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Indigenous knowledge of herders for classification and assessment of grazing landscapes in Northern Khorasan, Iran

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Abstract

To conduct this research we selected 42 herder informants known to be most knowledgeable about the local landscapes. The interviews took place at the field survey and the herders' camps and data were collected during fieldwork using interview, observation and semi-structured questionnaire. We asked the herders of northern Khorasan to study of "criteria of grazing landscapes classification, assessment of grazing landscapes and assessment indicators of grazing suitability". The results showed that for selection of the "criteria of grazing landscapes classification" the herders used their indigenous knowledge of grazing lands classification in order to determining the types of grazing landscapes. They used criteria of topography and type of grazing lands. For the "assessment of grazing landscapes" the herders used vegetation indicators including ecological status, fodder values and life forms for determine livestock grazing preferences. Based on changes in the type of cover, forage quality and plant species composition, they were altering livestock composition. Herders for "assessment of grazing suitability" used ecological and livestock production indicators. In general, Northern Khorasan herders' indigenous rangeland knowledge has implications for participatory research of scholars and indigenous herders, for verifying and testing methods of ecological traditional, as well as for sharing information in order to promote scientific and practical range management.

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Introduction

Indigenous knowledge is local knowledge derived from interaction between people and their environment and is characteristic of all cultures. It spans the entire range of human experience, including history, linguistics, art as well as technical aspects: agriculture, medicine, animal husbandry, engineering and fishing (Kroma, 1995). The value of traditional ecological knowledge as a source of natural resource and environment management practices is widely acknowledged. Extensive evidence has shown the effectiveness of traditional ecological knowledge in monitoring complex ecological processes (Chambers & Fabricius, 2007). Traditional knowledge provides adaptive approaches to the management of complex social-ecological systems (Mazzocchi, 2006). Traditional ecological knowledge can enrich the Western approach to natural resource and environment management, historically based on the domination of ecosystems (Berkes *et al.*, 2000). Indigenous knowledge system is easily adaptable to local issues and problems may be one of its strengths. The evidence showing that local resources are wielded in the production and application of indigenous knowledge and technologies proves the extent to which it could enhance sustainable development (Kolawole, 2010).

Understanding Indigenous Knowledge of herders and shepherds in rangelands helps to ensure that pastoralism practices. In addition, it will cause the correct planning and also the accurate management of rangelands, grazing landscapes, livestock and livestock productions. In fact it should cater for sustainable food security and conservation of the variety and variability of animals, plants and very vital soil properties such as physical, biological and chemical properties.

The systematic indigenous knowledge of herders for assessing and monitoring the grazing lands could be incorporated into ecological methods for decision-making with regard to the status of biodiversity (Yoccoz *et al.*, 2001). Most pastoralists indicated that the ranching management system was more sustainable for livestock production. This could be attributed partly to dual grazing rights because those allocated ranches are also allowed to use communal grazing land (Tsimako, 1991). Hence, most pastoralists prefer to have ranches because this allows them to increase their herd sizes, but their management does not necessarily change to promote rangeland conservation (Motlopi, 2006).

Herders have evolved in-depth knowledge in terms of systems of landscape classification, using diverse environmental features such as topography, soil and the dominant vegetation. This is the knowledge that herders use to determine the spatial distribution of livestock grazing (Scharieka, 2001). Herders' knowledge of landscape plays an important role in livestock and biodiversity management, and use is relevant for understanding the purposes of landscape classification. The pastoralists use composite indicators that include both environmental variables (physical and biological) and anthropogenic indicators (Oba & Kaitira, 2006). They use such indicators for making decisions with regard to livestock production, land use suitability related to conditions of soils, and value-weighted changes in plant species preferred by livestock for grazing. The anthropogenic indicators are value-weighted variables that use inferences from livestock production based on biological indicators, such as plant species (Roba & Oba 2008.). Also, herders use from factors of vegetation and socio-cultural values of land use potential to reconstruct the effects of historical land use on landscape change (Sheuyange *et al.*, 2005).

The herders identify grazing landscapes by different names. The names describe the physical topography, soils and vegetation. Other names describe historical events. The landscape classification criteria may combine cultural events, such as historical settlements and the types of topography. Grazing landscapes used by herders include key resources grazed during the dry season or drought periods (Angassa & Oba, 2007). The key resources might include marshes, mountain grazing lands, river

valleys and floodplains. Policies for alternative economic developments such as irrigated agriculture alienated the rights of herders' access to key resources by disrupting their flexible land use (Kassahun *et al*., 2008). Under the changed climate condition and vegetation cover indigenous knowledge has a powerful explanatory capacity to understand how the altered movement patterns and the types of livestock. So, the success secret of herders is using indigenous knowledge in management of grazing landscapes.

