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DETERMINATION AND CLASSIFICATION OF THE GEOGRAPHICAL DOMAIN OF IRANIAN DESERTS (CASE STUDY: KHORASAN PROVINCE DESERTS)

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ABSTRACT
Real deserts as one of the most important biomes of biosphere, occupy nearly 7.5 percent of world arid lands (UNDP, 1997). In order to determining geographical domain of real deserts for correct managing and sustainable development, we need to information about environmental factors that interactions between them resulted to desert condition. So, in this research which was carried out in 2000-2003, some of major earth sciences such as Geology, Geomorphology, Climatology, Hydrology, Pedology and Vegetation cover which are directly or indirectly affected on existing desert bioms, were studied. Then, considering fitness index for any of above subjects using standard tables, map of Khorasan deserts were drawn in six layers. Scale of base maps were 1/250000 that digitized in Geographical Information System (GIS) and were analyzed by Ilwis software. Individual analyzing of environmental factors indicated that climatic deserts contain the maximum area of Khorasn province (22100112 hectare), while geomorphologic deserts have the lowest area (3551050 hectare). Crossing and matching of different layers showed that total area of desert regions including common and non-common areas is about 24520687.5 hectare which is covered over than 82.79Khorasan province. In addition to overlying of desert layers resulted in boundary of real or potential deserts in area equal with 1418450 hectare which is covered over of 4.79 Khorasan province. Vital resources are limited seriously by harsh conditions such as low precipitation, evaporate formations, logging of water table, and so on in real deserts. Recent region contain different landscapes and facies of playa for example: salt marsh (Kavirs), Dags, Badlands, Flooded beds and Sand dunes. So, it is recommended non development program at this area because of lack population and vital sources. Difference between common and non-common areas of overlaid layers is about 23102237.5 hectare which is named Semi-desert areas and covered over of 87 Khorasan province. Because of concentrating of human communities and consequent development of exploiting activities, desertification phenomenon is obviously accelerated recent area. Desertification process such as degradation of vegetation due to overgrazing, secondary salinization, wind erosion, water erosion, decreasing infiltration rate and water logging were occurred at this area. Thus, mismanagement and exceed exploiting from destructive sources of semi-desert areas caused land degradation and desertification. Hence, development programs in semi-desert areas were failed so far and were caused many problems from view of social, economy and migration. So, primary it is necessary to performance combat desertification programs at this area. Secondary, it is recommended determining fitness land use by monitoring of environmental factors permanently.

KEYWORDS: Real desert, Environmental factors, Domain, Khorasan province

INTRODUCTION

From view of geomorphologies, desert is a geographical term which is identified with lack of water. At this situation, activity and processes of biotic was limited even stopped [3]. But, from view of world floristic classification, desert is one of the most important biomes whose ecological condition was affected by climatic, geologic, geomorphologic and soil factors [1]. So, because of scarcity of unit pattern on globally for classifying deserts, we need to classify them based on environmental characteristics and social foundations which is aimed managing sustainable of arid zones [4]. At this paper, we presented one method for determination and classifying Iranian deserts specially Khorasan province using complete information about environmental agents.

MATERIALS AND METHODS

Study of area was located in north eastern of Iran on geographical situation (31, 10 – 38, 20 north altitudinal & 56, 10 – 61, 20 east longitudinal). Khorasan province is the biggest provinces of Iran that include about 29600000 hectare of total surface of country. Figure (1) shows study area in Iran. The high height is about 3200 meters located on Binalud Mountain and low height is about 300 meters on Saraks region in border of Garehghom playa in Turkemenestan. This area included five big basins which names are: Atrak, Gareh-ghom, Central Kavir, Salt Kavir, Lut basin and Eastern playa.

Scientists of Earth science of represented different definition from desert term, but totally emphasized on climatic factors. On this research, firstly identify environmental factors which are affected on forming desert condition directly or indirectly. Then, using indicators for each discipline, domain of real deserts (potential deserts) was distinguished and drown in geographical information system [1]. The most important information layers include: geology, geomorphology, climatology, pedology, hydrology and vegetation cover. Finally, multilayer of maps overlaid together and geographical domain of Khorasan deserts identified. How we can do it, were explained followings:

1. Geology

- Extracting and drawing of quaternary formation map using geology map
- Extracting and drawing of Evaporative formation map using satellite pictures and geology map
- Drawing Sand dunes map as a highlight characteristic of desert
- identifying and drawing domains of down-ward of basins which is polluted by run-off that passed from evaporative
- formation overlying above stages and mapping geological deserts

2. Geomorphology

- Identifying three unit of morphological form on topographical maps (Scale: 1/250000)
- Identifying sensitive formation to erosion such as marl, conglomerate, and tofu and … on topographical map. Also the other desert faces such as flooded beds, sand dunes, salt lands, salt lakes, alluvial fans, playas and ... were identified on topographical map.
- With overlying 1 and 2 above stages, total geomorphologic landscapes which is located next to knick line, were distinguished.
- Then using satellite photos and checking on ground, domain of geomorphologic faces plotted on map.

