management are described in figure 10 (a), (b), (c) and (d).

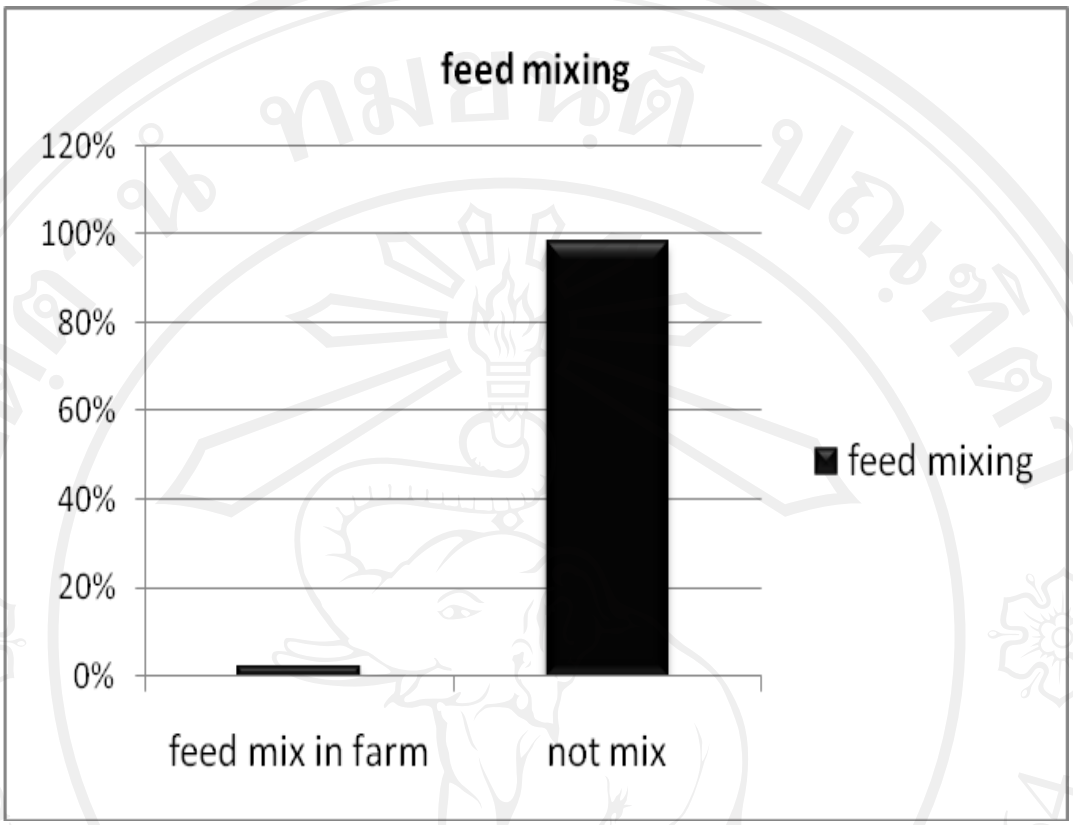

Figure 10 (a): Feeding management of dairy farms in study area

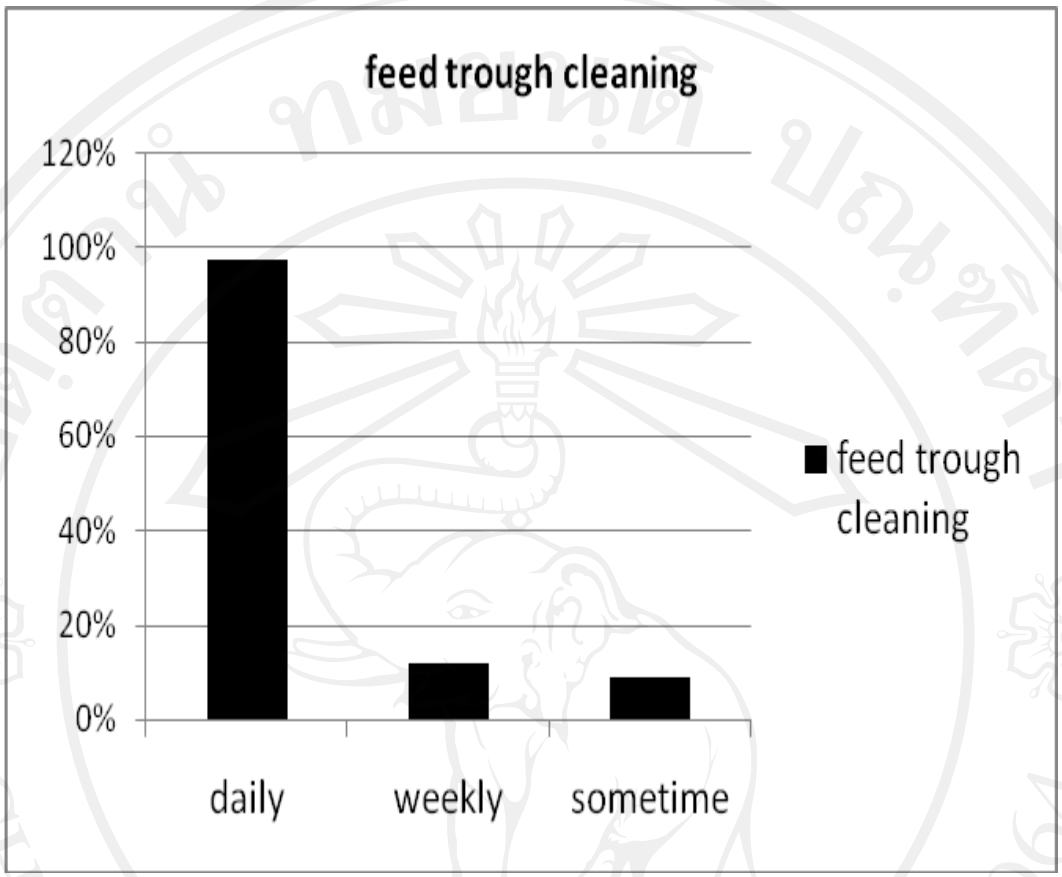

