

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The Analytical Hierarchy Process (AHP) technique coupled with GIS/RS environment was found to be a unique tool for better land suitability studies. The technique was used for land suitability study in Hooghly District, West Bengal, India for existing crops such as: rice, potato, jute and lentil etc. The cropping area was selected through remote sensing based NDVI analysis (agricultural area >0.2 NDVI value) for an area covering nearly 300ha. Soil nutrient based land suitability analysis was carried out using randomly selected fifty plot based soil samples for three soil morphological layers (top 0-15cm, shallow 15-30cm and deep 30-45cm layers).

The pairwise comparison matrix based ranking using AHP technique was carried out considering the importance of each parameter for studying crop suitability for the study area in GIS software environment. The total area, being under major rice and potato belt, could be classified from the suitability view point on top layer to 'highly suitable' class occupying 29.2%, 'moderately suitable' class 15.1%, 'marginal suitable' class 51.2% and 'not suitable' class 4.5%. The area classified as not suitable can be utilized for alternative crops for jute. Based on rice yield, nearly 76.2% area were found producing medium level of yield of 4-5 tons/ha. Based on shallow layer, 'highly suitable(S₁)' classed is reduced to 9.6% from 29.2% (top layer) class, 'not suitable' (N) class reached nearly 17.1% area. Suitability based on deep soil layer followed the pattern of shallow layer for rice crop.

Potato crop is highest production in the study area all over the district during the *Rabi* season. The suitability analysis based on soil top layer showed near 88.6% area is suitable (S₁ and S₂ classes) for growing potato. It is further confirmed by potato yield distribution map, identifying 90% of the farm area giving sound potato production. Base on soil shallow layer suitability analysis, it is found that 15.1%, 44.0% , 39.9% , and 1.0% of lands are under S₁, S₂, S₃, and N suitability classes, respectively. Though deep layer soil nutrient not contribute to potato crop, the layer showed nearly 81% of farm area suitable (S₁ and S₂ classes) for the crop.

Suitability view point for jute (deep rooted) crop, based on soil top layer, the majority of the area (nearly 90%) found medium suitable (S_2 and S_3) for the crop; based on soil shallow layer nearly 10% area found 'not suitable' class for the crop; and also found nearly similar trend of suitability based on deep soil layer for the crop. Similar to jute crop, the lentil suitability analysis showed, nearly 84.6% area found medium suitable (S_2 and S_3) for the crop in soil top layer analysis; nearly 18.5% area found not suitable for the crop in soil shallow layer analysis; nearly 15.8% area found 'highly suitable' for the crop in soil deep layer analysis.

For best crop rotation selection, nearly 25% area under 'not suitable' class for rice may be allotted for to jute crop as an alternative with better return to the farmers in the *kharif* season. Similarly, for best crop rotation in *rabi* season, nearly 8% area under 'not suitable' class for potato crop may be allotted for to lentil crop as an alternative with better return to the farmers. Thus, for better management and overall agricultural development of the area, *kharif* and *rabi* crop cultivation can be optimized using modern land suitability techniques based on AHP in GIS/RS software environment.

6.2 Future Recommendations

The following recommendations is suggested for the future study and also for the success of land suitability based sustainable agriculture system.

- Study may be carried out for 4-5 seasons to determine the best crop rotation for long term and multi-year cropland dynamics after implementing the findings at the end of each season.
- Ranking of parameters with level of influence may include all important crops to select the best alternative for individual landholding.
- The study may include new techniques for land suitability analysis such as integration of Fuzzy-logic quantifier, AHP- WLC, ANN/GA, Bayesian Networks /SLM etc.
- The study may include more number of factors such as: topography, climate, irrigation facilities and socio-economic estimation etc which may influence the sustainable use of the large scale land.

- Frequent soil sampling and testing need to be carried out to find the soil nutrient level variation, as initiated by Government of India with Soil Health Card scheme etc. for selecting the best crop rotations and other management practices and ensuring better income to the farmers.
- The study may be extended to the surrounding areas, the region and the whole country.