CHAPTER 4
RESULTS AND DISCUSSIONS

The principal objective of this study was to answer the question "from the provider's perspective, for the fiscal year 1999-2000, what are the cost and benefits of providing protective boots to farmers in Sa Kaeo Province?" The cost of the protective boots and the treatment of cases who were wearing protective boots from the program are interpreted as costs, while the reduction in the treatment of cases is interpreted as a benefit. Secondary data from various sources, and primary data sourced from 30 leptospirosis-infected patients hospitalized at Sa Kaeo Crown Prince Hospital, Sa Kaeo Province in the year 2000, and financial report from Office of Leptospirosis Control in the year 2000 were analyzed for cost-benefit estimation. The results are as follows:

4.1 Number of leptospirosis patients associated with infection condition and level of severity

The infection rate when wearing protective boots was 1.2% (Phuthikanon et al, 2000). The incremental risk when without protective boots compared to when protective boots were worn (odds ratio) was 7.1 (Tangkanakul et al, 2001). These were two guidelines for estimating the number of leptospirosis patients when protective boots were not in use. Utilizing the concept of odds, the infection rate when not wearing protective boots is 8.5%, or 12,685 persons from a farmer population of 149,236 persons. The number of estimated leptospirosis patients when protective boots were used is 1,790 persons.

The outcomes of leptospirosis infections are divided into two groups: asymptomatic and symptomatic infections. Asymptomatic infections will be subtracted from the total number of infections, as they incur no treatment cost. Based on the asymptomatic infection rate of 8.4% (Tangkanakul et al, 1998), it may be calculated the number of symptomatic infection by taking 100% of leptospirosis infections minus 8.4% of asymptomatic infections. These equals 91.6%; or 1,640 and 11,620 persons when with the protective boot program and without the protective boot program, respectively.

The severity of symptomatic leptospirosis infections is divided into three groups: mild, moderate and severe cases. There were 13 mild cases, 124 moderate cases and 4 severe cases, according to the epidemiological surveillance system: 506-disease surveillance report of Sa Kaeo Province for the year 2000. These were proportioned for estimating the number of mild, moderate and severe cases in this study and are following proportions: 13 mild cases, = 9.22%; 124 moderate cases, = 87.94%; and 4 severe cases,

= 2.84%. The number of mild, moderate and severe cases which will be used to estimate total treatment costs when with the protective boot program and without the protective boot program equal 151, 1,442, 47 and 1,071, 10,219, 330 persons, respectively, as detailed in table 4-1.

Table 4-1 Number of cases in associated with infection conditions and level of severity.

Unit of measurement: cases

Interventions	Study Population[1] (Persons)	Infections % (Number)	Asymptomatic[3] % (Number)	Symptomatic % (Number)	No. of cases in associated with each level of severity[4]		
					Mild % (Number)	Moderate % (Number)	Severe % (Number)
With the protective boot program	149,236	1.2[2] (1,790)	8.4 (150)	91.6 (1,640)	9.22 (151)	87.94 (1,442)	2.84 (47)
Without the protective boot program	149,236	8.5 (12,685)	8.4 (1,065)	91.6 (11,620)	9.22 (1,071)	87.94 (10,219)	2.84 (330)

Notes 1. Study population: please see page 32 for details.

2. Infection rate when without the protective boot program: this is an estimated value.

3. Symptomatic infections: this is an estimated value—100% of infections minus 8.4% of asymptomatic infection = 91.6%.

4. No. of cases in associated with each level of the disease's severity : they were estimated based on percentage share of mild, moderate, and severe case reported in Epidemiological Surveillance Report System, Sa Kaeo Provincial Health Office, 2000.

Sources: [1] Sa Kaeo Provincial Agriculture Office, Agricultural data base of Sa Kaeo Province, 2000. (Sa Kaeo : Sa Kaeo Provincial Agriculture Office, 2000), Photocopied.

[2] Puthikanon et al, Study of efficiency of Leptospirosis prevention boot. (Phitsunulok : Office of Communicable Disease Control zone 9, 2000), 27.

[3] Tangkanakul et al, Prevalence of asymtomatic leptospirosis infection among high risk group, 1998. Journal of Health Science Vol 9 No.1 (January - March), 2000, (Bangkok : Health Technical Office, 2000) 58.

[4] Epidemiological Surveillance report, Sa Kaeo Provincial Health Office, 2000

4.2 The average costs of the protective boots to be offered to the farmers and the total costs of the protective boot program.

The operating costs, the indirect costs, for the year 2000 was 38.33 Baht per pair (Tisayatikom and Thonimitr, 2000). The direct cost of the protective boots for the year 2000 was 132.24 Baht per pair (Office of Leptospirosis Control, 2000). Therefore, the protective boot cost is costed at 170.57 Baht per pair.