Figure 10 (b): Feeding management of dairy farms in study area

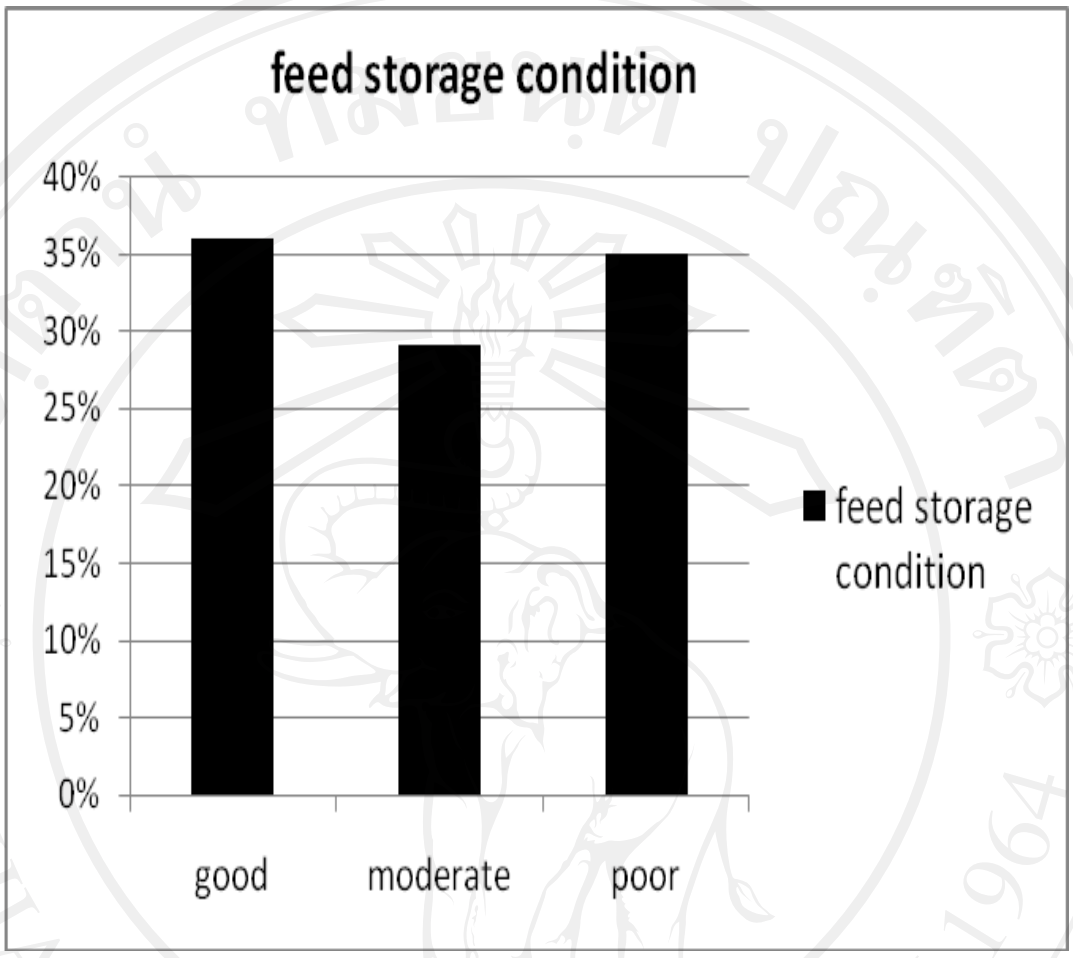

Figure 10 (c): Feeding management of dairy farms in study area

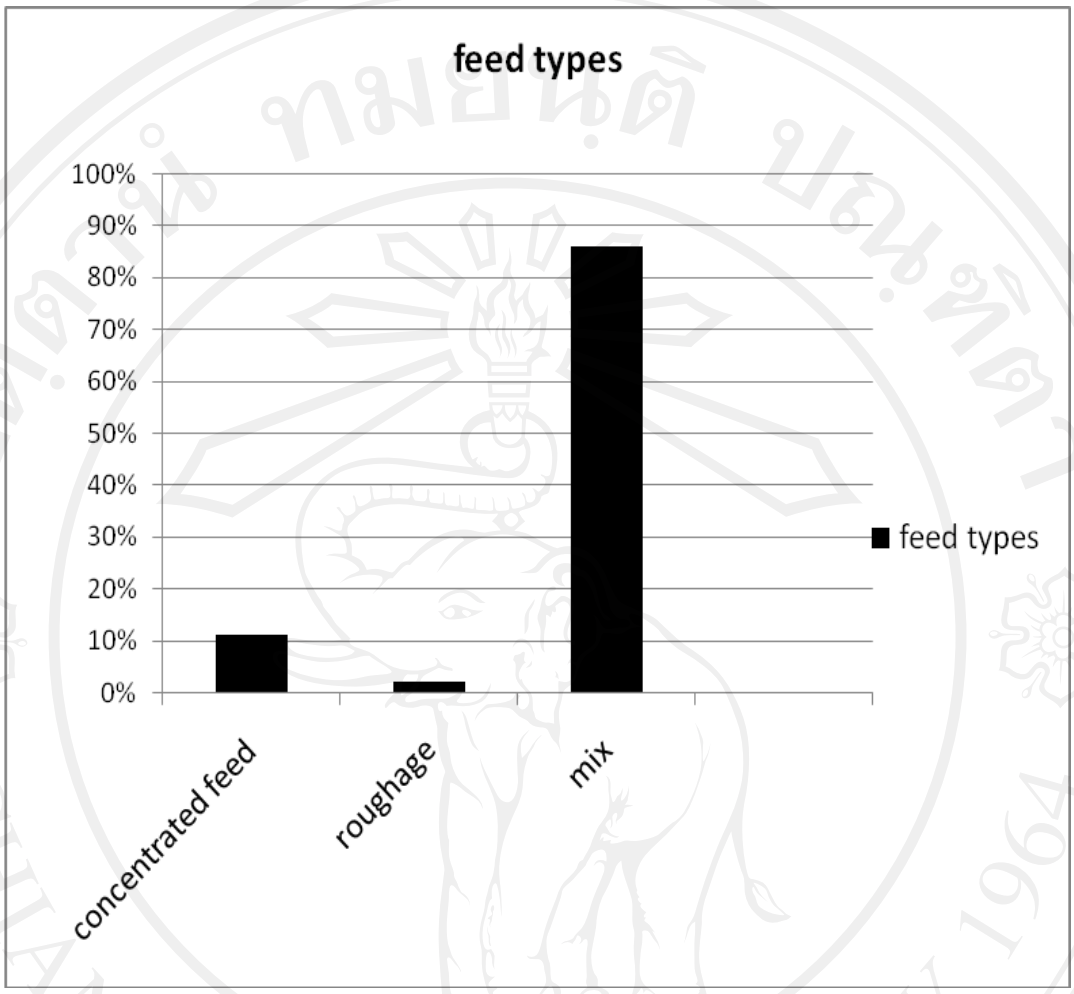

Figure10 (d): Feeding management of dairy farms in study area

50% of farmers used underground water as drinking water for cattle. Types of drinking water used in dairy farms are illustrated in figure 11.

