Evaluation and preparation of desertification map with analysis and survey of FAO-UNEP, ICD methods in Kashan region (wind erosion and degradation of water resources)

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Abstract

Some of the most important processes of desertification in arid zones are wind erosion and water resources degradation. In order to evaluate desertification indexes throughout the world, FAO - UNEP method will be used. In Iran, ICD* method is utilized for such an action. (2,9)

According to above mentioned methods, other indexes are recognized in Kashan area from the viewpoint of wind erosion and water resources degradation. It is useful to be added to available indexes and then a new model for evaluating desertification in 616.81 km is presented in proposed model. For evaluating indexes of present situation in desertification, 7 index and for potential human and environmental factor, 4 sub - factors are used (3).

By giving value to each of the indexes and sub - factors of desertification the intensity of wind erosion and water resources degradation are presented in the form of a desertification model (4).

Among the priorities of this new method is that human and environmental factors are not collected together and with the value of indexs, but the priorities of the factors just show the reason of desertification and will not interfere on determining the intensity of disertification in the area.

Four categories, known as very severe, severe, middle and calm are determined to show the severity of desertification. The results showed that:

1) 19.16 percent of total area is in very severe category of wind erosion.
2) 51.36 percent of total area is in severe category of wind erosion.
3) 29.48 percent of total area in middle category of wind erosion.
4) There is no calm erosion in the area.

Also:

1) 46.46 percent of total area is in very severe category of water resources degradation.
2) 53.54 percent of total area is in severe category of water resources degradation.
3) There is no water resources degradation in calm and middle categories, which show that the severity of water resources damaging is dominated in contrary to wind erosion process.

*Iranian Classification of Desertification

Introduction

The studying area having 61681 ha. wide located in 240k far from south of Tehran between 5',15° to 51',34° eastern longitude and 33',48° to 34',20° northern latitude. This area is a part of Kashan city affiliated to Isfahan province from political-administrative classification.
As it is mentioned in the abstract, the present desertification model for evaluating the amount of wind erosion and water resources degradation is formed after analyzing FAO-UNEP and ICD methods, in which are summarized here for more recognition.
The structure of evaluation system and mapping in FAO-UNEP method (a method published in 1984) is consisting of the process, aspects and class of desertification. The process including: decline of vegetation, water erosion, wind erosion, soil salinity, decrease of soil organic materials to forming and pressing the soil and gathering poisonous materials in soil, in which the first four cases are considered as the significant and determinant process and the last three cases as sub-factors of desertification. The desertfication aspects in this method is present situation, speed and talent of desertification (8).
The danger or total amount of desertification in this method is resulted from total points of various aspects and pressure of animal and man on environment. The related points regarding to each aspect is resulted from total points of considered criteria for each process (5). As it is observed, the process of water resources degradation, which is among the significant process of desertification in arid zone is mentioned in this method.
Another method which was analyzed is ICD method. This method can be studied during 4 steps as follows:
1) Separating and determining the model of desert environments.
2) Determining main and sub factors effective on desertification.
3) Estimating the amount of desertification.
4) Providing desertification map.
The total danger or amount of desertification in this method is resulted from total points of human and environmental factors and desertification indexes, in which comparing the received number, with classification table of desertification, the amount of related desertification will be determined.

Materials and methods

In order to determine the amount of desertification, first of all the basis or those evaluated units, will be determined. These similar units

will be resulted using geological information, topography, morphological or facies map (through interpretation of aerial photos or satellite images as

well as field studies and mixing them, which are mentioned as morphological map that are the same as working or studying units for evaluation and management of land resources (1,4). In this research, due to low and rather similar slope and geology of the area (sediments of period IV) geomorphological facies are used as working units.

Based on the analysis made on the above-mentioned methods, it was tried to recognize the criteria and effectives factor on mentioned process, then along with the criteria compatible with the area choose the suitable one, as a result to determine the amount of wind erosion and water resources degradation, based on giving the value to each criteria and desertification sub-factor (potential human and environmental) in the form of desertification model.

This method is in fact is a sub-model in which evaluation of present situation desertification is consisting of 7 criteria and potential human and environmental factors from 4 sub-factors.