Herders of Northern Khorasan in adapting to a harsh and variable physical environment, climate fluctuation and vegetation changes have developed principles and strategies for managing rangelands and grazing landscapes. Thus, in this study we addressed on three issues. In addressing the "criteria of grazing landscapes classification", we tried to understand the indigenous knowledge for landscapes management, which has an impact on the way government departments should address conservation. For addressing the "assessment of grazing landscapes by the herders" we were interested in understanding the indicators herders used. Finally, for addressing the "indicators for assessment of grazing suitability in landscapes" we were interested in the way herders used the different indicators for assessment of grazing suitability.

Materials and methods

Study area

This study was conducted in northern Khorasan province, Iran. This province lies between the coordinates 36˚ 42′ to 38˚ 14′ N latitude and 56˚ 31′ to 58˚ 30′ E longitude. The climate is semi-arid, with season rains from November to May. The mean annual rainfall is about 268.7 mm yr^{-1}. The largest plant families in study area are Poaceae, Asteraceae, Chenopodiaceae, Fabaceae, Lamiaceae and Rosaceae. The rangelands of this province are semi-arid and highly heterogeneous. The largest area of the province lands are devoted to rangelands or grazing landscapes. These rangelands divided into the dense (vegetation percent > 50%), semi-dense (vegetation percent= 25-50%) and low dense (vegetation percent= 5-25%). The low dense, semi-dense and dense rangelands are 52.8%, 40.3% and 6.9% of the province rangelands, respectively.

Data collection

Statistical population of the herders in province was very broad and does not allow interviews with all bearers of indigenous knowledge. So, we of Tribal Affairs of North Khorasan province were collected information about nomads and herders. Statistical population in this study shepherds, herders and elders were that use of rangelands traditionally. In this study four nomadic tribes and ten rural were selected. In each tribe or village, three people (herder) were selected. Nomadic tribes in North Khorasan province are: Bachvanloo, Badele kooh, Brimanloo, Pahlevanloo, Topkanloo, Diranloo, Sarkhani, Ghelyanloo, Ghahramanloo, Kavanloo, Keykanloo, Malavanloo, Mylanloo. In this study, indigenous knowledge four famous clans Bachvanloo, Mylanloo, Sarkhani and Keykanloo were studied. For investigation of the indigenous knowledge in rural regions were consulted with experts of Department of Natural Resources and Tribal Affairs of North Khorasan province. The experts have introduced villages that had a long history in pastoralist, rancher and range management. In rural regions of this province most ranchers use of rangeland the common. Ten villages studied are: Keshanak, Chamanbid, Azadegan, Roeyn, Bam, Badranloo, Kolab, Pishidareh, Tabar and Hashtmark.

Then, we selected 42 herder informants known to be most knowledgeable about the local landscapes. The selected informants were interviewed independently about local rangelands and landscapes history. The interviews took place at the field survey and the herders' homes and data were collected during fieldwork using interview, observation and questionnaire. In this study was used of semi-structured interviews because it standardized the way respondents were asked questions by different interviewers in order to minimize sources of error. In

addition, semi-structured interviews are flexible enough to allow in-depth discussion of different topics.

We have interviews with herders >30 years old. The elderly herders had numerous years of herding experiences and interest since their youth. The elder herders who joined the field survey team in this study varied in age from 30 to 78 years. After briefing them on the objectives of the study, we conducted interviews in the field while walking across grazing landscapes over a period of 28 days. This was aimed at establishing baseline information as well as agreeing on terminologies the herders used for landscape classification and the indicators they selected for assessing grazing landscapes (Roba & Oba, 2008).

In the next step, herders in the field survey conducted assessments and classifications of different ecological indicators using local methods. They were named different plants traditionally. In addition, the landscapes were classified. We analyzed herder assessments and classifications of grazing landscapes. Validation of data has been done through interview and dialogue with ranchers, elders and shepherds who were experienced and informed and also more know and understand the rangelands in which they ranch and that answers many questions can be found in the collective experience of the rancher community and doing informal experiments over years.