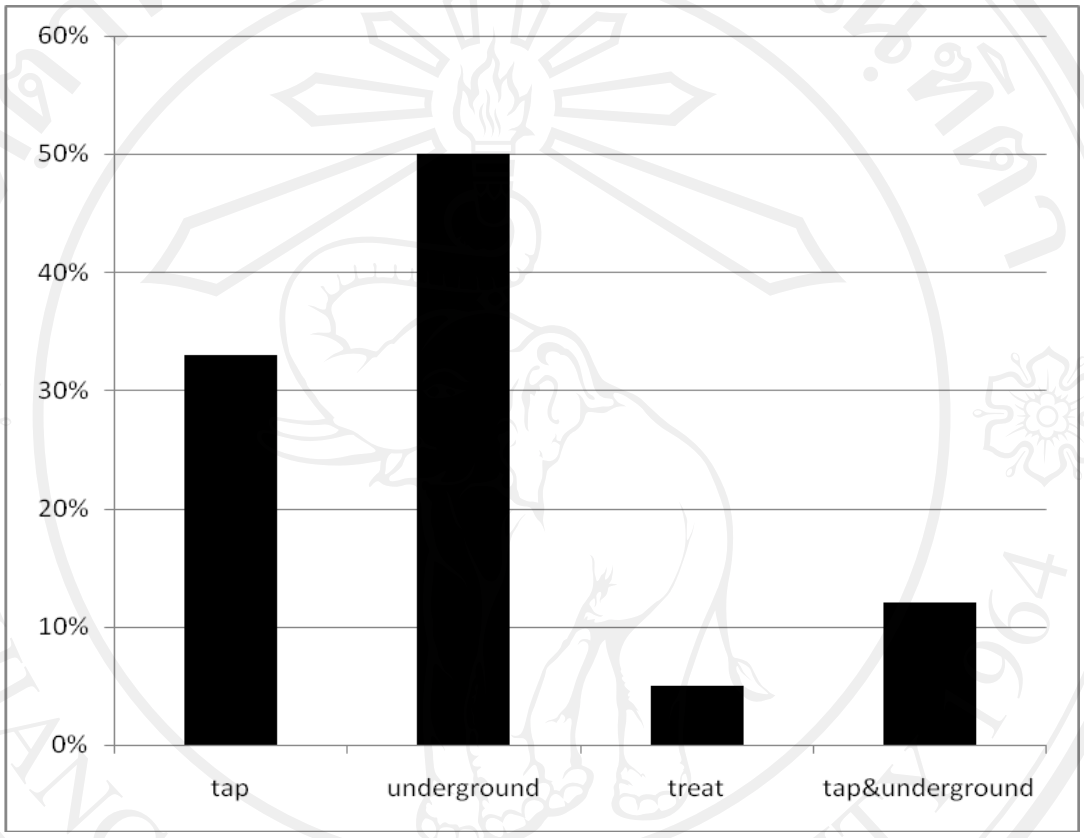

Figure 11: Types of drinking water used in dairy farms

4.4.2.3 Health management

(a) Vaccination and deworming

FMD vaccine was performed in all of the dairy cattle farms in Mae Wang. For prevention of parasitic disease, deworming program was conducted every 6months (54%), every 3months (11%) and annually (35%) respectively.