In contrary to available methods, the points of desertification were not summed with the points of potential human and environmental factors, but the later points just show the factor of desertification in the area and will not interfere for determining the amount of desertification in the area. On the other hand, in this method summing up of present situations and desertification potential was refrained in order to determine the amount of desertification in the area with higher precision.

Determining the classes of desertification and event their boundries will be different in virtue of local criteria and sub-factors and of course the researcher's opinion (6). The number of classes is consisting of 4 parts , among them class 4 is divided into 2 sub-classes due to high amount of damaging water resources in the area. As it is mentioned, evaluation of present situation of process is resulted from 7 criteria and evaluation of human and environmental factors from 4 sub-factors. This is why that classification of desertification is provided in two separate tables. The method of classification for amount of classification is given in tables 1 and 2.

Table 1 : Classification of the amount of desertification

Total No. received from 7 criteria effective on present situation of desertification of wind erosion and damaging water resources process	Classification of the quality of desertification amount	Class of desertification amount
0-12	low (calm)	I , II
12.1-24	Middle	III
24.1-36	High	IV
>36	very high	V

Table 2: Classification of desertification amount

Total No. received from 7 potential human and environmental sub-factors	Classification of the quality of desertification amount	Class of desertification amount
0-8	low (calm)	I , II
8.1-16	Middle	III
16.1-24	High	IV
>24	very high	V

Results

First of all, the points related to each of the criteria and sub-factors were determined (3) according to present information related to each of them, then amount of desertification process (wind erosion, water resources degradation) and factor of desertification (potential human, environmental) were specified from total points of criteria and sub-factors. Moreover, received points from each of the geomorphological facies were compared with field studies and the related problems were removed, if any. The points related to the process and desertification factors in each of the facies are given in table 3.

Table 3 : Analyzing the process, factors and amount of desertification in Kashan area

No.	Geomorphological facies	Code of the facies on the map	Area (Km^2)	Quantity value of Wind erosion process	Quantity value of damaging water resources process	The factor of wind erosion		The factor of damaging water resources		Quantity value of desertification amount (dominat process)
						Human (A)	Environmental(N)	Human (A)	Environmental(N)	
1	Sandy field along with water way erosion having low density	1	2.62	16.1	33.1	12.2	7.7	20	16.8	33.1
2	Flood distribution area	2	13.4	19.55	35	15	9.78	24.25	19.1	35
3	Sandy field	3	3.85	17.25	32.85	12.8	7.7	20	16.8	32.85
4	Agricultural land	4	4.12	17.2	34.35	21	9.7	30	17.7	34.35
5	Agricultural land	5	157.79	23.6	38.75	25	13.6	37	20.6	38.75
6	Sandy field	6	125.32	30.4	35.55	19.1	13.7	26.8	19.7	35.55
7	Clay field	7	13.25	30.25	40	9.6	11.6	21.1	24.6	40
8	Active and fixed sandy hills	8	118.2	36.2	35	12.3	18.5	27.2	18.7	36.2
9	Agricultural land and clay field	5+7	22.97	28	45	26	10.7	29.6	21.1	41
10	Agricultural land and sandy hills	5+8	121.63	29	35.1	23.1	11.6	30.3	20.7	35.1
11	Sandy field and clay field	6+7	17.97	30.1	36.35	16.7	13.5	25.1	21.6	36.35
12	Sandy field and clay hills	6+8	15.67	27.1	31.75	18.1	14.5	27.55	18.7	21.75
	Total		616.81	___	___	___	___	___	___	___
	The average weight of the process numerical value, the factors and amount of desertification			28.5	36.35	19.9	13.86	30.02	20.06	36.58

Discussion and conclusion

According to the estimation made from the viewpoint of wind erosion amount, facies No. 8 (active and fixed arena and hills facies) having the highest quantity value (very severe class) has first class, facies No. 6, 7, 5+7, 5+8, 6+7 and 6+8 in second class and facies No. 1, 2, 3, 4 and 5 have middle class desertification. Concerning the amount of water resources degradation, the facies 5+7 (agricultural lands and field facies) having the highest quantity value in first class and facies No. 1, 2, 3, 4, 6, 5+8 and 6+8 have high intensity class of desertification. (ch1).

