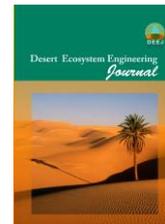




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Prioritization of rainfall storage methods for rangeland improvement and management of Jiroft Plain using Multi-Criteria Decision Making (MCDM)

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Extended Abstract

Introduction: Lacking of the water and low availability of soil moisture are the subject matter of the dry and semi-arid areas of the world, which has caused the brittleness of the living conditions for plants. It is necessary the use of new technologies to solve the problem of water scarcity through storage rainfall methods in arid and semi-arid areas. Due to the variety of storage rainfall methods, the high cost of their implementation and their different performance, it needs to evaluate these methods base on different criteria to find the best and suitable method in dry and semi-arid climates. Since decisions will be faced with multiple criteria that they have a complex relationship in such a situation, decision is difficult to choose the best method. The use of multi-criteria decision-making methods is highly effective to solve this problem. This study was aimed to prioritize rainfall storage methods (flood spreading, pitting, turkey nest, arc basin and contour furrow) in rangelands of Jiroft plain according to ecological, economic, technical and social criteria using multi-criteria decision-making methods.

Material and methods: Jiroft plain are part of the Jazmoriyan watershed in the south of Kerman province. Its height varies from a surface of 500 to 800 meters. The annual rainfall is 191.1 mm. Recent droughts and drainage of groundwater due to water abstraction in agricultural sectors are among the factors of water shortage in the region that have had adverse effects on vegetation in the region. Multi-criteria decision-making methods AHP, TOPSIS, VIKOR and SAW were applied to select the best method for storing rainfall. Combined methods (Statistic, Borda, Copeland and Poset method) were used to unite ranks resulted by MSDM methods.

Results and discussion: Results showed that the economic criteria had the highest rank, the ecological,

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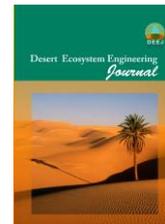
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social and technical criteria were in the following order respectively. The relative weighting of different methods altered in different criteria. Hence, flood spreading was the best storage rainfall method based on all criteria. Turkey nest had the lowest economic rank. The lowest ecological and technical ranks belonged to Pitting. Contour furrow had the lowest rank in social criteria. Assessment of sub-criteria showed that flood control was the most important ecological factors, structural lifetime was the most important technical factor, the participation of people in the implementation was the important social factor and return on investment was the most important economical factor influencing storage rainfall methods. Flood spreading and pitting had the highest and the least amount of final weight in the AHP method, respectively. The results of the TOPSIS method showed that flood spreading had the highest relative proximity index. In the VIKOR method, the lowest Q value belonged to the flood spreading, so it was placed in the first rank. The highest Q was also for the turkey nest method. According to the SAW method, the best method was flood spreading. The combined methods showed that arc basin method was located in units 2 and 3, and each of the other methods had unique units. As the flood spreading was located in the first unit, the contour furrow, turkey nest and pitting were placed in unit 2, 4 and 5 respectively.

Conclusion: Various factors can affect the failure or success of restoration operation in rangelands. The results of this study showed that the economic factor is the first criterion to be considered in choosing the best method to storage rainfall in jiroft plain. In economical criterion, return on investment should be measured based on incurred costs and the benefits derived from the ecological and social impacts of methods. People's participation is the most important social factor in storage rainfall plans, because people's acceptance and people's participation guarantee the sustainability of storage rainfall plans in the region. In general, various multi-criteria decision-making methods showed that flood spreading has the highest priority for storing rainfalls in the Jiroft plain. Contour furrow, arc basin, Turkey nest and Pitting were in the next ranks for best method respectively. Flood spreading is not only a simple and inexpensive way to improve the quality of natural ecosystems but also has a high societal value by increasing groundwater and increasing the income of inhabitants through enhancing grazing and farming activities.

Keywords: Storage rainfall, Flood spreading, Rangeland, Economical criteria