## REFERENCES


Alonso, P.L.et al.(1993)."*A Malaria Control Trial Using Insecticide Treated Bednets and Targeted Chemoprophylaxis in A Rural Area of The Gambia, West Africa.6. The Impact of The Intervention on Mortality And Morbidity from Malaria*".Trans. R. Soc. Tro. Med. Hyg.Vol 87, pp37- 44

Kroeger, A. and others (1994)." *Insecticide - Impregnated Bednets for Malaria Control: Varing Experiences from Ecuador, Colombia, And Peru Concerning Acceptability and Effectiveness*". Am. J. Trop.Med. Hyg.Vol 53, pp 313-323

Beach, R. F. et al. (1993)." *Effectiveness of Permethrin Impregnated Bednets and Curtains for Malaria Control in A Holoendemic Area Of Western Kenya*". Am. J. Tro. Med. Hyg. Volume 49(3)

Brinkmann, U. and Brinkmann, A. (1995)."*Economic Aspects of The Use of Impregnated Mosquito Nets for Malaria Control*". Bull Word Health Organ. Volume 73, pp 651-658

Carnevale, P. et al. (1988). "*Control of Malaria Using Mosquito Nets Impregnated with Pyrethroids in Burkina Faso*". Bull Soc Pathol Exot Fillales.Vol 81, pp 832-846

Christian Lengeler Jacqueline Cattani and Don de Savigny.(1996). Net Gain

D'Alessandro, U. et al. (1995). "*Mortality and Morbidity From Malaria in Gambian Children after Introduction of An Impregnated Bednet Programme*". Lancet.Vol 345, pp 479-483

Gratz, N.G. and Jany, W.C. (1994)." *What Role for Insecticide in Vector Control Programs* ". Am. J. Trop. Med . Hyg .Vol 50, pp11-20

Gilles, H. M. and David, A.Warrell. (1993). Bruce - Chwatt's Essential Malariology

Sexton, J. D. et al. (1990). "*Permethrin Imprgnated Curtains and Bednets Prevent Malaria in Western Kenya*". Am. J. Trop. Hyg .Vol 43, pp 11-18

Irne, A. and Others. (1994). The Malaria Manual

Kevin, L. P. (1993)." *Status, Experience and Issues in Malaria Vector Control in The Western Pacic Region".*Geneva: WHO

Kamol - Ratanakul, P. and Prasittisuk, C. (1992)."*The Effectiveness of Chemoprophylaxis Against Malaria for Non- Immune Migrant Workers in Eastern Thailand"*Am. J. Trop. Med. Hyg. 1992; 47:305 - 9

Kamol - Ratanakul, P. and Others.(1993). " *Cost- Effectiveness of Three Short Course Anti Tubeculosis Frogram Compare with A Standard Regime in Thailand*".J.Clin. Epidemiol. Pergamon Press Ltd ; 46 (7): 631 - 636

Picard, J. et al (1993)." A *Malaria Control Trial Using Insecticide Treated Bednets and Targeted Chemoprophylaxis in A Rural Area of The Gambia, West Africa. 8. Cost -Effectiveness of Bed Net Impregnation Alone or Combined with Chemoprophylaxis in Preventing Mortality and Morbidity From Malaria in Gambian Children".* Trans. R. Soc. Trop. Med. Hyg .Vol 87

Premji, Z. et al. (1995)."*Changes in Malaria Associated Morbidity in Chidren Using Insecticide Treated Mosquito Nets in The Bagamoyo District of Coastal Tanzania*".Trop. Med. Parasitol .Vol 46, pp 147-153

Sexton, J.D. et al (1990)." *Permethrin Impregnated Curtains and Bed Nets Prevent Malaria in Western Kenya*". Am. J. Trop. Med. Hyg .Vol 43, pp11-18

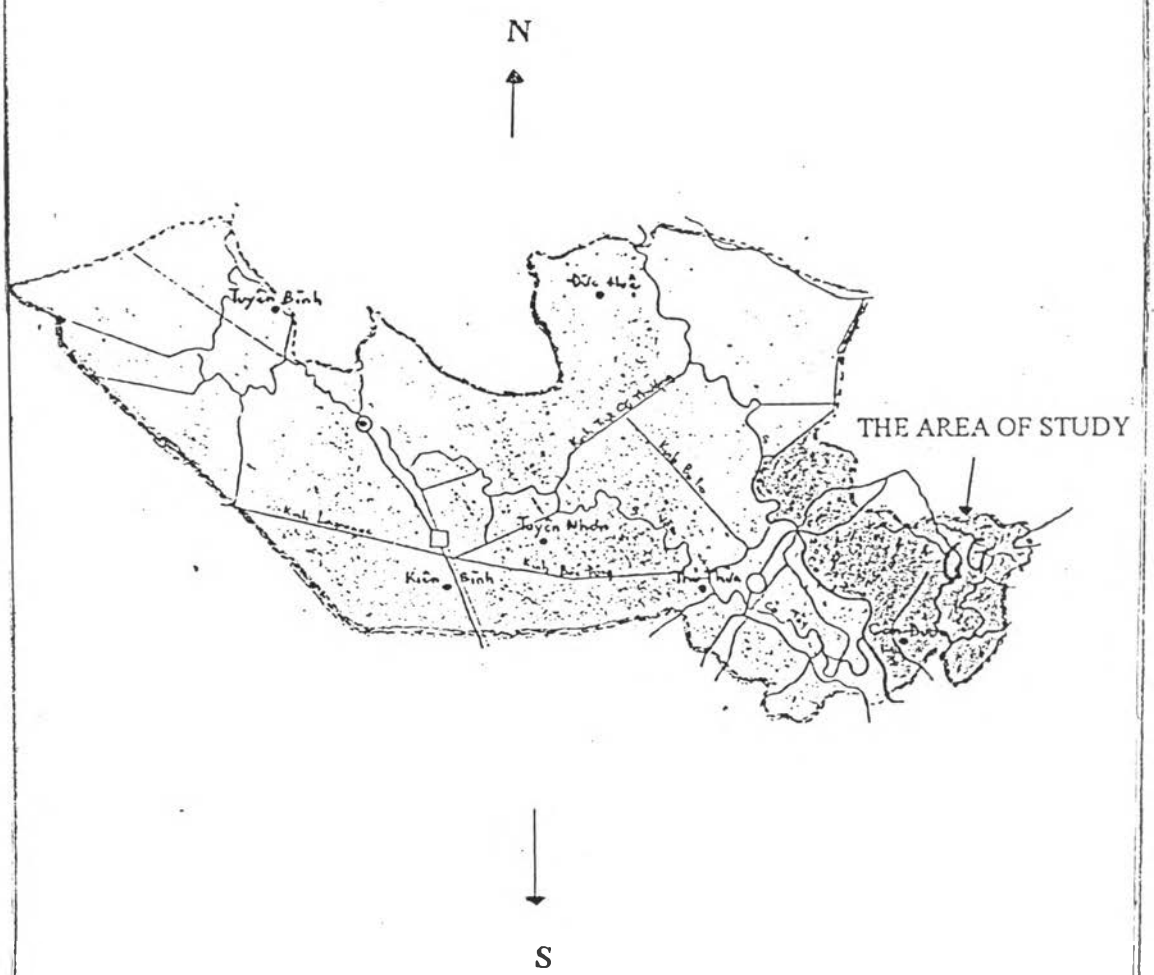
Walther, H.W and Gregor, I. M. (1988). Malaria Principles and Practice of Malariology

Winch, P.J. et al (1994)." *Seasonal Variation In The Perceived Risk Of Malaria : Implications For The Promotion Of Insecticide - Impregnated Bednets*". Soc Sci. Med.Vol 39, pp 63-75

