Monitoring Prospective Sites for Water Harvesting Structures Using Remote Sensing and Geographic Information Systems-Based Modeling in Egypt

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Abstract : Egypt has limited water resources, and it will be under water stress by the year 2030. Therefore, Egypt should consider natural and non-conventional water resources to overcome such a problem. Rain harvesting is one solution. This Paper presents a geographic information system (GIS) methodology - based on decision support system (DSS) that uses remote sensing data, filed survey, and GIS to identify potential RWH areas. The input into the DSS includes a map of rainfall surplus, slope, potential runoff coefficient (PRC), land cover/use, soil texture. In addition, the outputs are map showing potential sites for RWH. Identifying suitable RWH sites implemented in the ArcGIS model environment using the model builder of ArcGIS 10.1. Based on Analytical hierarchy process (AHP) analysis taking into account five layers, the spatial extents of RWH suitability areas identified using Multi-Criteria Evaluation (MCE). The suitability model generated a suitability map for RWH with four suitability classes, i.e. Excellent, Moderate, Poor, and unsuitable. The spatial distribution of the suitability map showed that the excellent suitable areas for RWH concentrated in the northern part of Egypt. According to their averages, 3.24% of the total area have excellent and good suitability for RWH, while 45.04 % and 51.48 % of the total area are moderate and unsuitable suitability, respectively. The majority of the areas with excellent suitability have slopes between 2 and 8% and with an intensively cultivated area. The major soil type in the excellent suitable area is loam and the rainfall range from 100 up to 200 mm. Validation of the used technique depends on comparing existing RWH structures locations with the generated suitability map using proximity analysis tool of ArcGIS 10.1. The result shows that most of exiting RWH structures categorized as successful.

Keywords : rainwater harvesting (RWH), geographic information system (GIS), analytical hierarchy process (AHP), multi-criteria evaluation (MCE), decision support system (DSS)

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