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Study of the floristic, range condition and trend to protect range ecosystems in the Esfahan

Zahara Jafari[1*], Fariba Aslani[2], Samira Mesri[3]

[1]*Range Management, Department of Watershed and Range Management, Faculty of Agricultural Sciences and Natural Resources, University of Gorgan, Iran*

[2]*Range Management, Department of Watershed and Range Management, Faculty of Agricultural Sciences and Natural Resources, University of Gorgan, Iran*

[3]*Department of Soil, Faculty of Agricultural Sciences and Natural Resources, University of Gorgan, Iran*

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Abstract

Vegetation is one of the most important components of the natural ecosystems that in addition to expressing vegetative conditions are indicating present environmental conditions. Study vegetation condition case study has carried out to identify region abilities and limitations in order to permanent utilization. The study area was identified using the Google Earth software and then was controlled by field survey and GPS device. First of all, the area's floristic list and plant's life form were prepared. Range condition was identified by 6-factor Dr. Goodwin's method that was modified by dr. Bassiri and by considering. For determining range trend scoring method was used and we considered regress signs in vegetation and solid in the case study. The results showed that rangelands condition in Nanadegan village in both types is poor. In determining the range trend in the first type, the total positive scores was +9 and the total negative scores was -19, so the first type trend is negative and in the second type, total positive scores was +14 and total negative scores was -14 that second type trend is constant.

***Corresponding Author:** Zahra jafari ✉ jafariz68@yahoo.com

Introduction

Ecosystems vary greatly in size and composition, ranging from a small community of microbes in a drop of water, to the entire Amazon rain forest. The very existence of people, and that of the millions of species with which the planet is shared, is dependent on the health of our ecosystems. People are putting increasing strain on the world's terrestrial and aquatic ecosystemsIran, our vast country has high biodiversity, because of many topography and different climatic, that these diversities cause wide range of direct and indirect benefits in the local and global scale. Current losses of biodiversity are restricting future development options, Ecosystems are being transformed and in some cases, irreversible degraded a large number of species have gone extinct in recent history or are treated with extinction, reductions diversity is widely considered to be in decline. Unfortunately, many human activities cause unprecedented damage to ecosystems that threaten the stability and sustainability of ecosystems (Makhdoom, 2005). Data from vegetation may be useful in solution ecological problems such as biology conservation and natural resource management. Evaluating plant information can be used to predict future changes (Mesdaghi, 2001). Many studies have been carried out to investigate the floristic and plant life forms, which can point to researches of Razavi *et al.* (2009) and Abrari Vajary *et al.* (2004). Frey & Probst (1986) studied Alborz vegetation and identified different life forms of plants including: Conifer and broadleaf trees, herbaceous, shrub and cushion life forms. Mousavi and *et al.* (2012) carried out an analysis of the natural vegetation Chabahar coastal and identified range types and forest vegetation in the area. Macharia & Ekaya (2005) after testing the grazing different intensities on range condition and trend in semi-arid area in Kenya، announced that irregular use of range species cause to weaken range reduce vegetation percentage and change in plan composition and diversity. Moradiyan (1997) evaluated rangelands condition and trend in 53 ranges with different managements in Fars province and have shown that most of these ranges have poor condition and negative trend. The researcher has suggested that to prevent the rangelands destruction process we must provide fodder for rancher to prevent early grazing and reduce cut shrub cutting in range with provision of fuel. He emphasized necessity of complete and continuum monitoring in the rehabilitation and utilization of rangeland by the executive. Ghalasy Mode *et al.* (2006) introduced flora and plants life forms area of Birjand West and were identified family, genus, species and biological forms in the area and introduced Compositae as the largest family in the area.

Since the identification of plant elements in an area considers as an infrastructure study for other researches and also to determine floristic composition the main and exact work in case study, hasn't been done to perform such studies seems essential. In this context, identify the flora, life form and Chorotype to determine the rangelands condition and trend Nanadegan village in the Esfahan province.