The long time period of rice farming is 140-150 days. The short-lived protective boots is 1.55 months. Therefore, 3 pairs of protective boots is allocated for each farmer, at a cost of 511.71 Baht per farmer.

Based on the assumption that, "every pair of protective boots has no side effects and incurs no treatment cost", the total cost of the protective boot program would be 76,365,553.56 Baht, as detailed in table 4-2.

Table 4-2 Cost of protective boots: per pair, per farmer, and total cost, year 2000.

Items	Amount	Unit of measurement
1. Protective boots plus administration	170.57	Baht per pair
2. Total number of boots per farmer	3	Pairs per person
3. Average cost per farmer (1. x 2.)	511.71	Baht per person
4. Total number of farmers	149,236	Persons
5. Total cost of protective boot program (3. X 4.)	76,365,553.56	Baht

Notes: Please see page 26 for details.

4.3 The average treatment costs associated with each hospital visit and level of severity

The average treatment cost is composed of routine service costs, and medical care costs. Routine service costs are estimated at 131.69 Baht for each OPD visit, and 794.41 Baht for each IPD patient-day (Tisayathikom and Thonimirt, 2001). Medical care costs; for the first visit, they were 287.38, 3,722.38, 1,356.74 Baht for mild, moderate and severe cases, respectively (n = 3, 25, 2 for mild, moderate and severe cases, respectively). For the second visit, they were 259.90, 402.67, and 0 Baht for mild, moderate and severe cases, respectively (n = 1, 12, 0 for mild, moderate and severe cases, respectively). Length of stay for each IPD case was 7.32 (n = 25), and 2 (n = 2) days for moderate and severe cases, respectively.

Based on the data mentioned above, the average treatment cost associated with each level of severity and hospital visit were 419.07, 9,669.15, 3,077.25 Baht for the first visit; and 391.59, 534.36 Baht for the second visit for mild, moderate and severe cases, respectively, as detailed in table 4-3.

Table 4-3 An average treatment cost in associated with each hospital visit and level of severity

		1st visit			2nd visit		
		Mild	Moderate	Severe	Mild	Moderate	Severe
$RSC_{(t)h}$/case	(Baht)	131.69	5946.77	1720.51	131.69	131.69	0
$RSC_{(H)OPD}$[1]	(Baht/visit)	131.69	131.69	131.69	131.69	131.69	131.69
OPD visit	(Visit)	1	1	1	1	1	0
$RSC_{(H)IPD}$[1]	(Baht/day)	794.41	794.41	794.41	794.41	794.41	794.41
$LOS_{(t)h}$	[Day(s)]	0	7.32 (n=25)	2 (n=2)	0	0	0
$MCC_{(t)h}$/case[2]	(Baht)	287.38 (n=3)	3,722.38 (n=25)	1,356.74 (n=2)	259.90 (n=1)	402.67 (n=12)	0
Average treatment cost/case ($RSC_{(t)h}$/case + $MCC_{(t)h}$/case)		419.07	9,669.15	3,077.25	391.59	534.36	0

Note [1] Source: Tisayathikom and Thonimirt, Unit cost analysis of public health facilities in 6 provinces, fiscal year 2000, under the social investment project (SIP). (Bangkok: Office of health insurance, 2001), 47.

[2] Please see appendix B for details.

4.4 Total treatment costs when with, and without, the protective boot program

Sourced from table 4-3, the average treatment costs associated with each hospital visit and level of severity were 419.07, 9,669.15 and 3,077.25 Baht for the first visit; and 391.59, 534.36 and 0 Baht for the second visit for mild, moderate and severe cases, respectively.

Sourced from table 4-1, the number of cases associated with each infection condition and level of severity: mild, moderate, severe were 1,071, 10,219, and 330 cases when without the protective boot program; and 151, 1,442, and 47 cases when with the protective boot program, respectively.

Sourced from appendix 4, the second visit rates for mild and moderate cases were 33% and 48%, respectively. From these percentages, the number of patients who would need a second treatment was 353 and 4,905 cases when without the protective boot program; and 50 and 692 cases when with the protective boot program.

Therefore, without the protective boot program, the total treatment costs for mild, moderate and severe cases are estimated to be 448,823.97, 98,809,043.85, and 1,015,492.50 Baht for the first visit; and 138,231.27, 2,621,035.80, and 0 Baht for the second visit, respectively. The estimated grand total cost is 103,032,627.39 Baht, as detailed in table 4-4.