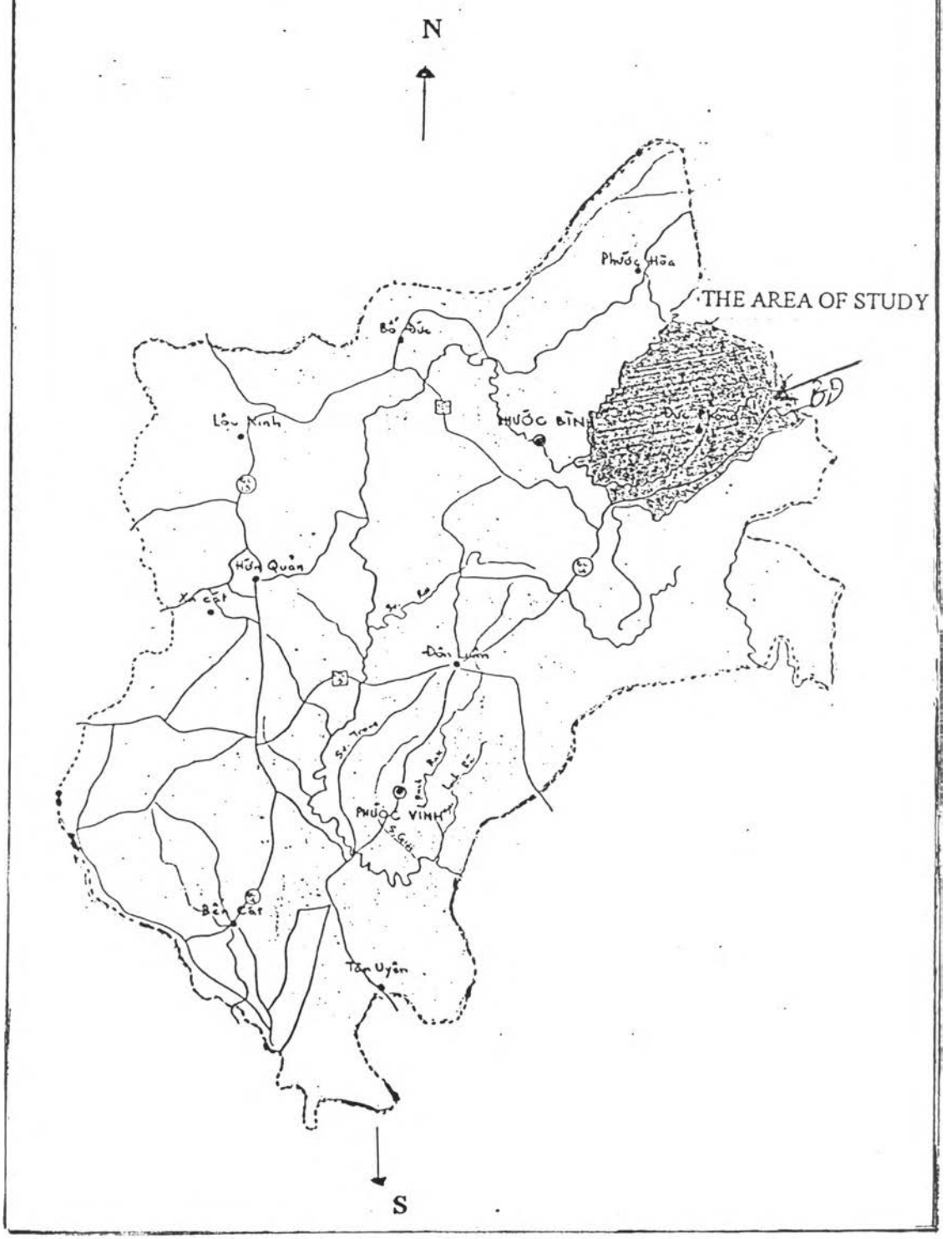
# APPENDICES

## APPENDIX 1. MAPS

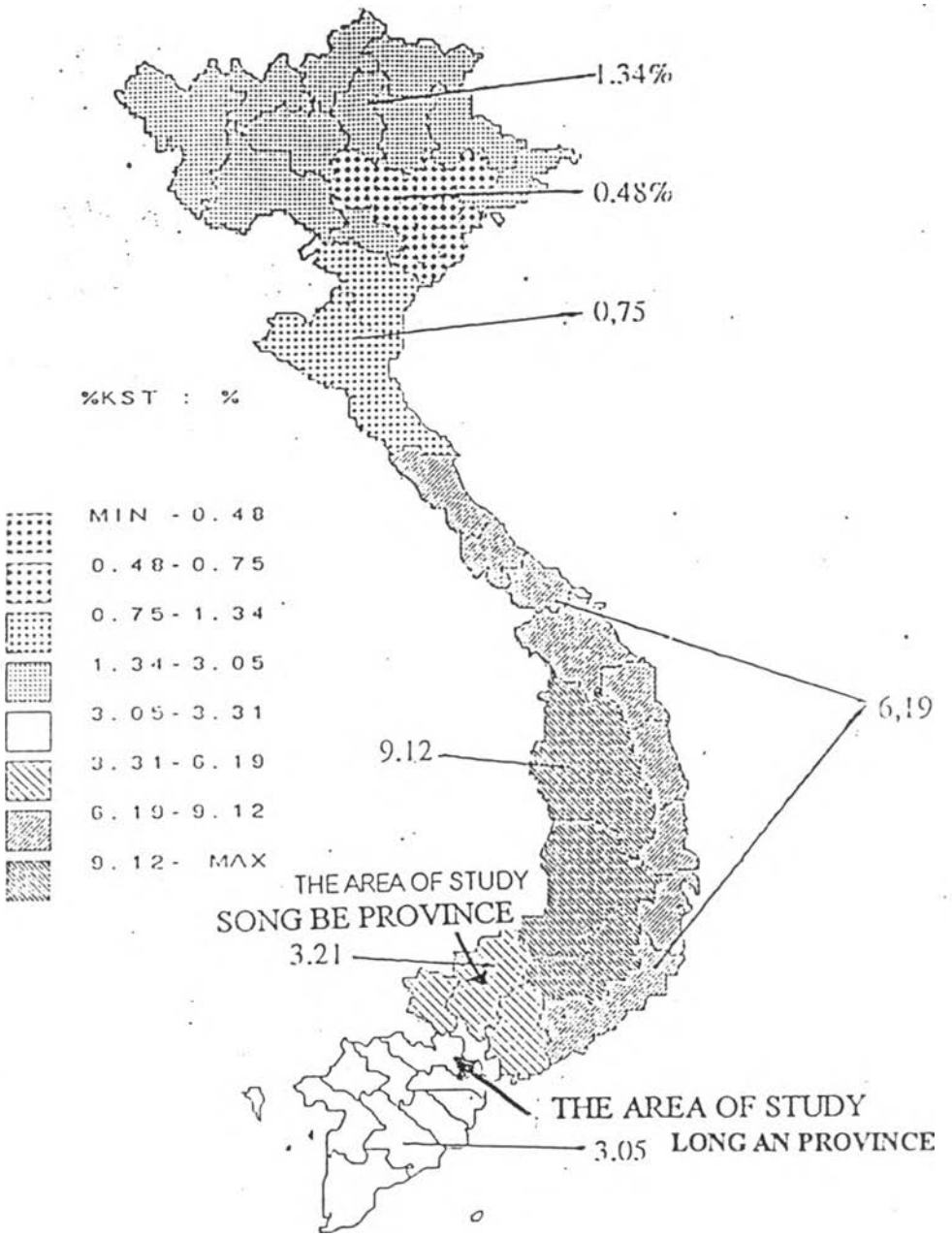
## APPENDIX 1.1. MAP OF LONG AN PROVINCE



