



## CHAPTER 5

# CONCLUSION AND RECOMMENDATIONS

### 5.1 CONCLUSION

Leptospirosis is an acute occupational zoonotic infectious disease. In Thailand, it affects rice farmers because they have accidentally lacerated skin or constantly immersing of feet while operating their rice farm. The wearing of protective boots is recommended as the most appropriate preventive measure against leptospirosis. Its potential for prevention was found to be 7.1 times that of not wearing protective boots.

This study aimed to assess the costs and benefits, from the provider perspective, of a program in which farmers used protective boots to prevent leptospirosis.

Sa Kaeo Province is one of many provinces in Thailand faced with the health problem of leptospirosis since the year 2000. To assess the costs and benefits, therefore, Sa Kaeo province was determined as the study area. One hundred and forty-nine thousand, two hundred and thirty-six rice farmers in Sa Kaeo Province (Sa Kaeo Provincial Agricultural Office, 2000) were selected as the study population. The period of 140-150 days (Panichpatana, 2002) was concluded as the period of time during which the farmers were required to wear the protective boots. The protective boot working lifetime was set at 1.55 months (Phuthikanon et al, 2000). The total cost of the protective boots program was composed of the protective boot program cost and the treatment cost for cases that still contracted the disease while wearing the protective boots. The benefit was the reduction in the treatment cost that would have remained without the program. The cost per unit was composed of routine cost and medical care cost. All costs were measured from the provider perspective in Thai Baht in the year 2000. Disease severity was classified into 4 levels: asymptomatic, mild, moderate, and severe or fatal. Secondary data from various sources, and primary data sourced from 30 purposively selected leptospirosis-infected patients hospitalized at Sa Kaeo Crown Prince Hospital, Sa Kaeo Province, and the Office of Leptospirosis Control were used for the following estimation.

1. The numbers of cases with and without the protective boot program were estimated using the ratio of odds between not wearing the protective boots compared with wearing the protective boots, divided by the infection rate when wearing the protective boots.

- a) Odds ratio was 7.1 times (Tangkanakul et al, 2000).
- b) Infection rate when wearing the protective boots was 1.2% (Phuthikanon et al, 2000).

2. The number of cases associated with asymptomatic disease severity was estimated at 8.4% (Tangkanakul et al, 2000).

3. The number of cases associated with symptomatic disease severity was estimated using 100% of the number of cases minus 8.4% of asymptomatic disease severity.

4. Mild, moderate, and severe were estimated as 9.22%, 87.94%, and 2.84% for each level of severity, respectively (Annual Epidemiological Surveillance Report, Sa Kaeo Provincial Health Office, 2000).

5. The total costs with the protective boot program were comprised of the total cost of the protective boot program and the total cost of leptospirosis treatment. Their average costs were estimated as follows:

a) The protective boot cost:

1. Routine service cost was estimated at 38.33 Baht (Tisayathikhom and Thonimirt, 2000).

2. Medical care cost was estimated using the cost accounting method, and was found to be 132.24 Baht. These data were drawn from the Office of Leptospirosis Control, 2000.

b) Treatment cost:

1. Routine service cost: per OPD visit was estimated at 131.69 Baht, per IPD patient-day was estimated at 794.41 Baht (Tisayathikhom and Thonimirt, 2000).

2. Medical care costs were estimated using an adjusted charge method and were found to be 287.38, 3,722.38, and 3,077.25 Baht at 1<sup>st</sup> visit, and 259.90, 402.67, and 0.00 Baht at 2<sup>nd</sup> visit, at mild, moderate, and severe respectively

3. Length of stay for calculating the cost per IPD patient-day, to be the cost per IPD case, was estimated at 7.32, and 2 days, at moderate, and severe respectively.

These data were drawn from 30 purposively selected sample leptospirosis-infected patients hospitalized at Sa Kaeo Crown Prince Hospital in the year 2000.

6. The 2<sup>nd</sup> visit rate was estimated at 33%, and 48% at mild, and moderate restively. These data, also, were drawn from 30 purposively selected sample leptospirosis-infected patients hospitalized at Sa Kaeo Crown Prince Hospital in the year 2000.

7. For the total cost without the protective boot program, the average cost was estimated in the same way as the average treatment cost with the protective boot program.

### Results

1. The number of cases without the protective boot program was 11,620 cases. These were composed of 1,071 mild, 10,219 moderate, and 330 severe cases.

2. The number of cases with the protective boot program was 1,640 cases. These were composed of 151 mild, 1,442 moderate, and 47 severe cases.

3. Average treatment cost per case:

a) At the first visit, this reached a total of 419.07 Baht for a mild case, 9,669.15 Baht for a moderate case, and 3,077.25 Baht for a severe case.

b) At the second visit, this reached a total of 391.59 Baht for a mild case, 534.36 Baht for a moderate case, and 0.00 Baht for a severe case.

4. The protective boot cost was calculated using 3 pairs of boots per farmer. The cost per pair was 170.57 Baht.

5. The total costs with the protective boot program were 90,905,734.80 Baht. The cost of the protective boot program itself was 76,365,553.56 Baht, while the treatment cost was 14,540,181.24 Baht.

6. The total cost without the protective boot program was 103,032,627.39 Baht.

7. The net financial cost saving was 12,126,892.59 Baht for 9,980 cases, with 283 deaths prevented.

8. If the demand for the additional boots were increase from 3 pairs per farmer to 4 pairs per farmer due to the provision free-of-charge basis, the protective boot program cost would increase to an estimated 116,360,919.32 Baht. This would represent an increased cost burden of 13,328,291.93 Baht to the provider.

9. If the price of the protective boots decrease by 50% from 170.57 due to competition in the protective boot market, the protective boot program cost would decrease to 52,722,958.02 Baht. This would increase the net financial cost saving to the provider from 12,126,892.59 Baht to 50,309,669.37 Baht.

## 5.2 Recommendations

For the individual farmer perspective, the wearing of protective boots, in addition to helping prevent disease, further improves personal hygiene. From the provider perspective, the findings from this study showed that the protective boot program delivers a substantial financial saving. This helps to decrease overall health care expenditure. However, provision with free-of-charge, and the negligible cost burden for the farmers may cause them to take the provision of free protective boots for granted, with a consequent increase in the protective boot cost. In addition, with a monopolized protective boot market, the protective boot program cost will increase. These produce a considerable cost burden to the provider. Therefore, the protective boot program might be better implemented using other strategies, such as a cost-sharing system, funding support for essential program elements and requiring that others be paid by the farmers, and so on. The objective is to promote equity, self-awareness, utilization and maintenance. Further study, to determine suitable strategies, is required.

Nevertheless, health education still need to be implemented intensively, to transfer information continuously and to create ongoing awareness among the farmers, so strengthening the farmers themselves.

It should be carefully noted that this cost-benefit analysis includes only the costs from the provider perspective. If the costs-benefits from other perspectives - those of the farmers and their families, and those of the wider society, especially the lost years of

farmers' lives, which cannot be calculated into money equivalents, were included, it is expected that the benefits from the protective boot program would be even more significant.

### **5.3 Limitations**

The results of this study were limited to Sa Kaeo Province, to existing data, and especially to the 30 purposively selected sample patients, which was too small a sample to be a satisfactory representation. According to the objective of minimize the program's cost, maximize the program's effectiveness, effectiveness of other various kinds of protective boot and its cost associated with various kinds of providing strategic should be conducted in further.