Material and methods

Study area

The case study in 30 kilometers south of the Fereydan city covers a total area of 3088 hectares. Study area is located between longitudes from 50° 17' 30" to 50° 23' 13" E, and latitudes from 32° 47' 24" to 32° 52' 19" N. Altitude is 2290 meters. Area general slope is the east-west and its average value 20 percent. The annual average rainfall is 327 mm. often, atmospheric precipitation is as rain and in mountains heights is snow and doesn't have well distribution. The rainfall maximum is in December and March months and the rainfall lowest is in the summer season. The number of frost days is 144 days a year. The maximum annual relative humidity is 85% and the minimum is 11%. Daily average temperature is 10° C. Heavy soil texture to moderate, soil lime content 30%, soil pH 7/5-7/8 and soil electrical conductivity is 0/6 Ds/m.

Research method

In order to study the floristic, palatability classes, Chorotype and vegetation life forms, the case study was identified by using field survey, Google Earth software and geographic and topographic maps and in their positions it was recorded by global position

system (GPS). Also in order to more identification of the area weather data, the rate of evaporation and the soil information were prepared by offices and were evaluated. In order to identify species, the overall condition of the vegetation was assessed and species were collected in various season in the stage plants full growth by using guides local people (village have 69 households and 345 population) and experts and were photographed to indicate the natural stands of plants and life form and were recorded list all species and palatability class each of species in the corresponding table. Was evaluated range condition by using 6-factor method of dr. Goodwin modified by the Dr. Bassiri. In order to determine range trend from scoring method and consider regress signs in vegetation and soil in the case study was used.

Results and discussion

According to division of FAO expert, Henri Pabo and considering the weather conditions and rainfall amount, case study is among semi-steppe ecological zones and seen indicating plants semi- steppe areas such as species types *Astracantha verus* in the area. Although the flora of each region is influenced by climatic conditions, changes were created in the flora with human intervention through overgrazing and the out of season, cutting trees and shrubs for fuel, plowing slops, so that current vegetation type doesn't represents the major condition of the area in climax state. Through field studies area floristic list and palatability class of the species were prepared and has been described in Table 1.

Table 1. List of family, species, life form and chorotype in the study area. Chorotypes (IT, Irano-Turanian; ES, European-Siberian; M, Mediterranean; Cosm, Cosmopolite; SS, Sahara-Sindian), Life forms (Th, Therophyte; He, Hemicryptophyte; Ch, Chamaephyte; Ge, Geophte; Cr, Cryptophyte; Ph, Phanerophyte). Plant longevity (P, Perennial؛ A, Annual), Vegetative form (F, Forb؛ Sh: Shrub).

Family	Species	Palatability class	Life forms	Choro-type	Vegeta-tive Form	Plant longevity
Boraginaceae	*Echium amoenum*	3	He.	IT	F	P
Caryophyllaceae	*Acanthophyllium microcephalum*	3	Ch.	IT	sh	P
	Gypsophylla virgate	3	Th.	IT	F	P
Compositae	*Centaurea vigata*	3	He.	IT	F	P
	Cichorium intybus	3	He.	Pl	F	P
	Cirsium congerstum	3	He.	IT	F	P
	Cousinia bachtiarica	3	He.	IT	F	P
	Echinops sp	3	He.	IT	F	P
	Scariola orientalis	2	He.	IT	F	P
Cruciferae	*Alyssum meniocoides*	3	Th.	IT	F	P
Euphorbiaceae	*Euphorbia macroclada*	3	He.	ES,M	F	P
Gramineae	*Melica percica*	1	Cr.	IT,M	F	P
	Poa bulbosa	3	Cr.	IT,ES,M	F	P
	Agropyron tricophorum	2	Th.	IT,M	F	P
	Boissiera squarrosa	3	Th.	IT	F	P
	Bromus tomentellus	1	Th.	IT,ES,M	F	P
	Stipa barbata	3	Th.	IT,M	F	P
Hypericaceae	*Hypericum perforatum*	3	He.	IT	F	P
Juncuseae	*Juncuss minutulus*	3	Th.	IT,ES	F	P
Labiatae	*Achillea biebersteinii*	3	He.	IT	F	P