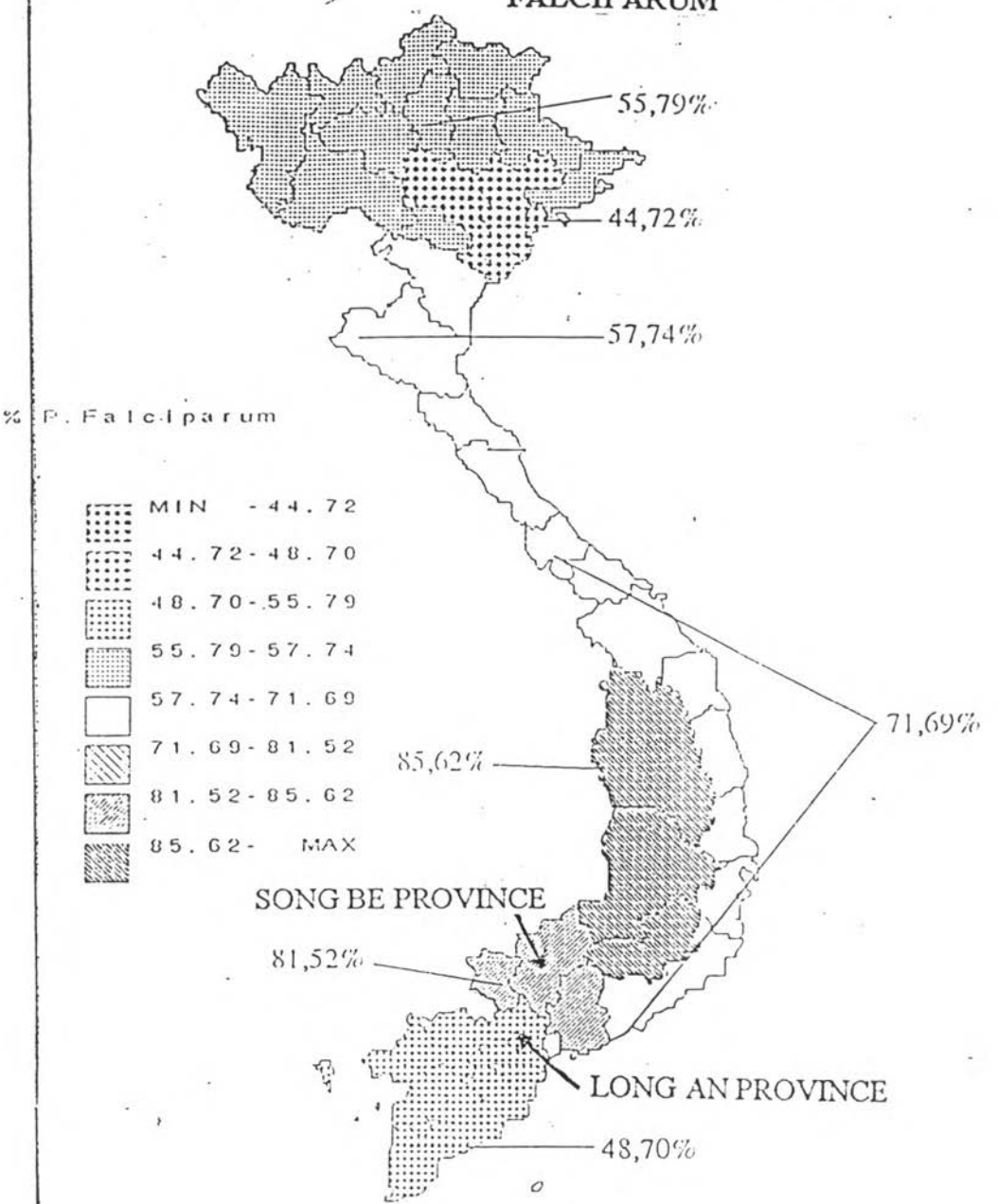
## APENDIX 1.2. MAP OF SONG BE PROVINCE



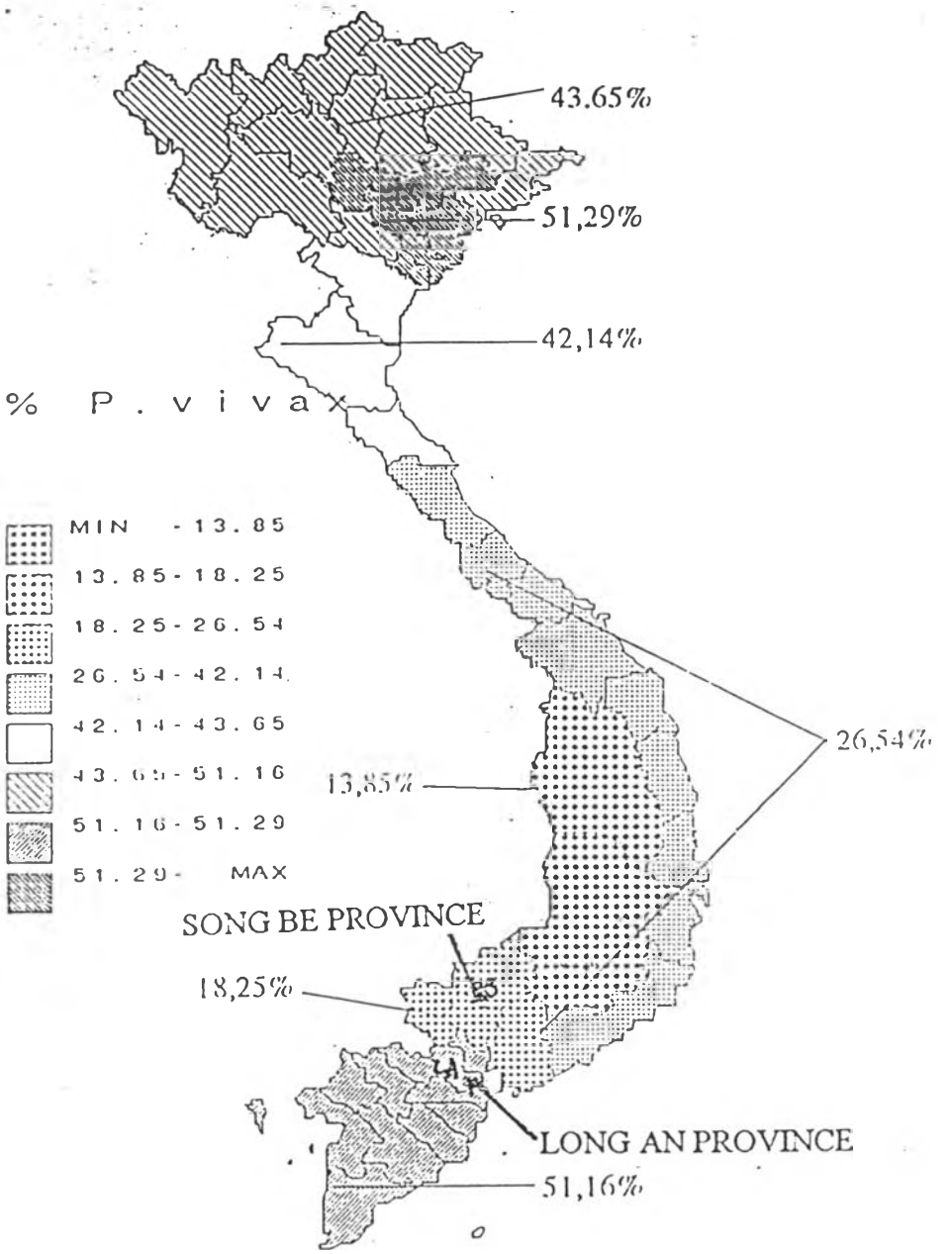
APPENDIX 1.3. MAP OF DISTRIBUTION OF MALARIA PARASITES



## APPENDIX 1.4. MAP OF DISTRIBUTION OF PLASMODIUM FALCIPARUM



APPENDIX 1.5. MAP OF DISTRIBUTION OF PLASMODIUM VIVAX



# APPENDIX 2 . MALARIA RELATED DATA

**Table A2.1** : Malaria Cases in Treated Bednet Group, Long An Province

| Before intervention | | | | After intervention | | | |
|---|---|---|---|---|---|---|---|
| Date | P.F. | P.V. | Total | Date | P.F. | P.V. | Total |
| 09/1993 | 15 | 22 | 37 | 09/1994 | 5 | 7 | 12 |
| 10/1993 | 12 | 23 | 35 | 10/1994 | 4 | 8 | 12 |
| 11/1993 | 14 | 20 | 34 | 11/1994 | 3 | 6 | 9 |
| 12/1993 | 13 | 17 | 30 | 12/1994 | 3 | 4 | 7 |
| 01/1994 | 9 | 12 | 21 | 01/1995 | 2 | 2 | 4 |
| 02/1994 | 10 | 14 | 24 | 02/1995 | 1 | 2 | 3 |
| 03/1994 | 12 | 16 | 28 | 03/1995 | 3 | 2 | 5 |
| 04/1994 | 12 | 17 | 29 | 04/1995 | 2 | 4 | 6 |
| 05/1994 | 15 | 18 | 33 | 05/1995 | 3 | 3 | 6 |
| 06/1994 | 18 | 19 | 37 | 06/1995 | 5 | 8 | 13 |
| 07/1994 | 19 | 20 | 39 | 07/1995 | 6 | 8 | 14 |
| 08/1994 | 21 | 22 | 43 | 08/1995 | 5 | 10 | 15 |
| **G.Total** | **170** | **220** | **390** | **G. Total** | **42** | **64** | **106** |

CHI square test, $p < 0.01$

P.F. = Plasmodium falciparum; P.V. = Plasmodium vivax

**Table A2.2** : Malaria Cases Among < 9 y.o. Children in Treated Bednet Group, Long An Province

| Before intervention | | | | After intervention | | | |
|---|---|---|---|---|---|---|---|
| Date | P.F. | P.V. | Total | Date | P.F. | P.V. | Total |
| 09/1993 | 6 | 4 | 10 | 09/1994 | 0 | 1 | 1 |
| 10/1993 | 7 | 5 | 12 | 10/1994 | 1 | 1 | 2 |
| 11/1993 | 3 | 5 | 8 | 11/1994 | 0 | 1 | 1 |
| 12/1993 | 1 | 3 | 4 | 12/1994 | 0 | 1 | 1 |
| 01/1994 | 0 | 2 | 2 | 01/1995 | 1 | 0 | 1 |
| 02/1994 | 2 | 3 | 5 | 02/1995 | 0 | 0 | 0 |
| 03/1994 | 2 | 2 | 4 | 03/1995 | 0 | 1 | 1 |
| 04/1994 | 2 | 3 | 5 | 04/1995 | 0 | 0 | 0 |
| 05/1994 | 3 | 4 | 7 | 05/1995 | 1 | 1 | 2 |
| 06/1994 | 7 | 6 | 13 | 06/1995 | 2 | 2 | 4 |
| 07/1994 | 7 | 8 | 15 | 07/1995 | 1 | 1 | 2 |
| 08/1994 | 6 | 7 | 13 | 08/1995 | 1 | 1 | 2 |
| **G. Total** | **46** | **52** | **98** | **G. Total** | **7** | **10** | **17** |