Results

1- Criteria of grazing landscapes classification

Different criteria were used by the herders to classify grazing lands. The usual names used in landscapes taxonomy are based on topography, type of soils and type of grazing lands. Herders based on topography were classified grazing lands to GhalpoGhala, Kamar, Yan, Zao, Kolout, Safag. In addition, they based on the type of vegetation were classified landscapes to Bootalegh and Chamanzar. They based on the type of grazing lands were classified landscapes to, Olang, BashaDav, BarvaDav, Goneshg, Zemang and Barouj. Full descriptions of the main rangeland units are given in Table 1, 2 and 3.

Table 1. Different rangelands units as described by herders based on topography.

Rangeland types	*Descriptions*
GhalpoGhala	This type is characterized by deep valley or impassable mountains. They have a sharp slope. These lands usually have debris and plants on the rocky. The vegetation in these lands remains green even during the dry season. The livestock movement and grazing in grazing lands is difficult. So, the lands are used less for grazing. However, because of the more agility goats than sheep and cattle, graze from these landscapes easier.
Kamar	These rangelands are rocky. The vegetation is variable but dominated by species such as *Amygdalus Lyciodes*, *Pistacia Atlantica*, *Psathyrosthachys fragilis*, *Agropyron tauri*, *Zygophyllum* sp, *Cotonester* sp, *Festuca ovina*. This landscape is associated with seasonal streams. These rangelands are grazed in case of rainy. Because, topsoil is less muddy and livestock will not fall down. So, It does not damage livestock and soil and rangeland plants. These areas are preferred by all classes of livestock.
Yan	These grazing lands are gentle slopes. Yan may be facing the sun or behind the sun. When the sun is intense, herds grazes in Yan behind the sun. The vegetation cover is quite variable but dominated by species such as *Prangos Ferulaceae*, *Stachys lavandulifolia* , *Thymus kotschyanus*, *Onobrychys cournata*, *Festuca ovina*, *Bromus tomentellus*, *Acantholimon festucaceum*, *Agropyron spp*, Annals forbs and Annals grass. These lands are preferred by all livestock classes.

Zao	They have very deep valleys and impassable. These areas are not used for grazing. Sometimes leopards are found in these areas.
Kolout	These grazing lands are hilly. These lands are preferred by all livestock classes. Major vegetation types include *Artemisia sieberi* and *Stipa barbata*.
Safag	These rangelands are flat. In case of rain, These rangelands are used less. Because, they are soft soil and livestock sinks that this will damage the plants and soil. Major vegetation types include *Artemisia sieberi*, *Poa bulbosa*, *Agropyron intermedium*, *Salsola rigida*, *Bromus tomentellus*, *Salvia limbata*, *Bromus tecterum* and *Stipa barbata*.

Table 2. Different rangelands units as described by herders based on type of grazing lands

Rangeland types	*Descriptions*
Olang	These rangelands are vegetated by grass and forbs. In other words, they are grassland. These grazing lands usually are in the wide valleys floor. The vegetation is dominated by species such as *Onobrychys sp*, *Festuca sp*, *Dactylis glomerata*, *Agropyron sp*, *Trifolium sp*, *Bromus sp*, *Poa sp* and *Hordeum sp*. These grazing lands are soft soils and are the best rangelands for lambs and cattle.
Zemang/ BashaDav/ Goneshg	These grazing lands are behind to the sun and in the northern slopes. These rangelands usually are grazed in case of that air temperature is high. In other words, these grazing lands are summer. This landscape has high elevations. The vegetation is very variable. These areas are preferred by all classes of livestock.
Barouj/ BarvaDav	These rangelands are facing to the sun and in the southern slopes. These rangelands usually are grazed in case of that air temperature is low. In other words, these grazing lands are winter. This landscape has low altitude. Major vegetation types include *Artemisia sieberi*, *Astragalus gossypinus*, *Salsola sp*, *Ephedra sp* and *Stipa barbata*. These areas are preferred by all classes of livestock. They are rough and gravel soils. So, are not suitable for grazing lambs. Because, the lambs have soft hooves and their hooves are wounds.

Table 3. Different rangelands units as described by herders based on the type of vegetation

Rangeland types	*Descriptions*
Chamanzar	These rangelands are vegetated by grass. In other words, they are grassland and usually are found in mountainous areas. They are almost synonymous with *Olang* rangelands. The vegetation is dominated by species such as *Secale montanum, Bromus tomentellus*, *Festuca sp*, *Dactylis glomerata*, *Agropyron sp*, *Poa sp* and *Hordeum sp*. These areas are preferred by all classes of livestock.
Bootalegh	They are covered by shrubs plants. The vegetation is dominated by species such as *Cotonester sp*, *Acantholimon festucaceum*, *Pistacia sp*, *Amygdalus scoparia*, *Amygdalus horrida*, *Cerataegus sp* and *Celtis sp*. The landscape is preferred by goats. In these lands risk of wolf stroke is high.