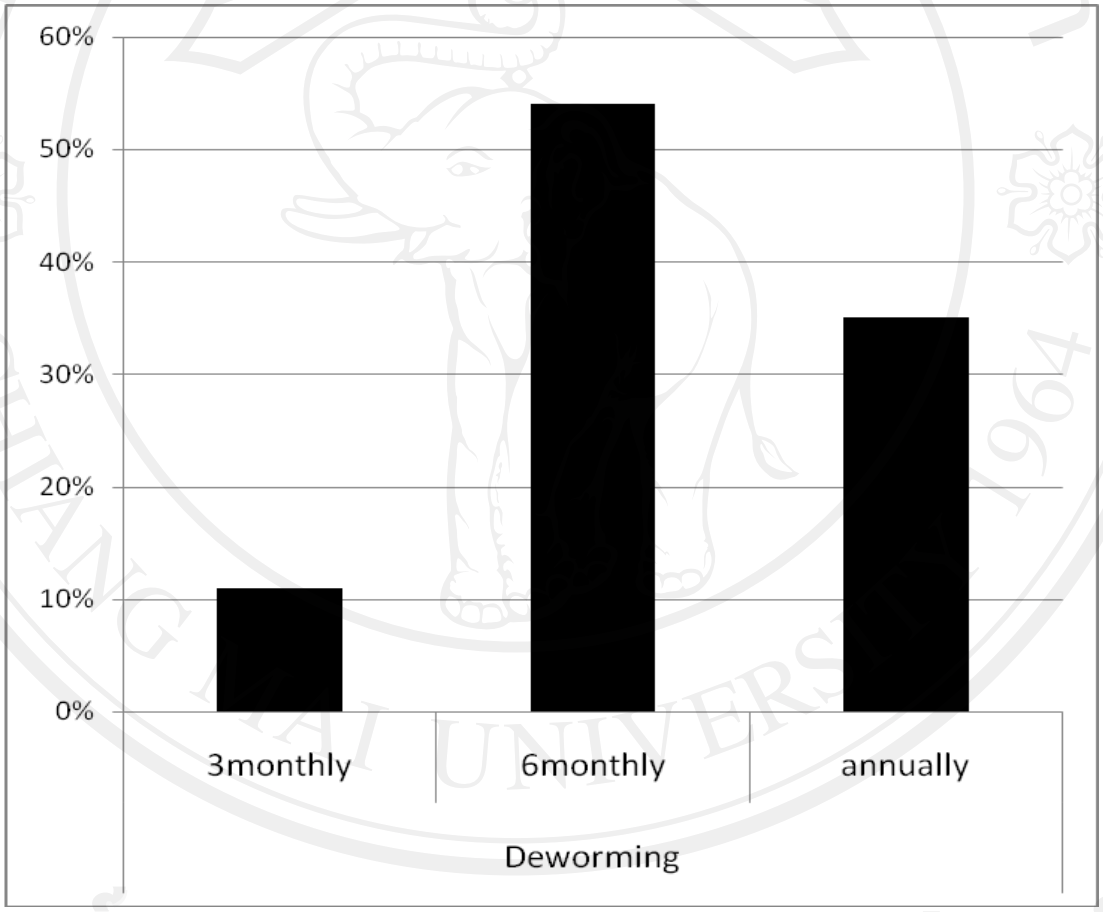

Figure12: Three variables of deworming program in Mae Wang dairy farms

(b) Dry period

This study found that dry period was 2 months in 85% of the farms. 10% of the farms were taking 3months for dry period. The last 5% used 2-3 months for dry period.

Table 7: Duration of dry periods in dairy farms

No. of farms	Dry period	(%)
34	2months	85%
4	3months	10%
2	2-3 months	5%
40		

(c) Breeding

Artificial insemination (AI) was critical breeding program in Mae Wang area. 15% of the farmers used breeding bull for their cows. Mostly dairy cows were 90% Holstein Friesian crossed-breed.

Table 8: Number of farms and types of breed in that farms

No. of farms	Breed	(%)	Total answered
18	90-100%HF*	50%	37
16	70-90% HF*	42%	
1	50-70% HF*	2.6%	
2	90-100 and 70-90% HF*	5.2%	

HF* = Holstein Friesian

(d) Sick animals treating

Veterinarian was important responsible person to treat sick animals in the study area. But some farm owners treated the animals by themselves. Volunteers treated the sick animals as well. Figure 13 demonstrates percentages of sick animal treatment by veterinarians, farmers and volunteers.