CHI square test, $p < 0.01$

P.F. = Plasmodium falciparum; P.V. = Plasmodium vivax

**Table A2.3** : Malaria Cases in Untreated Bednet Group, Long An Province

| Before intervention | | | | After intervention | | | |
|---|---|---|---|---|---|---|---|
| Date | P.F. | P.V. | Total | Date | P.F. | P.V. | Total |
| 09/1993 | 16 | 18 | 34 | 09/1994 | 13 | 15 | 28 |
| 10/1993 | 14 | 12 | 26 | 10/1994 | 15 | 13 | 28 |
| 11/1993 | 12 | 14 | 26 | 11/1994 | 10 | 12 | 22 |
| 12/1993 | 11 | 12 | 23 | 12/1994 | 9 | 11 | 20 |
| 01/1994 | 9 | 9 | 18 | 01/1995 | 10 | 10 | 20 |
| 02/1994 | 10 | 11 | 21 | 02/1995 | 11 | 11 | 22 |
| 03/1994 | 9 | 9 | 18 | 03/1995 | 8 | 10 | 18 |
| 04/1994 | 11 | 15 | 26 | 04/1995 | 9 | 9 | 18 |
| 05/1994 | 14 | 17 | 31 | 05/1995 | 11 | 12 | 23 |
| 06/1994 | 17 | 19 | 36 | 06/1995 | 14 | 15 | 29 |
| 07/1994 | 19 | 20 | 39 | 07/1995 | 17 | 18 | 35 |
| 08/1994 | 22 | 24 | 46 | 08/1995 | 15 | 17 | 32 |
| **G. Total** | **164** | **180** | **344** | **G. Total** | **142** | **153** | **295** |

CHI square test, $p > 0.05$

P.F. = Plasmodium falciparum; P.V. = Plasmodium vivax

**Table A2.4**: Malaria Cases Among < 9 y.o. Children in Untreated Bednet Group, Long An Province

| Before intervention | | | | After intervention | | | |
|---|---|---|---|---|---|---|---|
| Date | P.F. | P.V. | Total | Date | P.F. | P.V. | Total |
| 09/1993 | 5 | 4 | 9 | 09/1994 | 5 | 4 | 9 |
| 10/1993 | 3 | 3 | 6 | 10/1994 | 4 | 5 | 9 |
| 11/1993 | 2 | 3 | 5 | 11/1994 | 3 | 3 | 6 |
| 12/1993 | 2 | 4 | 6 | 12/1994 | 3 | 2 | 5 |
| 01/1994 | 1 | 2 | 3 | 01/1995 | 2 | 1 | 3 |
| 02/1994 | 1 | 2 | 3 | 02/1995 | 2 | 1 | 3 |
| 03/1994 | 2 | 1 | 3 | 03/1995 | 0 | 2 | 2 |
| 04/1994 | 1 | 2 | 3 | 04/1995 | 1 | 1 | 2 |
| 05/1994 | 2 | 3 | 5 | 05/1995 | 2 | 1 | 3 |
| 06/1994 | 5 | 6 | 11 | 06/1995 | 3 | 4 | 7 |
| 07/1994 | 7 | 6 | 13 | 07/1995 | 3 | 5 | 8 |
| 08/1994 | 6 | 5 | 11 | 08/1995 | 5 | 7 | 12 |
| **G. Total** | **37** | **41** | **78** | **G. Total** | **33** | **36** | **69** |

CHI square test, $p > 0.05$

P.F. = Plasmodium falciparum; P.V. = Plasmodium vivax

**Table A2.5: Malaria Cases in Treated Bednet Group, Song Be Province**

| Before intervention | | | | | After intervention | | |
|---|---|---|---|---|---|---|---|
| Date | P.F. | P.V. | Total | Date | P.F. | P.V. | Total |
| 09/1993 | 31 | 4 | 35 | 09/1994 | 8 | 4 | 12 |
| 10/1993 | 29 | 5 | 34 | 10/1994 | 6 | 5 | 11 |
| 11/1993 | 33 | 7 | 40 | 11/1994 | 9 | 5 | 14 |
| 12/1993 | 34 | 9 | 43 | 12/1994 | 8 | 6 | 14 |
| 01/1994 | 29 | 6 | 35 | 01/1995 | 5 | 4 | 9 |
| 02/1994 | 23 | 5 | 28 | 02/1995 | 3 | 2 | 5 |
| 03/1994 | 24 | 5 | 29 | 03/1995 | 4 | 3 | 7 |
| 04/1994 | 27 | 8 | 35 | 04/1995 | 4 | 1 | 5 |
| 05/1994 | 31 | 9 | 40 | 05/1995 | 6 | 3 | 9 |
| 06/1994 | 33 | 8 | 41 | 06/1995 | 7 | 6 | 13 |
| 07/1994 | 32 | 8 | 40 | 07/1995 | 5 | 6 | 11 |
| 08/1994 | 35 | 8 | 43 | 08/1995 | 8 | 5 | 13 |
| **G. Total** | **361** | **82** | **443** | **G. Total** | **73** | **50** | **123** |

CHI square test, $p < 0.01$

P.F. = Plasmodium falciparum; P.V. = Plasmodium vivax

**Table A2.6: Malaria Cases Among < 9 y.o. Children in Treated Bednet Group, Song Be Province**

| Before intervention | | | | After intervention | | | |
|---|---|---|---|---|---|---|---|
| Date | P.F. | P.V. | Total | Date | P.F. | P.V. | Total |
| 09/1993 | 7 | 2 | 9 | 09/1994 | 1 | 0 | 1 |
| 10/1993 | 8 | 3 | 11 | 10/1994 | 0 | 1 | 1 |
| 11/1993 | 10 | 4 | 14 | 11/1994 | 2 | 1 | 3 |
| 12/1993 | 8 | 3 | 11 | 12/1994 | 1 | 0 | 1 |
| 01/1994 | 4 | 0 | 4 | 01/1995 | 0 | 0 | 0 |
| 02/1994 | 5 | 1 | 6 | 02/1995 | 0 | 1 | 1 |
| 03/1994 | 5 | 2 | 7 | 03/1995 | 1 | 1 | 2 |
| 04/1994 | 8 | 3 | 11 | 04/1995 | 1 | 0 | 1 |
| 05/1994 | 11 | 5 | 16 | 05/1995 | 2 | 2 | 4 |
| 06/1994 | 9 | 3 | 12 | 06/1995 | 2 | 1 | 3 |
| 07/1994 | 6 | 0 | 6 | 07/1995 | 1 | 1 | 2 |
| 08/1994 | 6 | 2 | 8 | 08/1995 | 1 | 1 | 2 |
| **G. Total** | **87** | **28** | **115** | **G. Total** | **12** | **9** | **21** |

CHI square test. $p < 0.01$

P.F. = Plasmodium falciparum; P.V. = Plasmodium vivax

**Table A2.7: Malaria Cases in Untreated Bednet Group, Song Be Province**

| Before intervention | | | | After intervention | | | |
|---|---|---|---|---|---|---|---|
| Date | P.F. | P.V. | Total | Date | P.F. | P.V. | Total |
| 09/1993 | 23 | 4 | 27 | 09/1994 | 17 | 5 | 22 |
| 10/1993 | 20 | 5 | 25 | 10/1994 | 22 | 4 | 26 |
| 11/1993 | 29 | 6 | 35 | 11/1994 | 25 | 8 | 33 |
| 12/1993 | 31 | 9 | 40 | 12/1994 | 31 | 9 | 40 |
| 01/1994 | 27 | 7 | 34 | 01/1995 | 26 | 6 | 32 |
| 02/1994 | 23 | 5 | 28 | 02/1995 | 20 | 3 | 23 |
| 03/1994 | 20 | 3 | 23 | 03/1995 | 20 | 2 | 22 |
| 04/1994 | 25 | 5 | 30 | 04/1995 | 27 | 5 | 32 |
| 05/1994 | 29 | 8 | 37 | 05/1995 | 29 | 8 | 37 |
| 06/1994 | 28 | 7 | 35 | 06/1995 | 19 | 5 | 24 |
| 07/1994 | 28 | 6 | 34 | 07/1995 | 20 | 7 | 27 |
| 08/1994 | 31 | 9 | 40 | 08/1995 | 24 | 8 | 32 |
| **G. Total** | **314** | **74** | **388** | **G. Total** | **280** | **70** | **350** |