Family	Species	Palatability class	Life forms	Choro-type	Vegeta-tive Form	Plant longevity
	Mentha aquatic	3	He.	IT	F	P
	Phlomis plivieri	3	Ge.	IT	F	P
	Stachys infelata	3	ch.	IT	F	P
	Stachys lavandelifolia	3	He.	IT	F	P
	Stachys pilifera	3	He.	IT	F	P
	Thymus kotchyanus	3	ch.	IT	sh	P
	Thymus eriocalyx	3	ch.	IT	sh	P
Legominosae	*Astragalus adsendens*	3	ch.	IT	sh	P
	Astragalus hamosus	3	He.	IT	sh	P
	Astragalus verus	3	He.	IT	sh	P
	Astragalus gosipianus	3	He.	IT	sh	P
	Astragalus pinotrum	3	He.	IT	F	P
	Halimodendron halodenron	3	ph.	IT	F	P
	Onobrychys melanotricha	1	ch.	IT	F	A
Liliaceae	*Fritillaria imperialis*	3	Ge.	IT	F	A
Malvaceae	*Alcea officinalis*	3	He.	IT	sh	P
Plumbaginaceae	*Acantholimon bromifolium*	3	ch.	IT	sh	P
Rosaceae	*Rosa canin*	3	ph.	IT,ES,M	sh	P
Thymelaceae	*Daphne macronata*	3	ph.	IT,ES	sh	P
Umbeliferae	*Klossia odoratasima*	1	ph.	IT,ES,M	F	P
	Prangus ferulacae	1	ph.	IT,ES,M	F	P
	Eryngium billardieri	3	ph.	IT,ES,M	F	P
Zygophylaceae	*Peganum harmala*	3	He.	IT,ES,M	F	P

Vegetation types in the study area

According to the climate and ecological condition of the case study, also field studies and by using physiognomic-floristic method, two plants types was determined in the study area that the prominent species including:

Type number 1:

1. *Astracantha verus*
2. *Agropyron tricophorum*

The dominant species of first type is from *Legominuseae* family and palatability it is Class 3, a perennial species, shrub and is of the *Tragacanth* species. The second dominant species of the first type is of the *Gramineae* family and palatability Class 2, perennial species, shrub and is one of the increaser species. Along species type number 1 we can name *Astracantha gosipinus* and *Eryngium billardieri*. Vegetation percent of this type on average is 28.2 percent.

Determination of range condition of the type 1

The range condition is rangeland health or on the other hand, ranges condition show similarity and dissimilarity vegetation composition of each rangeland type with vegetation composition of the same type in the climax state. Analyzing the effective factors in range condition for understanding of system function is so valuable (Mahdavi *et al.*, 2009). According to destruction degree of the rangelands, achieve to exact composición of rangelands in our country is difficult and almost impossible, usually to

determine the range condition estímate methods by using signs and evidences in the rangelands are use.

In this study, range condition was evaluated by using 6-factor method of Dr. Goodwin modified by Dr. Bassiri, to determine range condition notice to the soil and vegetation condition is essential. Because the total scores are 35/3, range condition of Nanadegan village is poor (Table 2).

Table 2. Determine rangelands condition of the case study by Dr. Goodwin method.

score	percent	factor
4/66	28/2	Crown cover
5/42	58/52 =III 37/94=II 3/54=I	Vegetation composition
11	11	Soil protection
8/06	50	Forage production
5	High=III Medium=I Low=I	Regeneration
1/16	8/2	Litter
35/3	-	Total

Determination range trend of the type number 1

Range trend, includes range condition changes. The totally two types of trends in the range condition are observed. Trend is positive and progressive, if changes be in the improvement direction of the range condition, trend is negative and regressive, if changes are in the regress direction of the range condition and trend is constant if changes in the range don't create. In any case, knowing the tendency of the range condition is important for range management plan and rangelands improvement. The range condition and trend is detectable by signs that are seen in the soil and vegetation. Signs present a lot thing about what happened in the past or are happening at the range.

To determine the range in each of the different stages of the range condition, the vegetation and soil were rated respectively. As shown in Table 3, total positive scores were +12 and total negative scores were -17 that can be expressed the case study trend is negative and regressive.

