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Land Evaluation for Suitable Cropland Areas Using a GIS Based Analytical Hierarchy Process Technique

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INTRODUCTION: Nowaday, the population of the planet is growing dramatically. In order to meet the increasing demand for the food the farming community has to produce more and more. Land Suitability analysis is needed for various purposes in the context of present day agriculture. The present popular methods that are followed for land suitability analysis include ranking and rating, weighted summation, requirement matching etc. Here the weights are arbitrarily chosen, and are sggregated using simple Boolean overlay methods. Although these methods are simple and strayghtforward they lack solid mathematical foundations. Ceballos - Silva and Lepoz -Blanco (2003), used matrix pair wise comparison for land suitability. This method overcomes the problem of determinig the weights. Analytical Hierarchy Process is a widely used method in decision-making. AHP is introduced by Saaty (1977), with the basic assumption that comparison of two elements is derived from their relative importance.GIS is the tool for input, storage and retrival, manipulation and analysis, and output of spatial data.

MATERIALS AND METHODS:

Data preparation is the first fundamental step in land suitability analysis. Our methodology is based on GIS analysis. In our methodology, land suitability is evaluated by applying different GIS analytical techniques, including interpolation and overlay based on multi-criteria analysis and AHP.

- *Selecting of criteria*

The set of criteria selected should adequately represent the decision-making environment and contribute towards the final goal (Prakash 2003).In this study criteria were selected using the literature reviews of internal and external references, interviewing with experts (questionnaires) and availability of data

- *Hierarchical Organisation of the Criteria*

Provide a hierarchical structure to affect criteria Such that higher-level criteria break to lower-level descriptions

- *Standardization of the Criteria Map and Weighing of criteria*

The process of setting the relative importance of each criterion is known as the standardisation of criteria (Prakash 2003). In this process scales of 0 to 1, 0 to 10 or 0 to 100 (etc.) are normally used for criteria standardisation. For determining the relative importance of criteria the pair-wise comparison matrix using Saaty's nine-point weighing scale were applied. Deriving weights for the selected map criteria (land characteristics map layers) is a fundamental requirement for applying the AHP method

- *Overlying*

After weighing of criteria regarding their importance for land suitability analysis, all criteria maps were overlaid using suitability index. Weighted overlay is a technique for applying a common scale of values to diverse and dissimilar input data to create an integrated analysis.

RESULTS AND DISCUSSION: This study emphasized the analytic hierarchy process to evaluate of effective criteria in dealing with crop cultivation. GIS-based models using analytic hierarchy process so simple and flexible that any number of criteria can be used to solve a problem. Therefore, the use of multi-criteria decision method in combination with GIS can be a powerful tool for decision making on environmental issues, the analysis of land use and Find suitable areas for cultivation. Analytical Hierarchy Process could lead increase public participation in decision making for land evaluation. Future research could test the efficiency of this method. Proposed model for the selection of fertile lands for growing a

crop can be generalized to different areas of land. Also according to the characteristics of each region can revise criteria or enter other criteria to issue

Keywords: analytical hierarchy process; land suitability evaluation

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