Planning of Access Road Using Satellite Technology and Best Path Modeling

ABSTRACT

Forest road construction for harvest operation are always been subjected to certain constrictions and limitations. Engineering practices on forest road alignment are hindered by costly environmental and operational assessment. GIS tools and related data such as remote sensing allows in allocating suitable access road by taking consideration of environmental and cost implication. The aim of this study is to present the method of integration of remote sensing data and GIS in allocating access road for forest harvesting using best path modeling. Therefore, the specific objectives of this study are to allocate the optimal forest roads network in forest operation, and to determine the density of forest road network. Allocating the best paths for forest road access for timber harvesting is a problem that can be solved by computer based approaches using spatial modeling. Spatial modeling is used to compute the indicative factors that suit road allocation. The model developed and designed using GIS to propose feasibility forest road allocation in the hill area. The method was designed to produce road layouts taking topographical features and forest environmental constraints into special consideration. In this study, four grid themes influencing the road construction were identified; elevation, slope, barrier of lake and distance to existing roads. The total of access road aligned and proposed in the respective area was 28,745.35m. Meanwhile the overall density calculated in selected compartments was about 9.93m/ha (0.80%). The densities of road paths presented here were achieved below as outlined by the forestry department. Thus, there is potential to reduce damage to the residual stand and to the ground area disturbance by the harvesting operation. The forest road alignment and information in this study provides an initial foundation on which GIS can be used for this kind of analysis in forest road planning. The result is not only associated with forest transportation, but at the same time is useful to identify a risk of road construction to the environment. This revealed that the minimum density of forest road construction can help mitigate the loss of ecological services of tropical forest subject to logging pressure and lead to greater financial benefit in future operations.

Keyword: Forest road allocation, Hill tropical forest, Remote sensing, GIS, Best path modeling