Table 3. Scores to determine range condition trend of the case study.

positive	negative	regressive signs in plants
1	2	1. Grazing the type of the trees until certain height relevant to livestock type and above of it is capable to limit growth.
1	2	2. Create dense branches and lack of young branches outside of the shrub canopy in height short shrubs by overgrazing.
1	3	3. Overgrazing cause to dry plants and haven't been able to revitalization.
3	2	4. Not be considered regeneration of the range desirable plants during current year.
3	3	5. Observe general weakness of the vegetation growth due to overgrazing.
2	3	6. Balance age classes (existence young and middle seedling).
2	2	7. Grazing some green unpalatability plants.
		regressive signs in soils
1	1	1. Create points without of vegetation by overgrazing or special ecological conditions of the region.
3	3	2. Existence Channels are relatively deep with steep walls and lack of vegetation.
0	1	3. The advent of rock fragments at the soil surface by washing the surface soft soils.
2	2	4. Constitution new sediment lack of vegetation.
0	2	5. Appear light color of the underground floors than the topsoil by leaching of soil.
1	1	6. Creation soil and dust

positive	negative	regressive signs in plants
		through blow wind and trapping livestock due to the lack of soil protection.
1	2	7. Aggregation sand particles or soft soil under shrub by wind erosion.
1	2	8. Around soil of the shrubs or at the interface between shrubs by wind erosion have height difference.
1	2	9. Accumulation of soil on the back of perennial plants and obstacles in the steep slopes.
0	3	10. Have been shown root and crown species.
1	2	11. Characteristic lines of ancient soils surfaces on the on rocks in the area.
1	1	12. Of muddy streams water.
1	1	13. Create narrow lines and micro terrace by of the trapping livestock in the steep areas.
+12	-17	scores total

Type number 2:

1. *Astragalus sp*

2. *Bromus tomentellus*

The dominant species of second type is from Legominuseae family and palatability it is Class 3, a perennial species, shrub and of the Tragacanth species. The second dominant species of the first type is of the Gramineae family and palatability it is Class 2, a perennial species, shrub and is one of the increaser species. Along species type number 1 *Astracantha verus* and *Scariola orientalis* can be named. Average vegetation percent of this type the is 23.905 percent.

Determination range condition of the type number 2

Based on table 4, condition type 2 is poor.

Table 4. determine rangelands condition of the case study by dr. Goodwin method.

Score	Percent	Factor
2/98	23/905	Crown cover
7/78	75/11 =III 1/46=II 23/43=II	Vegetation composition
11	11	Soil protection
8/06	50	Forage production
5	High=III Medium=II Low=I	Regenerationn
1/3	10/8	Litter
36/06	-	Total

Determination range trend of the type number 2

Based on table 5, total positive scores were +14 and total negative scores were -14 that trend of the type number 2 is constant.

Table 5. Scores to determine range condition trend of the case study.

Positive	Negative	Regressive signs in plants
1	2	1. Grazing the type of the trees until certain height relevant to livestock type and above of it is capable to limit growth.
1	2	2. Create dense branches and lack of young branches outside of the shrub canopy in height short shrubs by overgrazing.
1	3	3. Overgrazing cause to dry plants and haven't been able to revitalization.
3	2	4. Not be considered regeneration of the range desirable plants during current year.
3	3	5. Observe general weakness of the vegetation growth due to overgrazing.
2	2	6. Balance age classes (existence young and middle seedling).
2	2	7. Grazing some green unpalatability plants.

Positive	Negative	Regressive signs in plants regressive signs in soils
1	1	1. Create points without of vegetation by overgrazing or special ecological conditions of the region.
3	3	2. Existence Channels are relatively deep with steep walls and lack of vegetation.
0	1	3. The advent of rock fragments at the soil surface by washing the surface soft soils.
2	2	4. Constitution new sediment lack of vegetation.
0	2	5. Appear light color of the underground floors than the topsoil by leaching of soil.
1	1	6. Creation soil and dust through blow wind and trapping livestock due to the lack of soil protection.
1	2	7. Accumulation sand particles or soft soil under shrubs by wind erosion.
1	2	8. Around Soil of the shrubs or at the interface between shrubs by wind erosion have height difference.
1	2	9. Accumulation of soil on the back of perennial plants and obstacles in the steep slopes.
0	3	10. Have been shown root and crown species.
1	2	11. Characteristic lines of ancient soils surfaces on the rocks in the area.
1	1	12. Of muddy streams water.
1	1	13. Create narrow lines and micro terrace by of the trapping livestock in the steep areas.
+14	-14	scores total