CHI square test, $p > 0.05$

P.F. = Plasmodium falciparum; P.V. = Plasmodium vivax

**Table A2.8 : Malaria Cases Among < 9 y.o. Children in Untreated Bednet Group, Song Be Province**

| Before intervention | | | | After intervention | | | |
|---|---|---|---|---|---|---|---|
| Date | P.F. | P.V. | Total | Date | P.F. | P.V. | Total |
| 09/1993 | 7 | 2 | 9 | 09/1994 | 4 | 0 | 4 |
| 10/1993 | 8 | 1 | 9 | 10/1994 | 3 | 1 | 4 |
| 11/1993 | 10 | 2 | 12 | 11/1994 | 7 | 3 | 10 |
| 12/1993 | 13 | 3 | 16 | 12/1994 | 9 | 5 | 14 |
| 01/1994 | 9 | 1 | 10 | 01/1995 | 7 | 2 | 9 |
| 02/1994 | 5 | 1 | 6 | 02/1995 | 6 | 1 | 7 |
| 03/1994 | 6 | 2 | 8 | 03/1995 | 5 | 0 | 5 |
| 04/1994 | 7 | 2 | 9 | 04/1995 | 8 | 1 | 9 |
| 05/1994 | 10 | 4 | 14 | 05/1995 | 10 | 2 | 12 |
| 06/1994 | 8 | 2 | 10 | 06/1995 | 7 | 1 | 8 |
| 07/1994 | 7 | 1 | 8 | 07/1995 | 5 | 1 | 6 |
| 08/1994 | 8 | 2 | 10 | 08/1995 | 4 | 0 | 4 |
| **G. Total** | **98** | **23** | **121** | **G. Total** | **75** | **17** | **92** |

CHI square test, $p > 0.05$

P.F. = Plasmodium falciparum; P.V. = Plasmodium vivax

**Table A2.9**: Malaria Cases in Treated and in Untreated Bednet Groups, Song Be Province (Tho Son and Daknhau communes)

| With intervention (Tho Son) | | | | With no intervention (Daknhau) | | | |
|---|---|---|---|---|---|---|---|
| Date | P.F. | P.V. | Total | Date | P.F. | P.V. | Total |
| 09/1993 | 24 | 6 | 30 | 09/1994 | 17 | 5 | 22 |
| 10/1993 | 26 | 5 | 31 | 10/1994 | 22 | 4 | 26 |
| 11/1993 | 32 | 8 | 40 | 11/1994 | 25 | 8 | 33 |
| 12/1993 | 35 | 10 | 45 | 12/1994 | 36 | 10 | 46 |
| 01/1994 | 29 | 9 | 38 | 01/1995 | 33 | 7 | 40 |
| 02/1994 | 25 | 5 | 30 | 02/1995 | 20 | 3 | 23 |
| 03/1994 | 22 | 4 | 26 | 03/1995 | 20 | 2 | 22 |
| 04/1994 | 30 | 5 | 35 | 04/1995 | 31 | 5 | 36 |
| 05/1994 | 37 | 9 | 46 | 05/1995 | 32 | 9 | 41 |
| 06/1994 | 31 | 10 | 41 | 06/1995 | 28 | 8 | 36 |
| 07/1994 | 26 | 8 | 34 | 07/1995 | 23 | 7 | 30 |
| 08/1994 | 23 | 6 | 29 | 08/1995 | 19 | 5 | 24 |
| **G. Total** | **340** | **85** | **425** | **G. Total** | **306** | **73** | **379** |

CHI square test, $p > 0.05$

P.F. = Plasmodium falciparum; P.V. = Plasmodium vivax

**Table A2.10**: Malaria Cases in Treated and in Untreated Bednet Groups, Phu Rieng Rubber Company

| With intervention | | | | With no intervention | | | |
|---|---|---|---|---|---|---|---|
| Date | P.F. | P.V. | Total | Date | P.F. | P.V. | Total |
| 09/1993 | 12 | 1 | 13 | 09/1994 | 11 | 0 | 11 |
| 10/1993 | 10 | 2 | 12 | 10/1994 | 10 | 2 | 12 |
| 11/1993 | 12 | 3 | 15 | 11/1994 | 15 | 3 | 18 |
| 12/1993 | 16 | 5 | 21 | 12/1994 | 18 | 6 | 24 |
| 01/1994 | 14 | 3 | 17 | 01/1995 | 13 | 4 | 17 |
| 02/1994 | 10 | 2 | 12 | 02/1995 | 11 | 0 | 11 |
| 03/1994 | 10 | 1 | 11 | 03/1995 | 9 | 1 | 10 |
| 04/1994 | 13 | 2 | 15 | 04/1995 | 10 | 2 | 12 |
| 05/1994 | 16 | 6 | 22 | 05/1995 | 15 | 6 | 21 |
| 06/1994 | 13 | 5 | 18 | 06/1995 | 14 | 5 | 19 |
| 07/1994 | 11 | 3 | 14 | 07/1995 | 10 | 3 | 13 |
| 08/1994 | 11 | 2 | 13 | 08/1995 | 9 | 2 | 11 |
| **G. Total** | **148** | **35** | **183** | **G. Total** | **145** | **34** | **179** |

CHI square test, $p > 0.05$

P.F. = Plasmodium falciparum; P.V. = Plasmodium vivax

**Table A2.11:Anopheles Density in Long An Province ( man per hour )**

| Method of collection | Location | Anopheles species | Pre-impregnation ( 8/94) | Post -impregnation | |
|---|---|---|---|---|---|
| | | | | 1st round (9/94 - 2/95) | 2rd round (2-7/95) |
| Indoor man bait | Control | An.sundaicus | 0.02 | 0.02 | 0.13 |
| | | An.subpictus | 2.16 | 0.46 | 0.78 |
| | Trial | An.sundaicus | 0.61 | 0 | 0.02 |
| | | An.subpictus | 3.05 | 0.06 | 0.26 |
| Outdoor man bait | Control | An.sundaicus | 0.02 | 0.03 | 0.13 |
| | | An.subpictus | 2.38 | 1.37 | 1.31 |
| | Trial | An.sundaicus | 0.33 | 0.61 | 0.03 |
| | | An.subpictus | 1.86 | 0.96 | 0.36 |
| Daytime indoor resting | Control | An.sundaicus | 0.6 | 0 | 0.3 |
| | | An.subpictus | 27.8 | 0.5 | 12.1 |
| | Trial | An.sundaicus | 3 | 0 | 0.1 |
| | | An.subpictus | 29.4 | 0.9 | 6.6 |
| Around cattle shed | Control | An.sundaicus | 0 | 0 | 0 |
| | | An.subpictus | 37.5 | 13.7 | 32.5 |
| | Trial | An.sundaicus | 0.5 | 0 | 0 |
| | | An.subpictus | 56 | 31.25 | 25.5 |

Note:

After one year using Permethrin impregnated bednets , the Anopheles density is lower than untreated bednets group, particularly in the main vector like *An.sundaicus, An.subpictus*

**Table A2.12 : Anopheles Density in Song Be Province ( man per hour)**

| Method | Location | Aug-94 | Nov-94 | Apr-94 | Jul-95 |
|---|---|---|---|---|---|
| Indoor man | E | 0.4 | 0.23 | 0.14 | 0.05 |
| bait | C | 0.32 | 0.05 | 0.04 | 0.64 |
| Outdoor man | E | 0.55 | 0.4 | 0.14 | 0.1 |
| bait | C | 0.5 | 0.03 | 0.6 | 1.28 |

*Anopheles minimus* density

| Method | Location | Aug-94 | Nov-94 | Apr-94 | Jul-95 |
|---|---|---|---|---|---|
| Indoor man | E | 0.05 | 0.02 | 0.01 | 0.01 |
| bait | C | 0.02 | 0 | 0.09 | 0.23 |
| Outdoor man | E | 0.04 | 0.02 | 0.02 | 0.015 |
| bait | C | 0.07 | 0 | 0.02 | 0.18 |

*Anopheles dirus* density

| Method | Location | Aug-94 | Nov-94 | Apr-94 | Jul-95 |
|---|---|---|---|---|---|
| Indoor man | E | 0.03 | 0.02 | 0 | 0 |
| bait | C | 0.05 | 0 | 0.27 | 0.24 |
| Outdoor man | E | 0.02 | 0 | 0 | 0.01 |
| bait | C | 0.07 | 0.02 | 0.08 | 0.07 |

Note :
*Anopheles* density is lower in Permethrin impregnated bednets when comparing with untreated bednet group, particularly in the main vector borne disease like *An.minimus and An.dirus*. But after impregnation, *Anopheles* species still present with low density and Permethrin impregnated bednets measure doesnot change the components of species of vector also

