# CHAPTER VI

# CONCLUSION AND RECOMMENDATION

## 6.1 Conclusion

The land suitability assessment involves a complex process and usually requires a more comprehensive framework to arrive at the optimal solution. Land suitability assessment based on crop and environmental parameters were completed in Nam Dong district, Thua Thien Hue province, Vietnam by using multi-criteria evaluation techniques. GIS technique facilitated spatial analysis to achieve optimum utilization of the available land resources for sustainable agricultural production was used following the framework of FAO (1976) land evaluation method.

The assigned area is pixel (with the resolution of 30x30 meter) in the selected study site. Eight parameters for crop suitability (mean of annual temperature, mean of annual precipitation, soil depth, soil drainage, cation exchange capacity, pH, organic matter, and slope) and five parameters for environmental suitability (rainfall erovisity, soil erodibility, topography, land cover management and conservation practice) were considered and suitability analysis was carried out by fuzzy membership classification.

The results were obtained by using MCDM techniques which provide useful guidance for selecting optimum cropping patterns based on weighting factors for the relative importance of crops and environmental sustainability and local people's perceptions.

Fuzzy membership approach allows consideration of partial memberships to obviate the limitations of classical classification methods. GIS approach allows consideration of the spatial variability of relevant terrain and other parameters. The merit of the combination of these two approaches is found to be advantageous for delineating areas of various suitability ratings to a given crop more accurately. So measures could be taken to grow the crops best suited for a given area and also to improve the areas to suit a desired crop.

The geoprocessing models were built to execute the sequence command with short time consuming and without human error to get the physical suitability of each crop and relative suitability of eleven crops in the study area.

Once the model was built, long and complex steps of spatial analysis could be processed and easily updated on any parameters or functions in the model diagram. The manual operation of "Raster Calculator in Spatial Analysis" was time consuming and mistakes could occur because of many steps have to be carried out separately. However, in the model builder, once the model was built, it could be used for all factors with only change of input parameters and set of necessary values to obtain the results without human errors after the model has been validated.

The parameters of the model and also the weighting factors can be changed based on the different stakeholders. Scenario analysis can be done by changing the criterion maps to obtain variation of outputs or model responses resulting from the uncertainty in the input factors, either individually or in combination. The task performed by changing those factors can be easily accomplished in the model to satisfy the human need such as for food security or for commercial production or for land conservation.

The model produced land suitability maps for banana, bean, cassava, citrus, irrigated-rice, maize, pineapple, rubber, sugarcane, sweet-potato, and upland-rice. Subsequently, the results were used for the crop relative suitability assessment that allocates the crop with highest suitability index for a given unit of land represented by a pixel in the grid.

The relative physical suitability results showed that the total 20745.72 ha of arable land in the study area were suitable for ten crops which was banana, bean, cassava, irrigated-rice, maize, pineapple, rubber, sugarcane, sweet-potato and rainfed upland rice. The highest percentage (30.9%) suitable area was rubber, the second and the third one was bean and pineapple with its percentage of suitability is 22.6% and 20%, the suitable area following was sugarcane, cassava, maize and banana, irrigated-rice and upland rice with its proportion of 11.46 %, 10%, 4.53%, 0.29%, 0.002% and 0.001%, respectively.

The comparison of relative crop suitability and the existing land use in the study area in year 2005 was conducted. Subsequently, the error matrix of existing land use in 2005 and relative crop suitability have done. The results showed that 2,526.57 ha of ten crops (banana, bean, cassava, irrigated-rice, maize, pineapple, rubber, sugarcane, sweet-potato and rainfed upland rice) should continue growing. While 18,219.15 ha may be better allocated to other crops was suggested.

### 6.2 Recommendation

Since this study was focused on physical suitability of the eleven crops, further research should be conducted to address issues such as the involving other land characteristics (such as the elevation, stone and rock, etc.). Socio-economic variables such as available agriculture labor force, spatial variables such as accessibility and distance from urban areas (travel cost of workers) and industrial areas (transportation cost of the products) should be incorporated. It should also look at the maximization of profit for the producer, along with the land preservation.

Each geoprocessing model was built based on a single function. Further study should build the geoprocessing model based on multiple functions for land suitability assessment.