With the protective boot program, the total treatment costs for mild, moderate and severe cases are estimated at 63,279.57, 13,492,914.30, and 144,630.75 Baht for the first visit; and 19,579.50, 369,777.12, and 0 Baht for the second visit, respectively. The grand total cost is estimated at 14,540,181.24 Baht, as detailed in table 4-5.

Table 4-4 Total treatment cost when without the protective boot program

	1st visit			2nd visit			Grand total
	Mild	Moderate	Severe	Mild (33% of mild case)	Moderate (48% of moderate case)	Severe	
No. of case when without the protective boot program : 11,620 cases in total[1]	1,071	10,219	330	353	4,905	0	-
Average treatment cost[2] (Baht/case)	419.07	9,669.15	3,077.25	391.59	534.36	0	-
Total treatment cost when without the protective boot program (Baht)	448,823.97	98,809,043.85	1,015,492.50	138,231.27	2,621,035.80	-	103,032,627.39

Notes [1] Please see table 4-1 for details.

[2] Please see table 4-3 for details.

Table 4-5 Total treatment cost when with the protective boot program

	1st visit			2nd visit			Grand total
	Mild	Moderate	Severe	Mild (33% of mild case)	Moderate (48% of moderate case)	Severe	
No. of case when with the protective boot program : 1,640 cases in total[1]	151	1,442	47	50	692	0	-
Average treatment cost[2] (Baht/case)	419.07	9,669.15	3,077.25	391.59	534.36	0	-
Total treatment cost when with the protective boot program (Baht)	63,279.57	13,942,914.30	144,630.75	19,579.50	369,777.12	-	14,540,181.24

Notes [1] Please see table 4-1 for details.

[2] Please see table 4-3 for details.

4.5 Cost-benefit Analysis

As can be seen in table 4-2, the total cost of the protective boots was 76,365.553.56 Baht. Table 4-4, the total treatment cost when without the protective boot program was 103,032,627.39 Baht. Table 4-5, the total treatment cost when with the protective boot program was 14,540,181.24 Baht. In total, the costs without the protective boot program and with the protective boot program were 103,032,627.39 Baht and 90,905,734.80 Baht, respectively. These signify that the protective boot program consumes lower cost than the situation without the protective boot program, being 12,126,892.59 Baht less costly, as detailed in table 4-6.

Table 4-6 Cost-benefit analysis

Unit of measurement: Baht

	Without the protective boot program	With the protective boot program	Net benefit
Total cost of the protective boot program	0	76,365,553.56[1]	
Total treatment cost	103,032,627.39[2]	14,540,181.24[3]	
Grand total	103,032,627.39	90,905,734.80	12,126,892.59

Notes: [1] Please see table 4-2 for details.

[2] Please see table 4-4 for details.

[3] Please see table 4-5 for details.

4.6 Sensitivity analysis

A. **If the number of protective boots per farmer is increased from 3 pairs per person to 4 pairs per person.**

Due to the unconditional service and the negligible cost burden for the farmers may cause the farmers take the provision of free protective boots for granted. These results in increased demand for the protective boots and increased costs for the program.

Assuming that the demand increases from 3 pairs per person to 4 pairs per person; the total cost of the protective boot program increases to 101,820,738.08 Baht. The grand total (1) without the protective program is stable, that is 103,032,627.39 Baht, and (2) with the protective program increases to 116,360,919.32 Baht; and increased cost burden of 13,328,291.93 Baht, as detailed in table 4-7.

Table 4-7 Cost-benefit analysis if the number of protective boots per farmer is increased from 3 pairs per person to 4 pairs per person.

Unit of measurement: Baht

	Without protective boot program	With protective boot program	Net benefit
Total cost of protective boot program	0	101,820,738.08	
Total treatment cost	103,032,627.39	14,540,181.24	
Grand total	103,494,424.00	116,360,919.32	-13,328,291.93

B. If the price of the protective boot decreases 50% from 170.57 Baht per pair.

In the year 2000, the protective boot market was monopolized, which possibly made price-fixing. If, in the future, the market has grown and there were to be free competition.

Assuming that the price decreased 50% from 170.57 Baht per pair, the total cost of the protective boot program will decrease to 38,182,776.78 Baht. The grand total (1) without the protective program is stable, that is 103,032,627.39 Baht, and (2) with the protective program decreases to 52,722,958.02Baht, so a saving of 50,309,669.37 Baht is the result, as detailed in table 4-8.

Table 4-8 Cost-benefit analysis if the price of the protective boots decreases 50% from 170.57 Baht per pair.

Unit of measurement: Baht

	Without protective boot program	With protective boot program	Net benefit
Total cost of protective boot program	0	38,182,776.78	
Total treatment cost	103,032,627.39	14,540,181.24	
Grand total	103,032,627.39	52,722,958.02	50,309,669.37