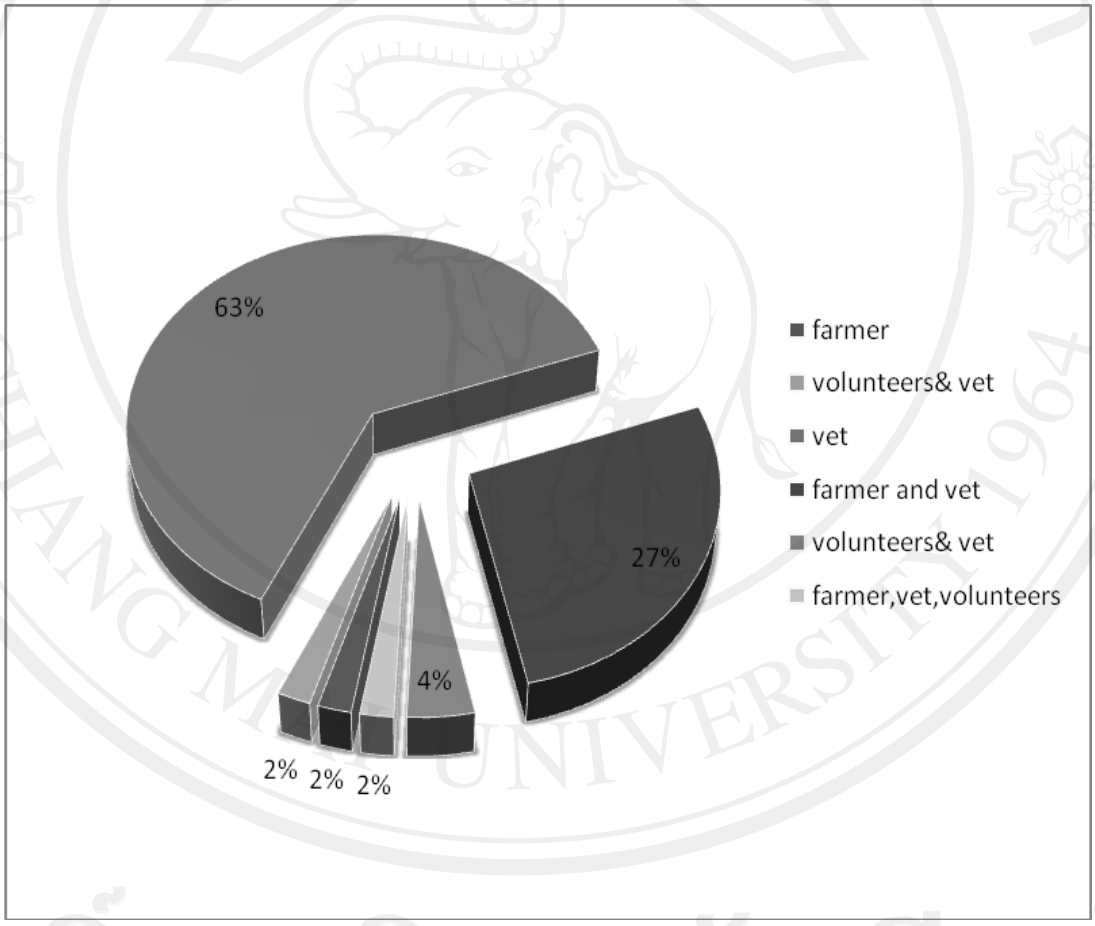

Figure 13: Treating sick animals by veterinarians, farmers and volunteers shown in percentage

4.4.2.4 Biosecurity

In this study, we investigated biosecurity situation of dairy farms by questionnaires including:

(a) records of all visitors
(b) washing facilities available
(c) shower practice
(d) personal protective cloths
(e) footbaths for clean boots
(f) disinfect all vehicles
(g) limit contacts to pet animals, birds and other susceptible animals
(h) isolation of sick animals.

Based on questionnaires answers, most of the dairy cattle farms were available washing facilities (98%) and 72% had shower practice, 67% of the farmers used personal protective cloths. 56% placed footbaths for cleaning the boots and 71% used disinfectants for cleaning all vehicles. 50% answered pet animals were separated with barn and 77% had a practice of sick animals isolation. Biosecurity status of dairy cattle farms is described by percentage in Figure14:

