

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

On the basis of empirical findings and research experience gained from this study, conclusions and recommendations are provided in this chapter. The conclusions of this study are as follows :

1. The most of costs for vector control measures in South-east Sulawesi are derived from National Development Budget, Government of Indonesia. During 1988-1994, foreign aid only contributed 29.55% of the total costs of vector control measures. The average cost of vector control measures each year is 74.77% of the total cost of malaria control programme. Among 95.85% of recurrent cost, there is 32.59% for personnel.
2. The baseline data of malaria vectors from three areas of study shows that there is a significant negative correlation between proportion of indoor resting and outdoor human-bite density for *An. subpictus* ($r = -0.966$ and $p < 0.05$) as well as *An. barbirostris* ($r = -0.988$ and $p < 0.01$). While *An. flavirostris* has no significant correlation ($r = -0.590$ and $p < 0.10$). Change in resting behavior of vectors are difficult to justify, but at least the vectors began to avoid contact with insecticide on the wall surface after several years application of IRS which is approximated since 1978 when the PR rose again. More studies are still needed to justify this interpretation.
3. Vector control measures by indoor residual spraying in South-east Sulawesi have been began since 1973. Parasite rates have reduced from 40.03% (1972) to 6.14% (1977), but since 1978 PR increased again and became fluctuating. Obviously, the PR of 2% was attained in 1986 after 13 years of indoor residual spraying applications. The effect of IRS in the reduction of PR is slightly small (slope = -0.0447 and t -value = -0.8914) and it is no significant effect ($p < 0.10$). It seems that the effectiveness of VCM by IRS is low.
4. The effectiveness and efficiency of IRS before 1978 seems higher compared to after 1978 due to change in resting behavior of vectors. But statistically, there were no significantly different in effectiveness and efficiency between IRS before and after 1978 ($t = -0.9944$ and -1.1732 respectively; $p < 0.05$).
5. The reduction of PR in South-east Sulawesi does not mean the outcome of VCM by IRS in the MCP alone, but also the effect of changes in socio-economic development environments, such as per capita income (slope = -2.169^{-4} ; $p < 0.01$).

6. When the contribution of VCM by IRS only has a little effect (5.64%) in the reduction of PR, the application of IRS becomes wasted, then the alternative methods of VCM should be identified. A possible alternative method which could save the wasted cost of IRS is illustrated with the equation model below :

$$PR_t = f (\text{Larviciding}_{\text{bll,t}}, \text{Surveillance}_t)$$

Larviciding by using *B. thuringiensis* would be used instead of IRS, and supporting by surveillance such as case finding and prompt treatment and entomological survey.

7. There is not enough evidence to generate an alternative source of financing. However, community participation in environmental management seems potential as an alternative resource of financing,

Based on the conclusions above, the following recommendations which can be used in the application of VCM in South-east Sulawesi :

1. Other methods of VCM should be considered for the priority areas which have been sprayed five or more times. The decision to undertake an indoor residual spraying by insecticide should be made only where it is operationally feasible and fully justified by relevant epidemiological information. Entomological expertise is required for the decision whether or not to use indoor residual spraying.
2. When it has been decided to shift IRS to other methods, an alternative method which more cost saving should be used i.e. the application of larviciding by *B. thuringiensis* which is supported by surveillance such as case finding and prompt treatment, and monitoring of vector (entomological survey). Environmental management can be applied if feasible, while impregnated bed-nets can be applied for the endemic area (non-priority) with no historical of IRS application. However, IRS should still be used for the new transmigration areas if the entomological information supports this decision.
3. Since the malaria control programme has fully integrated in the general health services, community participation should be encouraged to react in the environmental management, as well as private sector to involve in the VCM. An example of other possible sources of financing to be envisaged is a "vector control tax" system.

4. The effectiveness and efficiency problems of IRS due to change resting behavior of vector still need more data for fully justified inference. Further studies should include more information on entomological evaluation of IRS, the epidemiological consequences of IRS and other VCM activities such as impregnated bed-net, larviciding, larvivorous fish, source reduction and environmental management and also the on community knowledge, perception and behavior of malaria.