# APPENDIX 3. COST

**Table A3.1 : Capital Cost of Health Center in Long An Province**

| No | Item | Life of assets | Cost ($) | Exchange rate | Cost (VND) | Iflation | Current cost | Interest | Annual cost |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Building | 20 (86) | | | 25,000,000 | 0.10 | 53,500,000 | 0.10 | 6,079,545 |
| 2 | Medical equipment | | | | | | | | |
| | Microscope | 10 (86) | 1,100 | 1,000 | 1,100,000 | 0.10 | 2,354,000 | 0.10 | 361,375.50 |
| | Tray | 2 (94) | | | 50,000 | | 50,000 | | 26,315.79 |
| | Stethoscope | 2 (94) | 4 | 1050 | 4,200 | | 4,200 | | 2,210.53 |
| 3 | Funiture | | | | | | | | |
| | Chair | 5 (91) | | | 220,000 | 0.10 | 292,600 | 0.10 | 71,365.85 |
| | Writing desk | 5(91) | | | 330,000 | 0.10 | 438,900 | 0.10 | 107,048.78 |
| | Ward robe | 5(91) | | | 220,000 | 0.10 | 292,600 | 0.10 | 71,365.85 |
| | Long chair | 5(91) | | | 110,000 | 0.10 | 146,300 | 0.10 | 35,682.93 |
| | Electric fan | 5(91) | | | 110,000 | 0.10 | 146,300 | 0.10 | 35,682.93 |
| | Bed examination | 5 (91) | | | 220,000 | 0.10 | 292,600 | 0.10 | 71,365.85 |
| | Thermos | 2 (94) | | | 50,000 | | 50,000 | 0.10 | 26,315.79 |
| | Bicycle | 5 (91) | | | 550,000 | 0.10 | 731,500 | 0.10 | 178,414.63 |
| **Total annual capital cost** | | | | | | | | | **7,066,689.43** |

Note:

Calculate the cost

Current cost Cn= Co*(1+I )^n  I : in flation per year; n : n th year

Annual cost : Current cost * r / [1- (1/(1+r))^ n ] ; r : interest rate per year, n : life of asset

Health center in TanTap and Long Huu Dong commune was build in 1986

Calculate the cost in 1994

**Table A3.2 : Capital Cost of Health Center in Song Be Province**

| No | Item | Life of assets | Cost ($) | Exchange rate | Cost (VND) | Iflation | Current cost | Interest | Annual cost |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Building | 20 (90) | | | 36,000,000 | 0.10 | 52,704,000 | 0.10 | 5,955,552 |
| 2 | Medical equipment | | | | | | | | |
| | Microscope | 10 (90) | 1100 | 1020 | 1,122,000 | 0.10 | 1,642,608 | 0.10 | 251,319 |
| | Tray | 2 (94) | | | 50,000 | | 50,000 | 0.10 | 26,316 |
| | Stethoscope | 2 (94) | 4 | 1050 | 4,200 | | 4,200 | 0.10 | 2,210 |
| 3 | Furniture | | | | | | | | |
| | Chair | 5 (90) | | | 200,000 | 0.10 | 292,800 | 0.10 | 71,415 |
| | Writing desk | 5(90) | | | 300,000 | 0.10 | 439,200 | 0.10 | 107,122 |
| | Ward robe | 5(90) | | | 200,000 | 0.10 | 292,800 | 0.10 | 71,415 |
| | Long chair | 5(90) | | | 100,000 | 0.10 | 146,400 | 0.10 | 35,707 |
| | Electric fan | 5(90) | | | 100,000 | 0.10 | 146,400 | 0.10 | 35,707 |
| | Bed examination | 5 (90) | | | 200,000 | 0.10 | 292,800 | 0.10 | 71,415 |
| | Thermos | 2 (94) | | | 50,000 | | 50,000 | 0.10 | 26,316 |
| | Bicycle | 5 (90) | | | 500,000 | 0.10 | 732,000 | 0.10 | 178,537 |
| **Total annual capital cost** | | | | | | | | | **6,833,031** |

Note:

Health center in Thong Nhat and Nghia Trung commune was build in 1990

Calculate the cost in 1994

**Table A3.3 : Cost in Permethrin Treated Bednet Group ( Long An Province)**

| | |
|---|---|
| **Provider cost** | |
| **I. Capital cost** | |
| Microscope | 361,375.5 |
| No of test | 401.0 |
| Price of test | 901.2 |
| Proportion cost used for malaria | 95,525.7 |
| Building and other capital cost | 6,705,314.0 |
| No of visits/ year | 3,081.0 |
| Price of visit | 2,176.3 |
| Proportion cost used for malaria | 230,692.4 |
| Total capital cost | **326,218** |
| **II . Recurrent cost** | |
| Cost of litre Permethrin US$ | 360.0 |
| Exchange rate | 1,050.0 |
| Cost VND | 378,000.0 |
| 1. Cost of Permethrin used for treating bednets | |
| *1.1 Cost of Permethrin* | |
| No of single treated bednets( two rounds) | 258.0 |
| Quantity of Permethrin used for one single bednet | 3.6 |
| Quantity of Permethrin used for total single bednet | 928.8 |
| No of double treated bednets( two rounds) | 818.0 |
| Quantity of Permethrin used for one double bednet | 6.6 |
| Quantity of Permethrin used for total double bednet | 5,398.8 |
| Total Permethrin used for treating bednets | 6,327.6 |
| Cost of Permethrin used for treating bednets | **2,391,833** |
| *1.2 Cost for treating bednets* | |
| No of single treated bednets( two rounds) | 258.0 |
| Price for treating one single bednet | 200.0 |
| Price for treating total single bednets | 51,600.0 |
| No of double treated bednets( two rounds) | 818.0 |
| Price for treating one double bednet | 400.0 |
| Price for treating total double bednets | 327,200.0 |
| Total | **378,800** |
| *1.3 Equipment for treating bednets(Plastic bowls.)* | ***50,000.0*** |
| **Total cost of treating bednets** | **2,820,633** |

(Continue)

| 2. Cost of treatment | |
|---|---|
| *2.1 The drug ( anti- malaria)* | |
| No of adult patient who are diagnosed clinical P.F | 35.0 |
| Price for treating adult patient diagnosed clinical P.F | 466,970.0 |
| No of children patients who are diagnosed clinical P.F | 7.0 |
| Price for treating children patient diagnosed clinical P.F | 46,697.0 |
| No of adult patients who are diagnosed clinical PV | 54.0 |
| Price for treating adult patient diagnosed clinical P.V | 77,220.0 |
| No of children patients who are diagnosed clinical P.V | 10.0 |
| Price for treating children patient diagnosed clinical PV | 7,150.0 |
| Total | **598,037** |
| *2.2 Salary* | |
| No of staffs | 3.0 |
| Salary+ bonus/ person | 400,000.0 |
| Total salary+ bonus of staffs / year | 14,400,000.0 |
| Total patients visits Health center/ year | 3,081.0 |
| Price / visit | 4,673.8 |
| Proportion cost used for malaria | **495,423** |
| *2.3 Maintenance building* | |
| Price for maintenance building one year | 1,200,000.0 |
| Price/visit | 389.5 |
| Proportion cost used for malaria | **41,285** |
| *2.4 Operational cost* | |
| Electricity/year(no telephone, use water from the ground) | 600,000.0 |
| Price/visit | 194.7 |
| Proportion cost used for malaria | **20,643** |
| *2.5 Medical supplies used for diagnosed malaria disease* | |
| (giemsa,oil imersion,needles,lancet,slide,cotton) | |
| No of patients | 106.0 |
| Price/case | 1,000.0 |
| Total | **106,000** |
| Total cost of treatment | 1,261,388 |
| **Total recurrent cost** | **4,082,021** |
| **Total provider cost** | **4,408,239** |

(Continue)

| **Patient cost** | |
|---|---|
| *1. Bednets* | |
| No of single bednets | 129.0 |
| Price / one single bednet | 25,000.0 |
| Price for total single bednet | 3,225,000.0 |
| No of double bednets | 409.0 |
| Price / one double bednet | 50,000.0 |
| Price for total double bednet | 20,450,000.0 |
| Total cost for bednets | 23,675,000.0 |
| Life of nets | 5.0 |
| Price of nets for one year | **5,774,390.0** |
| *2. Drug cost ( non - antimalaria)* | |
| Average price for one case | 6,000 |
| Total cost | **636,000** |
| *3. Income loss due to illness* | |
| Average income loss/day | 10,000 |
| Average days absence from work | 5 |
| Total income loss | **4,450,000** |
| *4. Cost of food (special food due to illness)* | |
| Average monet spent more for food /day | 6,000 |
| Average illness days | 5 |
| Total cost of food | **3,180,000** |
| *5. Income loss of persons who take care of patient* | |
| Average days absence from work due to take care of patients | 3 |
| No of patients need take care | 17 |
| Total income loss | **510,000** |
| Total patient cost | **14,550,390** |