Herders are knowledgeable about each grazing lands in terms of resource distribution, and associate each

landscape with specific use during different seasons by different livestock species (Fig. 1 and Table 2). Utilization rate from rangelands in different season of summer (that soil usually is dry) and winter (that soil usually is wet) by pastoralists is presented in Figure 1. Herders believe that *Olang*, *Yan*, *Safag*, *Zemang* and *Chamanzar* are the best landscapes for grazing.

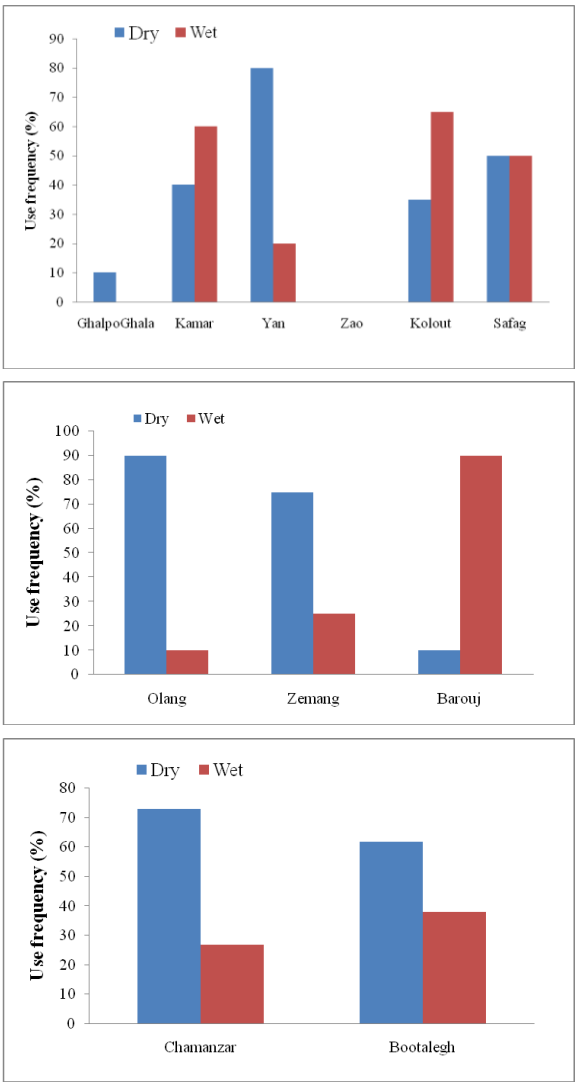

Fig. 1. Landscape types and the preferred season of grazing and (A) based on topography (B) type of vegetation (C) of grazing lands

Assessment of grazing landscapes by the herders

For assessment of changes in the quality of landscapes vegetation, herders monitored forage species in relation to their fodder values. They based on ecological status were classified plant species in four groups palatable, semi-palatable, low palatable and non-palatable.

Herders of Khorasan were identified 43 plant species in 18 families in different landscapes and grazing lands. From these plants, they described 30.23% as palatable, 20.9% as semi-palatable, and 23.25% as low-palatable and 25.56% as non-palatable. The palatable were mainly grasses and forbs. The different plants included diverse life forms (Table 4). Assessment of grazing lands and landscapes by herders in palatable, semi-palatable, low palatable, non-palatable, local name of plants, fodder value, and the different life forms are summarized in Table 4. In terms of fodder values, the palatable species were mainly useful for all classes of livestock. Utilization of different plants more is relative. This means that if forage of palatable species decrease in landscape, all classes of livestock may use from the semi-palatable species and even the low palatable species. However, it is noteworthy that the semi-palatable species were reported to be the main fodder for cattle and goats. In addition, differences in the frequencies of palatable and semi-palatable species showed that the landscapes experienced different levels of use. Figure 2 illustrates the grazing preferences of plant species by different livestock species in northern Khorasan.