Table 6. Plant types, range condition and trend of the case study.

type no.	dominant species	area (ha)	area percent	condi-tion	trend
1	1.*Astracantha verus* 2.*Agropyron tricophorum*	1011 /25	61	poor	negative
2	1.*Astragalus sp* 2.*Bromus tomentellus*	648	39	poor	constant
weight total	-	1659 /25	100	-	-

Rangeland as an integral part of the pastoral system is deep bed Iran's tribes and nomadic economic and social development. In the last three decades, renewable natural resources, particularly rangelands intensely have been degraded and face our country with deep crisis. We should remind that rangelands destruction will face our country with heavy difficulty such as devastating foods, water shortage in cities, soil hurricanes and sands dunes and finally environment pollution and if face severe drought catastrophe reaches the ultimate limit that must be experienced famine in the country. So officials should pay attention to conserve natural resources. Case study rangelands have poor condition and case study trend is in the negative direction. Province survey team has diagnosed Nanadegan village rangelands the summer and utilization time has stated it every year, for 120 days from early May month until late September month. Several factors intervene in rangelands vegetation and soil degradation, these factors are: unauthorized destruction or conversion to other land uses, surplus livestock on range capacity and intense and out of the season grazing, cutting shrubs and trees for fuel, byproducts illegally harvest. also, Within the study area, there are a number of the pharmaceutical and edible species such as Achillea, Prangus, Klossia odoratasima, Stachys lavandelifolia and Tragacanth, that currently utilization of the medicinal plant species are not subject any criterion and harvest and gather by some of the pastors and local people it is. Kelly *et al.* (1996) and Ilan *et al.*

(2008) reported that higher soil bulk densities and lower moisture content resulted from the reduction of plant inputs of organic matter to the soil, after the exclusion of grazing. In the present study, the vegetation cover ranged from 30 to 40% in the grazed plot and from 10 to 20% on the trampled track; both were lower than on the ungrazed plot, where the vegetation cover ranged from 50 to 70%. High grazing pressure in these areas seriously disturbs rangeland ecosystem and causes significant changes in vegetation structure. Over exploitation of above and belowground biomass by heavy grazing for long period induces indispensable degradation of rangeland ecosystem and also decreases in carrying capacity in central area of Mongolia. Changes in community structure by grazing are strongly depending on plant life-form and its palatability (Marcelo and *et al*., 2000). Recommended that experts of the Department of Natural Resources and Watershed Management in the Isfahan province in order to regularity and the rule of the utilization of the pharmaceutical, industries and food plants and the economic plan preparation utilization of the byproduct prepare plan and finally is attached range management plan than of confirm by the technical committee. It should be noted that in the utilization of these plants project excusive ranchers are in priority. Suggest that beneficiary orchards with collaboration the Animal and Agriculture organization Frieden city to provide plan for beekeeping and honey production and after approval of the plan, they should run it.

In general, higher levels of range condition help ensure sustained ranch productivity by reducing soil erosion. Range condition is an ecological measurement of potential range productivity without regard to grazing influences. The optimum range condition may also differ depending on the type of livestock or wildlife enterprises used.

Conclusion

Vegetation dynamics (changes) over time clearly affect the level of biodiversity, conservation status and productivity of rangelands. Other than climate, the principal causes of vegetation degradation in Mashuru Division have been through human activities. In an effort of utilizing the vegetation resources through cutting, grazing and burning, the result has been a negative impact on the rangeland condition. The frequency and intensity of utilization has significantly influenced the vegetation structure, composition, quality and productivity. Sustained overgrazing reduces cover, quality and productivity, changes plant composition from perennial to annual species and encourages bush encroachment. On the other hand, light to moderate grazing may maintain the range in a fairly good condition. Over the short term, large number of livestock can be grazed as long as the ability of the rangeland to recuperate is not reduced. A given number of grazers will affect a rangeland less when distributed over a wide than a small area. Also, continuous grazing is more apt to degrade pasture than when it is given a chance to rest and recover.

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