Concerning the comparison of potential human and environmental factor in present desertification process, the human factor was dominant in all geomorphological facies, except clay field facies and active and fixed sandy arenas and hills (active section) on environmental factors and is the major factor effective on wind erosion and water resources degradation as a result severity of desertification process in the area (ch2).

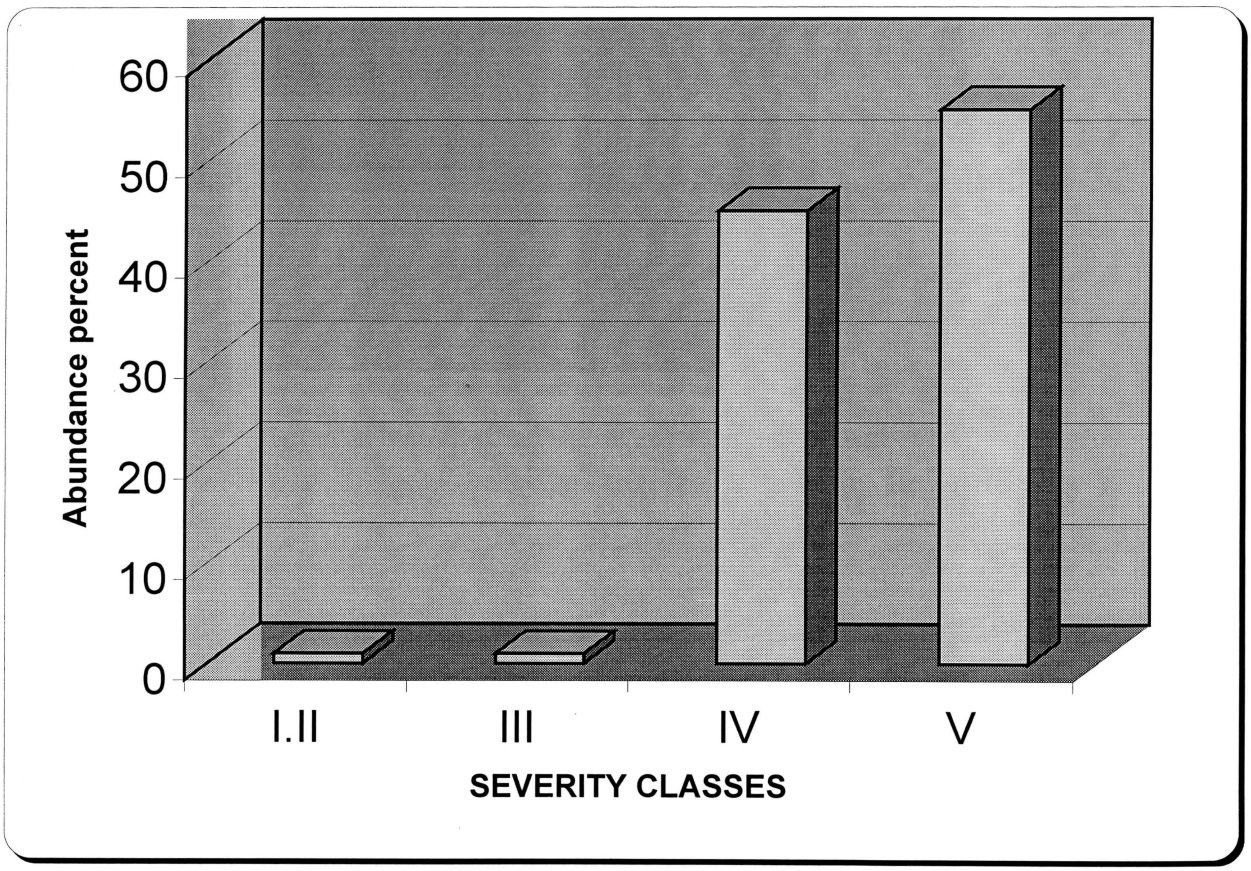
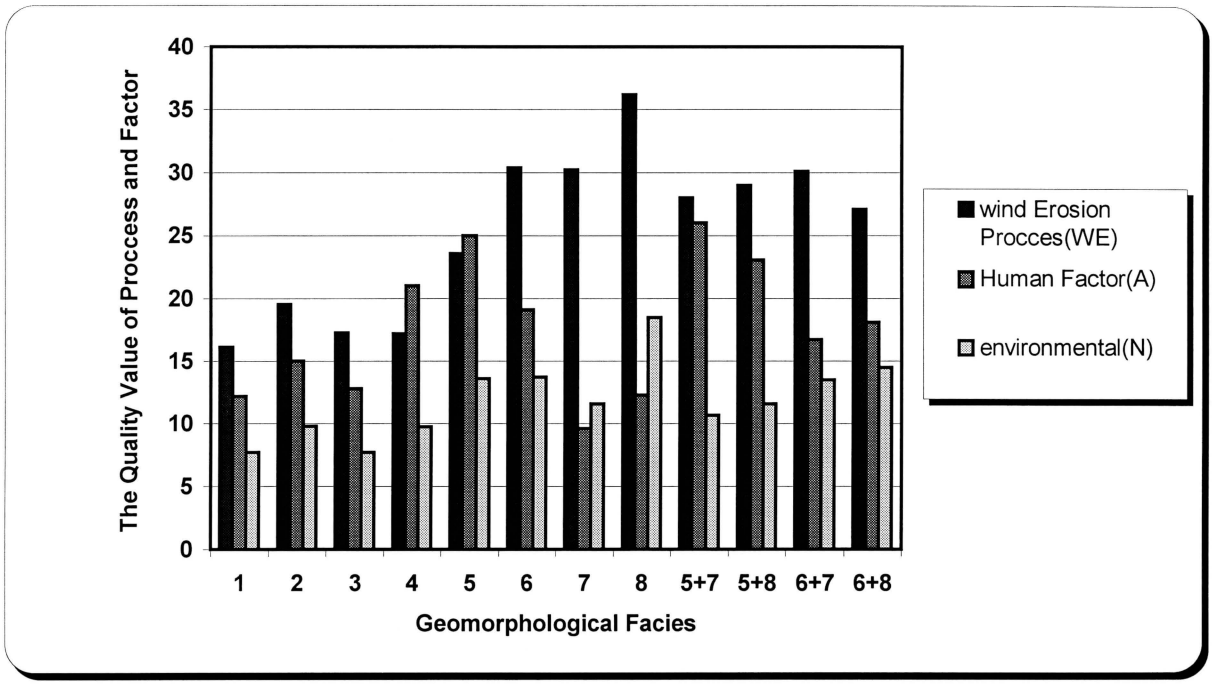