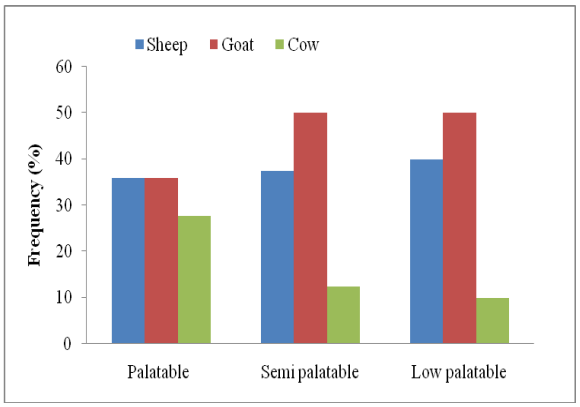

Fig. 2. The grazing preferences of plant species by different livestock species in northern Khorasan

Table 4. List of plant species identify by Khorasan herders.

Botanical name	*Family*	*Local name*	*Ecological*	*Fodder*	*Life*

			status	value	form
Ferula ovina	Umbelliferae	Halez	SP	S, G	F
Prangos Ferulaceae	Umbelliferae	Rebezen	SP	S,G	F
Ferula gummosa	Umbelliferae	Ghasni	SP	S,G	F
Conium macrulatum	Umbelliferae	Mamooran	LP	G	F
	Compositae	Goledebavan	LP	G	SH
Stachys lavandulifolia					
Thymus kotschyanus	Compositae	Anokh	LP	NON	SH
Artemisia spp	Compositae	Hafshan	SP	S, G	SH
Berberis vulgaris	Compositae	Zerishg	LP	G	SH
Lactuca orientalis	Compositae	Ghersh	LP	G	F
Tragopogon pratenssis	Compositae	Sboong	SP	S, G	F
Menta aquatica	Compositae	Boong	LP	S	F
Scariola viminea	Compositae	Shiroonag	P	S, G	F
Leucopoa sp	Poaceae	Ber	LP	S, C	G
Festuca ovina	Poaceae	Topal	P	S, G, C	G
Poa bolbosa	Poaceae	Topal	SP	S, G, C	G
Hordeum bolbosum	Poaceae	Ja	P	S, G, C	G
Bromus tomentellus	Poaceae	Topal	P	S, G, C	G
Stipa barbata	Poaceae	Topal	P	S, G, C	G
Agropyron sp	Poaceae	Topal	P	S, G, C	G
Melica persica	Poaceae	Topal	SP	C	G
Medicago sp	Leguminosae	Orencha	P	S, G, C	F
Onobrychys cournata	Leguminosae	Gini	NP	NON	SH
Onobrychys persica	Leguminosae	Shabdar	P	S, G, C	F
Trifolium canescens	Leguminosae	Shabdar	P	S, G, C	F
Astragalus gossypinus	Leguminosae	Gini	NP	NON	SH
Alhagi cameloram	Leguminosae	Davatigani	LP	G	F
Hultemia persica	Rosaceae	Pishedernaghi	NP	NON	SH
Crataegus spp	Rosaceae	Reykhog	SP	G	T
Acantholimon festucaceum	Plumbaginaceae	Gini	NP	NON	SH
Acanthephyllum bracteatum	Caryophylaceae	Gini	NP	NON	SH
Ephorbia spp	Ephorbiaceae	Hasanmast	LP	S	F
Amaranthus aviridis	Amaranthaceae	Tajkhoros	P	S, G, C	F
Anchusa ovata	Boraginaceae	Ligegan	NP	NON	F
Peganum harmala	Zygophyllaceae	Ouzaleg	NP	NON	F
Juniperus Horizontalis	Cupressaceae	Markh	NP	NON	T
Eremurus spectabilis	Liliaceae	Goleg	LP	S	F
Muscaria longipes	Liliaceae	Zil	SP	G	F
Hyoscyamus niger	Solanaseae	Beryemye	NP	NON	F
Lepidium campester	Cruciferae	Golgavr	P	S, G, C	F
Malva neglecta	Malvaceae	Nanjojeg	P	S, G	F
Verbascum thapsus	Scorphulariaceae	Zel	NP	NON	F
Hypericum scabrucm	Hypericaceae	Golazar	NP	NON	F
Polygonum aviculare	Polygonaceae	Hezarband	P	S, G	F

P: palatable, SP: semi-palatable, LP: low palatable, NP: non-palatable, S: Sheep, G: Goat and C: Cattle, G: Grass, H: Herb, SH: Shrub and T: Tree

3- Indicators for assessment of grazing suitability in landscapes

The main purpose of herders and shepherds grazing landscapes classification and vegetation is at improving livestock management and livestock production performances. Herders use different indicators for assessing of grazing suitability in grazing landscapes. These are the type of ecological indicators and livestock production indicators.

