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Optimal Site Selection for the Construction of Small Dams as a Water and Soil Erosion Management Option: Case Study from Kermanshah Province, Iran

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Abstract

Worldwide, semi-arid areas face water deficiency and soil erosion. A fast growing population and the resulting increase in food demand, increase the pressure on water and soil resources. An appropriate management and an optimal utilisation of soil and water resources are key to fight water scarcity and erosion in semi-arid zones. One effective management solution is the use of small dams. It is important to select the appropriate locations for small dam projects and to implement the right dam type such as cement dams or gabion dams. The site selection is difficult because spatial information and many influential variables must be gathered and analysed; these variables include technical, social and economical criteria.

This case study concentrated on the 9092 ha Meykhoran rural watershed located in Kermanshah Province, Iran. Geological, pedological, hydrological, and topographical information was gathered. Data analysing was done using tree-stage analytical hierarchy process. ARC-GIS, GS+, and PCI-GEOMATICA software were applied to analyse the gathered spatial information. The first stage involved the determination of hierarchical levels consisting of object, criteria, sub-criteria. During a second stage, standardisation, weighting, and paired comparisons of criteria and sub-criteria was done. In a last step, after overlaying criteria layers, the final maps for the determination of the optimal sites for the constructing of small dams were prepared. Using these patterns to locate further natural resources management projects will help to optimise usage of spatial information, save time, and decrease costs.

Keywords: Geographical information systems, small dams, soil erosion, spatial information, water deficiency