**Table A3.4 : Cost in Untreated Bednet Group ( Long An Province )**

| **Provider cost** | |
|---|---|
| **I. Capital cost** | |
| Microscope | 361,375.5 |
| No of test | 401.0 |
| Price of test | 901.2 |
| Proportion cost used for malaria | 265,854.0 |
| Building and other capital cost | 6,705,314.0 |
| No of visits/ year | 3,081.0 |
| Price of visit | 2,176.3 |
| Proportion cost used for malaria | 642,021.3 |
| Total capital cost | **907,875.3** |
| **II. Recurrent cost** | |
| *2.1 The drug ( anti- malaria)* | |
| No of adult patients who are diagnosed clinical P.F | 109 |
| Price for treating adult patient diagnosed clinical P.F | 1,454,278 |
| No of children patients who are diagnosed clinical P.F | 33 |
| Price for treating children patient diagnosed clinical P.F | 220,143 |
| No of adult patients who are diagnosed clinical P.V | 117 |
| Price for treating adult patient diagnosed clinical P.V | 167,310 |
| No of children patients who are diagnosed clinical P.V | 36 |
| Price for treating children patient diagnosed clinical PV | 25,740 |
| **Total** | **1,867,471** |
| *2.2 Salary* | |
| No of staffs | 3 |
| Salary+ bonus/ person | 400,000 |
| Total salary+bonus of staff/year | 14,400,000 |
| Total patients visits Health center/ year | 3,081 |
| Price / visit | 4,674 |
| Proportion cost used for malaria | **1,378,830** |
| *2.3 Maintenance building* | |
| Price for maintenance building one year | 1,200,000 |
| Price/visit | 389 |
| Proportion cost used for malaria | **114,898** |
| *2.4 Operational cost* | |
| Electricity/year(no telephone, use water from the ground) | 600,000 |
| Price/visit | 195 |
| Proportion cost used for malaria | **57,449** |
| | |
| | |

(Continue)

| | |
|---|---|
| *2.5 Medical supplies used for diagnosed malaria disease* | |
| (giemsa,oil imersion,needles,lancet,slide,cotton) | |
| No of patients | 295 |
| Price/case | 1,000 |
| Total | 295,000 |
| **Total recurrent cost** | **3,713,648** |
| **Total provider cost** | **4,621,523** |

| | |
|---|---|
| **Patient cost** | |
| *1. Bednets* | |
| No of single bednets | 180 |
| Price / one single bednet | 25,000 |
| Price for total single bednet | 4,500,000 |
| No of double bednets | 400 |
| Price / one double bednet | 50,000 |
| Price for total double bednet | 20,000,000 |
| Total cost for bednets | 24,500,000 |
| Life of nets | 5 |
| Price of nets for one year | **5,975,610** |
| *2. Drug cost ( non - antimalaria)* | |
| Average price for one case | 6,000 |
| Total cost | **1,770,000** |
| *3. Income loss due to illness* | |
| Average income loss/day | 10,000 |
| Average days absence from work | 5 |
| Total income loss | **11,300,000** |
| *4. Cost of food (special food due to illness)* | |
| Average money spent more for food /day | 6,000 |
| Average illness days | 5 |
| Total cost of food | **8,850,000** |
| *5. Income loss of persons who take care of patient* | |
| Average days absence from work due to take care of patients | 3 |
| No of patients need take care | 69 |
| Total income loss | **2,070,000** |
| **Total patient cost** | **29,965,610** |

**Table A3.5 : Cost in Permethrin Treated Bednet Group ( Song Be Province)**

| **Provider cost** | |
|---|---|
| **I. Capital cost** | |
| Microscope | 251,319 |
| No of tests | 473 |
| Price of test | 531 |
| Proportion cost used for malaria | 65,313 |
| Building and other capital cost | 6,581,715 |
| No of visits/ year | 3,355 |
| Price of visit | 1,961.7 |
| Proportion cost used for malaria | 241,297 |
| Total capital cost | **306,610** |
| **II . Recurrent cost** | |
| Cost of litre Permethrin US$ | 360 |
| Exchange rate | 1,050 |
| Cost VND | 378,000 |
| 1. Cost of Permethrin used for treating bednets | |
| *1.1 Cost of Permethrin* | |
| No of single treated bednets( two rounds) | 260.0 |
| Quantity of Permethrin used for one single bednet | 3.6 |
| Quantity of Permethrin used for total single bednets | 936.0 |
| No of double treated bednets( two rounds) | 820.0 |
| Quantity of Permethrin used for one double bednet | 6.6 |
| Quantity of Permethrin used for total double bednets | 5,412.0 |
| Total Permethrin used for treating bednets | 6,348.0 |
| Cost of Permethrin used for treating bednets | 2,399,544 |
| *1.2 Cost for treating bednets* | |
| No of single treated bednets( two rounds) | 260 |
| Price for treating one single bednet | 200 |
| Price for treating total single bednets | 52,000 |
| No of double treated bednets( two rounds) | 820 |
| Price for treating one double bednet | 400 |
| Price for treating total double bednets | 328,000 |
| Total | 380,000 |
| *1.3 Equipment for treating bednets(Plastic bowls.)* | 50,000 |
| **Total cost of treating bednets** | **2,829,544** |

(Continue)

| | |
|---|---|
| 2. Cost of treatment | |
| *2.1 The drug ( anti- malaria)* | |
| No of adult patients who are diagnosed clinical P.F | 61 |
| Price for treating adult patients diagnosed clinical P.F | 813,862 |
| No of children patient who are diagnosed clinical P.F | 12 |
| Price for treating children patients diagnosed clinical P.F | 80,052 |
| No of adult patient who are diagnosed clinical P.V | 41 |
| Price for treating adult patients diagnosed clinical P.V | 58,630 |
| No of children patients who are diagnosed clinical P.V | 9 |
| Price for treating children patients diagnosed clinical PV | 6,435 |
| Total | **958,979** |
| *2.2 Salary* | |
| No of staffs | 3 |
| Salary+ bonus/ person | 40,000 |
| Total salary+ bonus of staffs / year | 14,400,000 |
| Total patients visits Health center/ year | 3,355 |
| Price / visit | 4,292 |
| Proportion cost used for malaria | **527,928** |
| *2.3 Maintenance building* | |
| Price for maintenance building one year | 1,200,000 |
| Price/visit | 358 |
| Proportion cost used for malaria | **43,994** |
| *2.4 Operational cost* | |
| Electricity/year(no telephone, use water from the ground) | 600,000 |
| Price/visit | 178.8 |
| Proportion cost used for malaria | **21,997** |
| *2.5 Medical supplies used for diagnosed malaria disease* | |
| (giemsa,oil imersion,needles,lancet,slide,cotton) | |
| No of patients | 123 |
| Price/case | 1,000 |
| Total | 123,000 |
| Total cost of treatment | 1,675,899 |
| **Total recurrent cost** | **4,505,443** |
| **Total provider cost** | **4,812,053** |

(Continue)

| **Patient cost** | |
|---|---|
| *1. Bednets* | |
| No of single bednets | 130 |
| Price / one single bednet | 25,000 |
| Price for total single bednet | 3,250,000 |
| No of double bednets | 410 |
| Price / one double bednet | 50,000 |
| Price for total double bednet | 20,500,000 |
| Total cost for bednets | 23,750,000 |
| Life of nets | 5 |
| Price of nets for one year | **5,792,683** |
| *2. Drug cost ( non - antimalaria)* | |
| Average price for one case | 6,000 |
| Total cost | **738,000** |
| *3. Income loss due to illness* | |
| Average income loss/day | 10,000 |
| Average days absence from work | 5 |
| Total income loss | **5,100,000** |
| *4. Cost of food (special food due to illness)* | |
| Average money spent more for food /day | 6,000 |
| Average illness days | 5 |
| Total cost of food | **3,690,000** |
| *5. Income loss of persons who take care of patients* | |
| Average days absence from work due to take care of patients | 3 |
| No of patient need take care | 21 |
| Total income loss | **630,000** |
| **Total patient cost** | **15,950,683** |

