CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

According to the estimations of spatial distribution of the potential soil loss and their equivalent costs of losses of the NPK nutrients, findings in this study were already made in the following.

The results indicated that the estimated soil loss using USLE, SLEMSA and MMF models fallen within the range from less than 1 to 247.19, from 1 to 71.98 and from 1 to 131.09 ton ha $^{-1}$ year $^{-1}$, respectively.

The overall trend of soil loss distribution estimated by three models was quite different. About 66% of the total area was estimated to yield soil loss less than 10 ton ha^{-1} year^{-1} by USLE model while about 80% of the total area was estimated by SLEMSA model to have this level of soil loss. However, about 0.16% of total area was estimated to have the above rate of soil loss. Most area was estimated by MMF model to have soil loss at the rate of higher than 10 ton ha^{-1} year^{-1}.

Comparing soil loss estimation from three models with the observed one. The USLE model was slightly overestimated at three sites with the RMSE were at 3.62 ton ha $^{-1}$ year $^{-1}$ (8.40 percent) while SLEMSA and MMF models were underestimated soil loss with RMSEs of 9.89 and 6.73 ton ha $^{-1}$ year $^{-1}$respectively (22.95 and 15.61 percent). Thus, USLE model is the most suitable for estimating soil loss in this area.

About 37.13 percent of total areas need to have long-term conservation practices in the study area to reduce high soil loss rate, which is currently greater than 10 ton ha $^{-1}$ year $^{-1}$. This area will be reduced to about 4.6 percent if the tied ridging technique is applied or it will be declined to 2.3 percent if the terracing technique is applied.

The loss of nitrogen (N), phosphorous (P) and potassium (K) were estimated using the replacement cost technique. Nitrogen loss was the highest loss (about 425 tons) followed by phosphorus (about 132 tons) and potassium (about 91 tons). The total cost of losses of NPK was estimated to be about 3,033.02 millions Vnd year $^{-1}$ or US $ 153,808.29 year $^{-1}$.

GIS technology is a very powerful tool to assess the erosion situation because a huge set of dataset can be easily digitized and stored in a well-structured database, and spatial data analysis are conveniently implemented to monitor soil erosion status.

6.2 Recommendations

The integrated GIS-USLE model established in this study can be used as a useful tool for land conservation planners and soil conservationists to monitor and update continuing soil erosion status temporally and spatially in the study area. The process of monitoring can be facilitated through the use of GIS-USLE model in the evaluation of a wide range of land management considerations or alternatives in relation to soil loss and losses of nutrients. Particularly, the model can be used to evaluate soil conservation techniques that will be applied in the study area. This evaluation can be done by re-running model throughout adjustment of the C or P value for a target area or the entire area to assess the effect of complementing contouring or terracing techniques on the potential soil erosion rate and losses of nutrients. The effect of clearing the forested stands can be also conveniently evaluated using this model.

Besides, it can be applied to identify vulnerable areas to erosion and indicates where soil conservation practices urgently need to be implemented to reduce soil loss at high level.