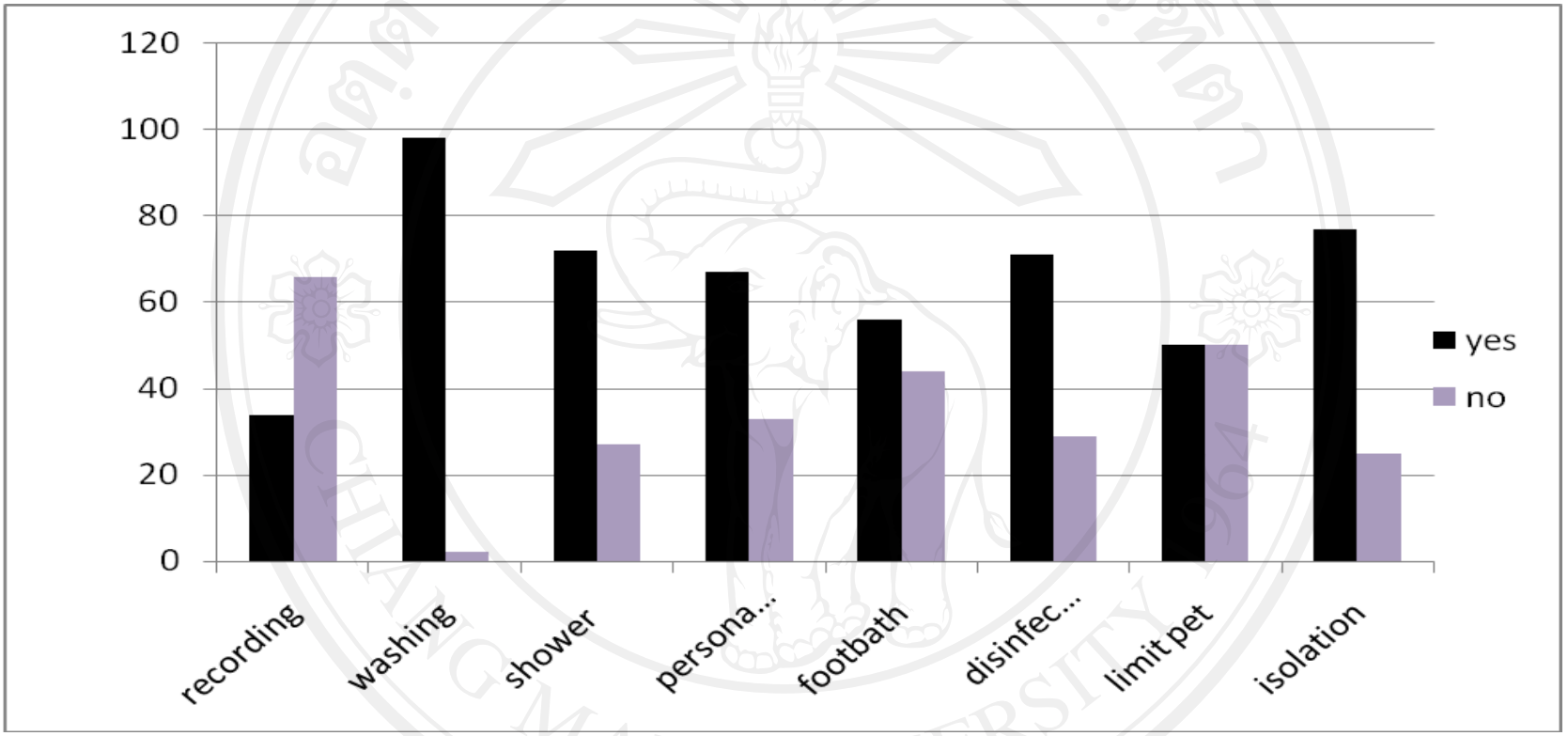

Figure14: Detection of biosecurity situation in dairy farms

4.4.2.5 Purchasing of animals

57% of farms purchased new animals from the other farms or outside of study area. Purchasing of new animals without quarantine practice was found in some dairy farms. New animals were kept (2-10) days for quarantine in our study area. So, quarantine period is not long enough to protect infectious disease transmission. Only 4% of farmers checked health status of new animals including vaccination and deworming.

Table 9: Number of farms that purchasing of new animals

Purchasing of new animals	Number of farms	(%)	Total number of answered
No	19	43%	44
yes	25	57%	

4.4.2.6 Current disease situations

50% of farmers in our study area were faced with reproductive disease problem. Less than 10% of farmers had been recognized for respiratory disease.

