Application of Multi Criteria Decision Making (MCDM) and Geographical Information System (GIS) on The Cultivated Land Use Evaluation

(Case Study: The Upper Stream of Ciliwung Watershed, Bogor District, West Java)

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Abstract

Regarding land use planning of Bogor-Puncak-Cianjur (BOPUNJUR) region, Presidential Decree (KEPPRES No. 114/1999) explains the area is defined to have 2 main functions i.e. protected area and cultivated area. Land use evaluation should be done to assess land resources potential for every utilization. The cultivated area comprise with paddy field, dry land, tea plantation and settlement. MCDM and GIS is a powerful combination tools to analyze the land use evaluation in spatial decision-making process, effectively and efficiently. The study site is a part of Bogor-Puncak-Cianjur (BOPUNJUR) region. The study site is located in the upper stream of Ciliwung watershed, Bogor District of West Java comprising Ciawi, Megamendung and Cisarua sub-districts. The objectives of this study are: (1). To develop land suitability models for paddy field and dry land based on different distance parameter, (2) To determine the optimal model of land suitability for paddy field and dry land. Several physical factors (elevation, slope, drainage, land use) were used as evaluation criteria in this study. A combination of Compromise Programming (CP) of MCDM techniques and GIS was implemented as the main methodology to evaluate land suitability for cultivated area. By using Pairwise Comparison of Analytic Hierarchy Process (AHP) techniques, value and weight assessment of physical factors was determined. The CP analysis for the three strategic values of p = 1, 2 and ∞ (e.g. p=10) was used to derived land suitability models of paddy field and dry land. The models were compared with the existing land use, and the optimal models were grasped. The optimal models of paddy field and dry land were obtained for distance parameter p = 1 because it had the biggest area of existing land use that suitable with land use evaluation results. The existing land use of the optimal models comprise with suitable area for paddy field (58%) and for dry land (56%). Reccomended strategies can be applied through Land Rehabilitation by Incentive System and re-evaluation land use policies. Unsuitable area in cultivated area should be conducted by advanced analysis in order to determine the other cultivation activities.

Key words: *Analytic Hierarchy Process (AHP), Compromise Programming, Cultivated Area, GIS and Remote Sensing, Land Use Evaluation.*

INTRODUCTION

Ciliwung watershed that empties it self into Jakarta Bay extends as long as 117 km and covers an area of about 347 km^2. Twenty years ago natural damage started occur from the upper stream to the lower of Ciliwung watershed. In the upper stream of Ciliwung watershed especially in Ciawi and Cisarua sub-districts, which are conservation areas, land ownership of 2,200 ha had changed within 10 years (1985 – 1995) (Harijono, 2002).

Furthermore, a changing land use in the BOPUNJUR region happened within a decade (1983-1993) converting greenery open space into built areas constituting