**Table A3.6 : Cost in Untreated Bednet Group ( Song Be Province)**

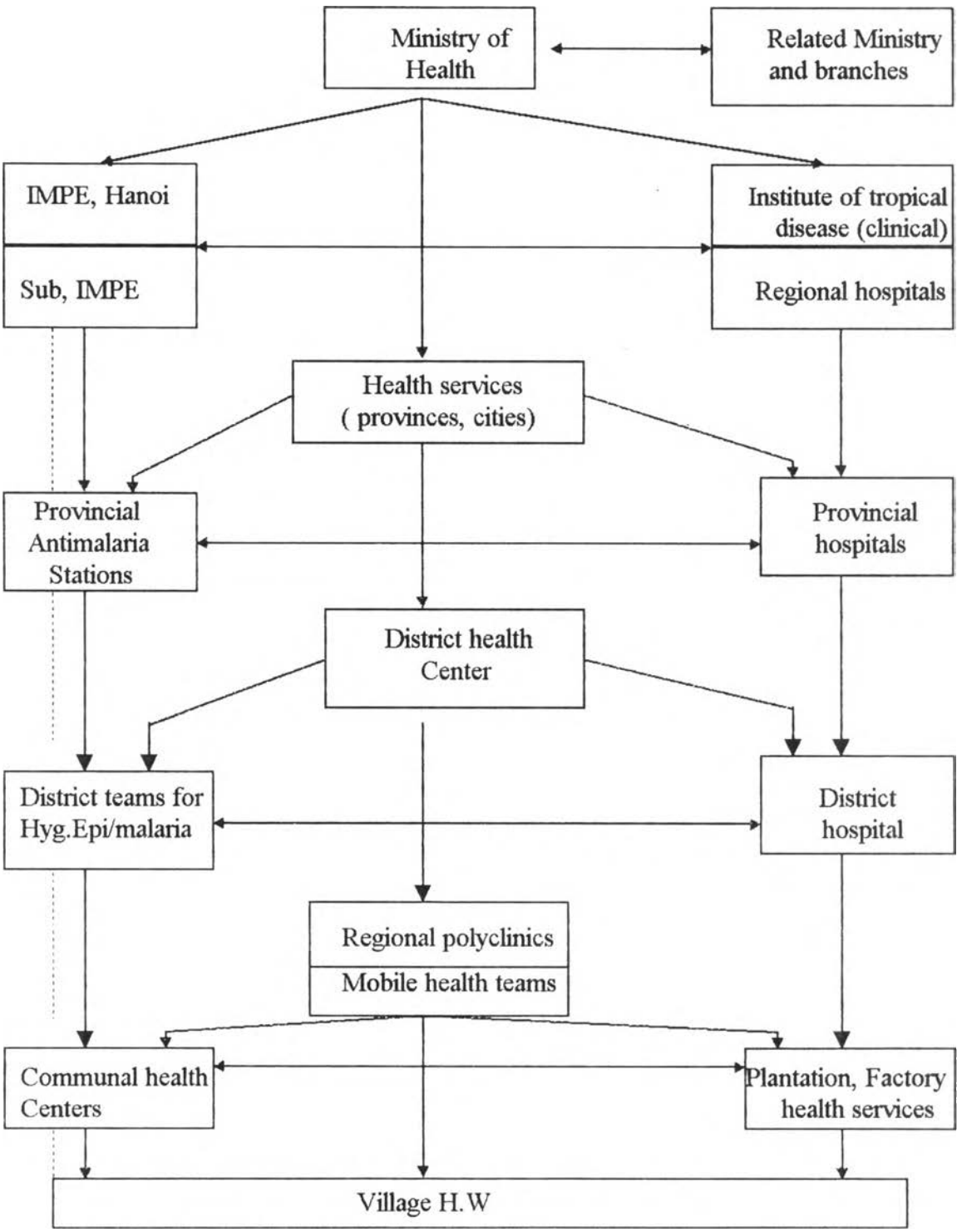
| **Provider cost** | |
|---|---|
| **I. Capital cost** | |
| Microscope | 251,319 |
| No of tests | 473 |
| Price of test | 531 |
| Proportion cost used for malaria | 185,850 |
| Building and other capital cost | 6,581,715 |
| No of visits/ year | 3,355 |
| Price of visit | 1,961.7 |
| Proportion cost used for malaria | 686,595 |
| Total capital cost | **872,445** |
| **II. Recurrent cost** | |
| *2.1 The drug ( anti- malaria)* | |
| No of adult patients who are diagnosed clinical P.F | 205 |
| Price for treating adult patient diagnosed clinical P.F | 2,735,110 |
| No of children patients who are diagnosed clinical P.F | 75 |
| Price for treating children patient diagnosed clinical P.F | 500,325 |
| No of adult patients who are diagnosed clinical PV | 53 |
| Price for treating adult patient diagnosed clinical P.V | 75,790 |
| No of children patients who are diagnosed clinical P.V | 17 |
| Price for treating children patient diagnosed clinical PV | 12,155 |
| **Total** | **3,323,380** |
| *2.2 Salary* | |
| No of staffs | 3 |
| Salary+ bonus/ person | 400,000 |
| Total salary+bonus of staff/year | 14,400,000 |
| Total patients visits Health center/ year | 3,355 |
| Price / visit | 4,292 |
| Proportion cost used for malaria | **1,502,235** |
| *2.3 Maintenance building* | |
| Price for maintenance building one year | 1,200,000 |
| Price/visit | 358 |
| Proportion cost used for malaria | **125,186** |
| *2.4 Operational cost* | |
| Electricity/year(no telephone, use water from the ground) | 600,000 |
| Price/visit | 178.8 |
| Proportion cost used for malaria | **62,593** |

(Continue)

| | |
|---|---|
| *2.5 Medical supplies used for diagnosed malaria disease* | |
| (giemsa,oil imersion,needles,lancet,slide,cotton) | |
| No of patients | 350 |
| Price/case | 1,000 |
| Total | **350,000** |
| **Total recurrent cost** | **5,363,395** |
| **Total provider cost** | **6,235,840** |

| **Patient cost** | |
|---|---|
| *1. Bednets* | |
| No of single bednets | 180 |
| Price / one single bednet | 25,000 |
| Price for total single bednets | 4,500,000 |
| No of double bednets | 395 |
| Price / one double bednet | 50,000 |
| Price for total double bednets | 19,750,000 |
| Total cost for bednets | 24,250,000 |
| Life of nets | 5 |
| Price of nets for one year | **5,914,634** |
| *2. Drug cost ( non - antimalaria)* | |
| Average price for one case | 6,000 |
| Total cost | **2,100,000** |
| *3. Income loss due to illness* | |
| Average income loss/day | 10,000 |
| Average days absence from work | 5 |
| Total income loss | **12,900,000** |
| *4. Cost of food (special food due to illness)* | |
| Average monet spent more for food /day | 6,000 |
| Average illness days | 5 |
| Total cost of food | **10,500,000** |
| *5. Income loss of persons who take care of patient* | |
| Average days absence from work due to take care of patients | 3 |
| No of patients need take care | 92 |
| Total income loss | **2,760,000** |
| **Total patient cost** | **34,174,634** |

## APPENDIX 4. MALARIA SERVICES NETWORK IN VIETNAM (1998)




Source : Institute of Malariology in Hanoi, 1998
Note : IMPE : Institute of Malariology, Parasitology and Entomology; H.W : Health worker

## APPENDIX 5 . CHARACTERISTIC OF MOSQUITOES IN VIETNAM

*Definition*

- The relative tendency of mosquitoes to feed indoor is known as endophagy, the opposite tendency is exophagy
- While the relative tendency of mosquitoes to rest indoor is known as endophily, the opposite tendency to shrun enclosed space whether by day or by night is termed exophily

*Characteristics of Mosquitoes in Viet Nam*

- Main vector: *An.minimus*, *An.dirus*, *An.sundaicus* : prefer biting human than animal

*Anopheles sundaicus :*

The biting time of Anopheles .sundaicus is the nightime ( especially from 22 PM to 2 AM. However this species can bite in the daytime in the begining of the rainy season ( in dark days). This species feed indoor and outdoor. In the previous years, this species often rest indoor in the day time, but now they rest indoor and outdoor also.This species prefer biting human than animal

*Anopheles dirus* :

Feed mainly outdoor (exophagy), and rest outdoor (exophily). The biting time of Anopheles .dirus is the nightime ( especially from 18 PM to 22 PM ). This species feed mainly outdoor (6 times higher than in outdoor ) This species often rest outdoor and this species prefer biting human to animal

*Anopheles minimus* :

The biting time of Anopheles .minimus is the nightime(especially from 21 PM to 2 AM). This species feed outdoor and indoor and this species often rest outdoor and indoor also. This species prefer biting human and animal

- Change of density during year

*Anopheles minimus* : highest at the begining and at the end of rainy season

*Anopheles dirus* : highest in the middle of the rainy season

*Anopheles sundaicus* : highest at the begining of the rainy season

## APPENDIX 6. CASE DEFINITION

*VietNam* :

- *If having the blood examination, based on two criteria :*

  Finding asexual forms of Plasmodium in the blood

  Fever : Armpit temperature above 37.5$^{o}$C and /or patients or the patient's relative said that the patients get fever within recent 3 days.

- *If donot have the blood examination, based on 3 criteria* :

  Fever ( like above) : the regular paroxysm of fever or fever with shaking, sweating or fever with anaemia

  Living or presenting in malarious areas within recent 6 months

  Cannot find any factors that explain the cause of fever

*WHO* :

Malaria case, in a malaria eradication program, is defined as a person in whom, regardless of the presence or absence of clinical symtoms, the occurrence of malaria parasite in the blood has been confirmed by microscopic examination

## APPENDIX 7. BIOASSAY ( WHO TECHNIQUE)

Let mosquitoes contact with Permethrin treated paper for 1hour, after that calculate the number of death mosquitoes within 24 hours. If the rate of dead mosquito > 98 %: mosquitoes are sensitive to Permethrin. If the rate of dead mosquito from 80 – 98 %: mosquitoes increase their tolerance. If the rate of dead mosquito below 80% : mosquitoes are resistant to Permethrin