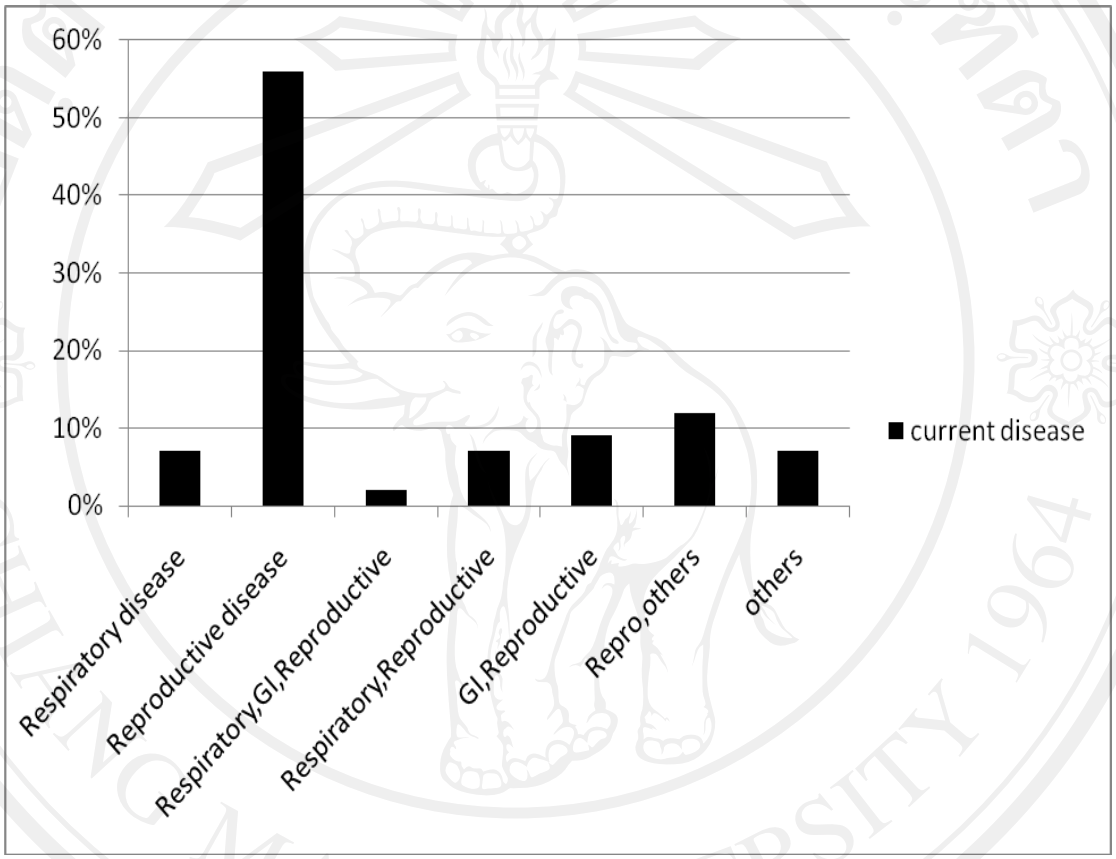

Figure 15: Current disease situations in dairy farms

Resp = Respiratory disease

Repro = Reproductive disease

GI = Gastro-intestinal disease

4.4.2.7 bTB knowledge and human TB experience

This study found that 86% of the farmers had lack of bTB knowledge as shown in table 10. There was no farmer who had been personal experience about human tuberculosis (TB).

Table10: Knowledge of bTB and human TB

bTB knowledge	Number of farms	(%)	Total
No	38	86	44
Yes	6	14	

It was found that 11% of the farmers had raw milk drinking practice. 85% of the farmers had never drunk raw milk as described in table 11.

Table 11: Raw or unpasteurized milk drinking

Raw milk drinking	Number of farms	(%)	Total
sometime	5	11	46
rare	2	4	
never	39	85	

4.4.2.8 Livestock farming

Livestock farming in our study area contained dairy farms, pig farms and poultry farms. The distances of the nearest farm and farms types were described in table 12 and 13.

Table 12: Distance of nearest farms around dairy cattle farms

Distance of nearest farm(km)	Number of farms	(%)	Total
1-2km	12	28	43
100-500m	31	72	

Table 13: Types of livestock farm near dairy farms

Types of the nearest farms	Number of farms	(%)	Total
dairy cattle farm	31	69	45
beef cattle farm	-	-	
poultry farm	4	9	
pig farm	5	11	
others	-	-	
dairy cattle farm & poultry farm	5	11	