A comparative assessment of prediction capabilities of modified analytical hierarchy process (M-AHP) and Mamdani fuzzy logic models using Netcad-GIS for forest fire susceptibility mapping

ABSTRACT

The main purpose of this study is to assess forest fire susceptibility maps (FFSMs) and their performances comparison using modified analytical hierarchy process (M-AHP) and Mamdani fuzzy logic (MFL) models in a geographic information system (GIS) environment. This study was carried out in the Minudasht Forests, Golestan Province, Iran, and was conducted in three main stages such as spatial data construction, forest fire modelling using M-AHP and MFL, and validation of constructed models using receiver operating characteristic (ROC) curve. At first, seven conditioning factors, such as altitude, slope aspect, slope angle, annual temperature, wind effect, land use, and normalized different vegetation index, were extracted from the spatial database. In the next step, FFSMs were prepared using M-AHP and MFL modules in a Netcad-GIS Architect environment. Finally, the ROC curves and area under the curves (AUCs) were estimated for validation purposes. The results showed that the AUCs for MFL and M-AHP are 88.20% and 77.72%, respectively. The results obtained in this study also showed that the MFL model performed better than the M-AHP model. These FFSMs can be applied for land use planning, management, and prevention of future fire hazards.

Keyword: Forest fire susceptibility maps; Modified analytical hierarchy process (M-AHP); Mamdani fuzzy logic (MFL)