Chart 1: distribution of severity classes present situation of desertification



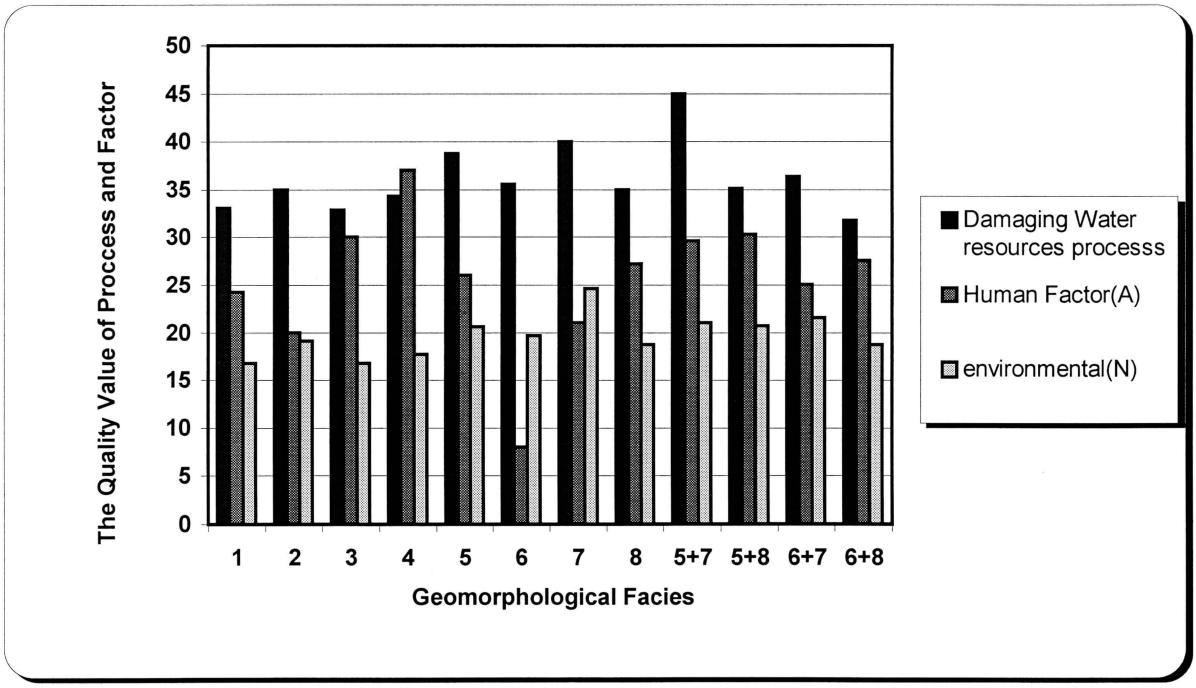


Chart 2: comparing the process points and desertification factors in various geomorphological facies

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THE EFFECT OF LIME APPLICATION ON THE SOME CHEMICAL PROPERTIES OF ACID SOILS HAVING DIFFERENT PHYSICAL PROPERTIES

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It was investigated changes of availability some macro and microelements in acid soils. For this purpose, different levels of lime were applied to acid soils having different textures. The pot experiment was done in greenhouse conditions and sunflower was grown in these pots. Vertisol and Alluvial acid soils were used in this experiment.

According to the results, N, P, Ca and Mg contents of sunflower increased with application of increasing rates of lime (0%; 50%; 100% and 150% lime levels of real requirements were applied). These increases for N, P, Ca and Mg were determined 24.8%; 81.8%; 82.2% and 43.9% respectively. The K; Fe; Cu; Zn and Mn contents of sunflower decreased with lime application. These decreases for K; Fe; Cu; Zn and Mn were determined 17.7%; 7.9%; 12.0%; 9.7% and 5.0% respectively. This research suggested that the application ratio of lime is very important for the availability of nutrient elements and nutrition balance in acid soils.

Key words: acid soil, lime, lime requirement, macro and microelements, sunflower

THE EFFECT OF ZINC APPLICATION ON THE METHODS CAN BE USED DETERMINE OF AVAILABLE Fe, Cu, AND Mn CONTENTS OF SOILS IN TURKEY

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The methods of determine of available Fe, Cu and Mn contents in soils was investigated in this research. For this purpose, Maize was grown greenhouse conditions in pots. It was investigated that the effect of increasing rates zinc application on Maize. Eight chemical methods for the determiningof available Fe, Cu and Mn were used in this research. These methods are 0.005 M DTPA + 0.01 M $CaCl_2$ + 0.1 M TEA; 0.005 M DTPA + 1 M NH_4HCO_3; 0.01 M Na_2EDTA + 1 M $(NH_4)_2CO_3$; 0.01 N Na_2EDTA + 1 N NH_4Oac; 0.01 N Na_2EDTA; 1 N NH_4Oac; 2 N $MgCl_2$ and 0.05 N HCl + 0.025 N H_2SO_4. The correlation cofficients between chemical extraction methods and biological indexes was determined after experiment. The higest correlation cofficient was determined with are 0.005 M DTPA +0.01 M $CaCl_2$ + 0.1 M TEA method for Fe; the same way was determined with 0.01 N Na_2EDTA method for Cu and it was determined with 0.01 M Na_2EDTA + 1 M $(NH_4)_2CO_3$ method for Mn.

Fe, Cu and Mn contents of Maize decreased with the application of increasing rates zinc.Furthermore, the most suitable method for hte determining of Fe, Cu and Mn contents in soils was not determined same methods. Because the application of increasing rates zinc effected the most suitable method for the determining of these elements. This situation should not be forgotten the application of zinc to the soils at that time.

Key words: extraction method, Fe, Cu, Mn, Zn, Maize.