An Evaluation on the Intensity of Desertification by using IMDPA model (Case study: Baghedar region, Yazd)

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Extended Abstract

Introduction

Desertification is regarded as the third global challenge of water scarcity and drought crisis in the 21st century. This phenomenon has more damaging effects than other regions in arid, semi-arid and dry semi-wet due to fragile ecosystem. Iran also due to the special geographical position and a fragile ecosystem is at the risk of desertification. In most of the area of natural resources of Iran, the ecosystem is fragile and arid conditions. According to the new definition of desert, except a narrow strip in north of Iran, other parts of the country encounter desertification problem. In various studies, it has been found that a variety of factors affecting desertification and varies from climate to climate and region to region. So dealing with this phenomenon, especially in arid and semi-arid countries will be very useful and beneficial. In this regard, offering appropriate solutions and management practices to reduce the severity of this phenomenon and also prevented the spreading. In this way, understanding the process of desertification and its causes, intensification and also knowing the strength and weakness of these processes and factors will be very important which needs to be investigated. In recent years, with national and international studies, the most common model in the world for mapping desertification has been collected which the most important of them are: UNEP-FAO, TAXONOMY ESAs¹, MEDALUS, ICD, MICD², and IMDPA³. In our country, MICD and ICD and recently IMDPA have been offered.

Research Methodology

In this study the risk of desertification, soil and vegetation using two criteria that each index is composed of several criteria that include:

Soil: Soil Depth, Electrical Conductivity (EC), Soil Texture and Gravel Percentage.
Vegetation cover: Vegetation Utilization, Vegetation Condition, Vegetation Recovery

In the next stage, after considering the impact of each indicator in the area of desertification, it was given a weight between 1-4 and the manner of given weight was equal to linear to weight. So that the value of 1 for the best condition and 4 for the worst condition of weight from the view of severity of desertification of region. For determining the extent of desertification of every measure, the geometric mean of benchmark index, according to the following formula was useful and finally for each criterion with regarding to the performed weighting a map was prepared.

\[ \text{Index} - X = \left(\frac{\text{Layer}_1 \cdot \text{Layer}_2 \cdot \ldots \cdot \text{Layer}_n}{1\text{\ldots n}}\right)^{1/n} \]  (1)

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¹ Environment Sensitive Areas to Desertification
² Modified Iranian Classification Desertification
³ Iranian Model of Desertification Potential Assessment
Where:
Index-X: A given criteria
Layer: Index of each criterion
N: number of indices for each criterion

Therefore three layers of the criteria condition was achieved which these maps were to check the quality of each measure and its impact on desertification was used. Finally on the basis of following formula, the final severity of regional desertification is achieved through geometric mean of the criteria.

\[
\text{Desertification intensity} = (\text{Soil} \times \text{Vegetation cover})^{\frac{1}{2}}
\]

Finally desertification map with regarding to four obtained weights and according to the table were classified into four classifications: Low, moderate, high and very high.

Table 1. Classification of desertification intensity

<table>
<thead>
<tr>
<th>Quality index</th>
<th>Numerical Range</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1-1.5</td>
<td>Low</td>
</tr>
<tr>
<td>2</td>
<td>1.6-2.5</td>
<td>Medium</td>
</tr>
<tr>
<td>3</td>
<td>2.6-3.5</td>
<td>High</td>
</tr>
<tr>
<td>4</td>
<td>3.6-4</td>
<td>Very High</td>
</tr>
</tbody>
</table>

Result and Discussion

The results of this evaluation indicate that the area was classified high in terms of standard soil and moderate to high in terms of vegetation standard. Among the index of soil standard, soil texture and salinity with a weighted average of 79/1 and 2/1, had the highest and lowest impact in the process of desertification. Among the index of vegetation standard, the index of recovery and vegetation conditions with a weighted average of 53/1, 34/1 had the greater impact on the process of desertification. According to the results, the desertification intensity of BagheDar is in medium to high classification.

Accessibility of different criteria and indices in one hand and considering various aspects of land degradation process on the other hand provide an accurate estimation of desertification condition and degree as well as determining effective factors in land degradation.

Degree and effect of desertification criteria varied from point to point and climate to climate. In order to obtain reliable results in different region of the country, this model should be calibrated according to criteria and indicators prevailing in the arid, semi-arid and dry semi-wet. One of the major drawbacks is that all the effecting factors among the criteria for various reasons including extensive work, high cost and lack of data are not measurable.

Meanwhile all of the indices play major role in desertification process since the number of indices in the current study has been reduced consequently the efficiency of the model has decreased which needs more studies to find solutions for overcoming this problem.

Desertification models maintained its efficiency that will provide regular new information then quickly identifying trend desertification and providing the way of dealing with it and thus updating the information is one of the steps for success in the phenomenon against desertification.

Keyword: BagheDar, Desertification, Criteria, Index, IMDPA.