



## Agricultural land use suitability analysis using GIS and AHP technique



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### ABSTRACT

The aim of this study was to determine suitable lands for agricultural use in the Yusufeli district of Artvin city (Turkey), where the current agricultural land in the district center and 3 villages will be completely inundated while the land in 22 villages will be partially inundated due to three large dams currently being constructed. The “Analytic Hierarchy Process (AHP)” method, commonly used in land use suitability analysis, was utilized in this study. In application, the parameters of great soil group, land use capability class, land use capability sub-class, soil depth, slope, aspect, elevation, erosion degree and other soil properties were used. In determining the weights of the parameters, experts' opinions were consulted, and the agricultural land suitability map generated was divided into 5 categories according to the land suitability classification of the United Nations Food and Agriculture Organization (FAO). After deducting the forests, pastures and reservoir areas from the reclassified suitability map, it was estimated that 0.08% of the study area (177.87 ha) is highly suitable for agricultural production, while 1.55% (3578.33 ha) is moderately suitable and 6.3% (14575.91 ha) is marginally suitable for agricultural production. In addition, it was found that the proportion of land that is currently unsuitable for agricultural production is 2.24% (5183.63 ha), while the amount of land that is permanently unsuitable is 3.42% (7923.39 ha). It was also determined that the following facts were all effective factors in reaching these results: a substantial portion (approximately 85%) of the study area is covered with forests and pastures, the soil depth is inadequate for agricultural production, the slope in the study area is quite high and, accordingly, the erosion degree is high.

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### 1. Introduction

It is well-known that the rational and sustainable use of irreproducible natural resources such as land is one of the most important indicators of economic growth. In fact, the World Commission on Environment and Development associated land suitability with sustainable development and defined sustainable development as meeting the needs of the present without compromising the ability of future generations to meet their own needs (Feizizadeh and Blaschke, 2012). Moreover, rapid population growth and migration require new areas in terms of meeting primary needs, particularly in metropolises. In turn, these needs cause natural resources such as forests, pastures, wetlands and agricultural land to be transformed into settlements or industrial areas and cause these areas to be used in ways that are unsuitable for their potential. For this reason, it is extremely important to prepare land use plans that enable the transfer of natural resources to future generations and that

enable the planned and sustainable use of these resources in a manner that is suitable for their potential.

A prerequisite of land use planning is land suitability assessment. The assessment in question guides towards the optimal use of land by providing information on the opportunities and constraints in the use of a given land area (Mokarram and Aminzadeh, 2010) and involves the decision to use available resources based on their assessed potential (Bandyopadhyay et al., 2009). For this assessment, the most suitable land use type is first determined through land suitability analyses that consider land properties and user needs (Akbulak, 2010; Amiri and Shariff, 2012). Land use suitability analysis is the process of determining the suitability of a given land area for a certain type of use (agriculture, forest, recreation, etc.) and the level of suitability. An important part of this process is the determination of the criteria that affect the suitability of the land (Al-Shalabi et al., 2006). The presence of various and multiple criteria makes land use suitability analysis increasingly complex because, to support the long-term use of a piece of land without deterioration, criteria such as the socio-economic and environmental costs and consequences must be taken into consideration in addition to the inherent properties of that unit of land (Duc, 2006; Bandyopadhyay et al., 2009).

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