3. Climatology

identifying one network of synoptic stations and determination statistical period

Gathering, calculating and analyzing data and statistical parameters [2].

drawing and plotting isometric maps based on statistical parameters which is reflected desert condition including:

- Yearly average rainfall layer
- Demarton Aridity index layer
- Yearly average temperature layer
- Yearly average evaporation layer
- Overlying isometric layers (5 layer above) and plotting final map of climatic deserts

4. Pedology

- Gathering and extracting soil data on study area
- Using map of evaluation resources and land capability (scale: 1/250000)
- Recommendation soil index for recognizing pedologic deserts based on effective factors on desert soil genesis and morphological characteristics of aridsols
- Drawing desert map with attention to soil restrictions and characteristics of soil in arid zones

5. Vegetation cover

- Study of Vegetation cover based on physiognomy and floristic method
- Identifying indicator plants of deserts
- Preparing land use map including vegetation cover, cultivated lands, bare lands and rocks
- Classifying foundation of vegetation cover in desert regions using Ferri & Probst classification method

RESULTS

Survey on individual of six agents including geology, geomorphology, climatology, pedology, vegetation cover and hydrology indicated that maximum area of desert regions with 22100112 hectare belongs to climatic agent while minimum area of deserts belongs to hydrology (2407955 hectare) and geomorphology (3551050 hectare) agents, respectively. It is necessary to remind that role of hydrological agent especially surface hydrology (run-off) is indirect so that run-off by passing evaporative geological formations caused secondary Salinizaion of soils in down-ward of basins. Table (1) shows the area of different agents effective on appearance of deserts in Khorasan province. Figures (2, 3, 4 and 5) show Domain of Khorasan deserts based on above environmental factors. In spite of Individual role each of environmental factors on spreading domain of desert regions, crossing and replicating of different layers provide this possibility that we know importance of each factor on limiting domain desert. So, in order to surveying on joint area, different layers were overlaid together twofold, triple and multiple.

1. Twofold crossing layers

Twofold crossing and overlying environmental factors showed that maximum joint area (83.91 percent) belongs to climate and vegetation cover. This subject present that climatic parameters have direct and indirect impact on composition and diversity of desert plant communities. The next stage, soil with climate and soil with vegetation cover have the most joint area. This expresses impact of periodical climatic changes on pedogenisis and the other hand impact of soil resources on desert plant diversity. Minimum joint area (14.8 percent) belongs to geomorphology and vegetation layers. This expresses that impaction of morphology is locality while climate impact is widely.

2. Multiple crossing desert layers

Overlaying four layers of desert maps showed that in spite of decreasing joint area, amount of joint area between four layers including climate, vegetation cover, geomorphology and soil is about 12.31 percent that comparing the other crosses, is higher. Therefore, it is seemed that interaction impacts of layers were controlled by soil layer and soil factor has a importance role on desert boundary. Table (3) indicate multiple crossing maps of Khorasan desert from view of different environmental factors

CONCLUSION

Final crossing of Khorasan desert maps except hydrologic layer indicated that amount of joint area of layers mainly was influenced by geomorphologic layer. Truly, boundary of potential (real) deserts was assessed by geomorphologic feathers. At this region (real desert), bioresources was restricted by different environmental limits in harsh condition. The area of Potential deserts of Khorasan province is about 1418450 hectare which is occupied nearly 5 percent of total area. This region contain many of desert feathers such as Kavirs (playa), clayey pans, badlands, sand dunes, salt marsh and lakes. Diffraction between joint and non joint areas of desert (24520687.5

hectare) with area of real deserts (1418450) is about 23102237.5 hectare that include over of 78 percent of total area of Khorasan province (figure 6). Recent region as a border line between desert and non desert regions was nominated transition zone or semi – desert area. So, there was observed that desert and semi- desert regions of Khorasan province consist of 24520687.5 hectare from total area. In the other words, total area of desert including real deserts and semi deserts in Khorasane province is over of 82.79 percent from total area. These studies descried that concentration of human population consequently development activities such as farming, mining, husbandry, industry and … lead to accelerate desertification trend in border of playa (real desert). Therefore, we obligate to performance combat desertification programs at this region (semi-desert zone).

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TABLE-1. Shows the area of different agents effective on appearance of deserts

Ratio to total area (percent)	Area(hectare)	Effective agents on desert condition
15.02	4449944	Geology
11.99	3551050	Geomorphology
74.62	22100113	Climatology
46.48	13766463	Pedology
70.24	20804475	Plant cover
8.13	2407955	Hydrology

TABLE-2. Twofold crossing of desert maps based on environmental factors

Joint area (percent)	Joint & non joint area (hectare)	Joint area (hectare)	Desert layers
83.91	23311387.5	19560450	Climate vegetation cover
17.21	21542462.5	3707969	Geology + vegetation cover
53.88	22436381.25	12088813	Soil+ vegetation cover
14.80	21185200	3135644	Geomorphology + vegetation cover
16.12	22857312.5	3684825	Climate + geology
15.41	22223143.75	3425600	Climate + geomorphology
55.23	23083912.5	12750288	Climate + soil
25.36	6374856.25	1616788	Geology + geomorphology
19.06	15291931.25	2914556	Geology + soil
23.01	14067168.75	3236500	Geomorphology + soil

TABLE-3. Multiple crossing maps of Khorasan desert

Joint area (percent)	Joint & non joint area (hectare)	Joint area (hectare)	Desert layers
10.90	24507363	2670694	Geology + vegetation + climate + soil
12.31	24087188	2964075	Geomorphology + vegetation + climate + soil
6.13	23679731	1452475	Geomorphology + geology + climate + soil
6.13	23912913	1465700	Geology + vegetation + climate + geomorphology
6.21	23096775	1434619	Geology + vegetation + geomorphology + soil
5.78	245206875	1418450	Climate + geology + vegetation + geomorphology + soil