The ecological indicators indicate relationships between biophysical or topography landscapes and performance of livestock products. For example, herders represent grazing lands with high slope, spiny plants and low water sources are assessed as unsuitable grazing landscapes. The selection of these lands for grazing livestock reduces performance of livestock products. These landscapes because of their

poorer grazing potential will always be able to support less livestock, even under the most favorable weather conditions and management. Herders described the Chamanzar, Zemang and Olang landscapes generally as suitable for all livestock species. While the grazing lands of GhalpoGhala and Zao lead to decrease in livestock productions and even are caused livestock diseases.

Livestock production indicators referring to increase of livestock weight, high wool, smooth skin, body condition, high milk yield, mating frequencies and fat lamps and kids. Grazing landscapes of Chamanzar, Zemang and Olang are numerous key-plant species and so have high quality and quantity forage increase. As a result, these landscapes increase livestock weight, wool, smooth skin, fat lamps and kids and mating. In addition they improve livestock body condition and high milk yield. In generally, herders often combine ecological indicators and livestock production indicators for assessment of the grazing lands and rangeland simultaneously. Adverse changes including preterm grazing, high grazing pressure, focusing of herders on key forage plant species, noncompliance of grazing capacity and drought in both ecological indicators and livestock production indicators may cause declining suitability of grazing lands and livestock productivity.

Discussion

Criteria of grazing landscapes classification

The main production objectives of herders are not just increasing herd size, but also increasing milk yield, livestock weight, mating, maintaining an appropriate herd structure for short and long term reproductive success and ensuring disease resistance. They always try to maintain a diverse composition of livestock designed to meet their needs and to fit the environment, grazing lands or species plant composition. Each type of livestock fills a specific objective of the herder family. Herders to achieve these goals, in classification of grazing landscapes were used criteria of topography and type of grazing lands. Assessments of landscapes based on herder knowledge showed that the lands Kamar, Yan, Kolout, Olang, Zemang and Chamanzar are highly suitable for increase of livestock productions and it increases their income The herders believed that the different criteria used in grazing landscapes classification are interrelated and that each factor influences the other at the next lower levels. For example, the topography determined the characteristics of landforms, which in turn affected the vegetation types. Goma *et al*., (2001) represented herder knowledge of the physical characteristics of soil is important in monitoring land degradation, through indirect observation of change in suitability for livestock production. Such indigenous knowledge of soil conditions has also been used by the farming communities. Oba and Kotile, (2001) showed that the use of common soil and vegetation indices allows comparison of land degradation assessments between the indigenous ecological knowledge of the pastoralists and ecological techniques. Evaluation by traditional range scouts and range ecologists on changes in range condition and trends showed high correlation. Soils are crucial for rating landscape-livestock suitability.

The results showed that some grazing landscapes are suited to wet-season grazing, while others are suited to dry-season grazing. In addition, some landscapes could be grazed during both the wet and the dry seasons. The landscapes have soft soil, short forage and herbaceous, suited to dry-season grazing. While the landscapes have gravel and rocky soil, high forage and shrub suited to wet-season grazing. These knowledge systems were necessary for regulating livestock grazing patterns.

Assessment of grazing landscapes by the herders

The results of this study showed that herders for assessment of grazing lands used from important criteria including ecological status, fodder values and life form. They by these criteria determine livestock grazing preferences. The grazing of sheep and goats on palatable species is equal. While, grazing of goat on semi-palatable about 12% and 38% is more from sheep and cow, respectively. In addition, grazing of it

on low-palatable about 10% and 40% is more from sheep and cow, respectively.

Herders based on changes in plants quantity of semi-palatable, palatable and life forms may modify livestock composition in landscapes. In other words, livestock management decisions, including moving to a new locality and or changes in livestock composition, are usually made after continuous monitoring of grazing landscapes. When monitoring the change in the quality of livestock fodder, herders relied on their knowledge of the Palatable, semi-palatable, low-palatable and non-palatable species. Usually palatable species were those most affected by grazing and tended to decline across landscapes where changes is occurred in plant species composition. The results showed that herders were assessed grazing landscapes based on the 'utilization value' for livestock. For example, if plants species composition changes from grass to shrubs, they will change livestock from cattle and sheep to goat. Also, if plant community composition changes from shrubs to forbs, they will change livestock from goat to sheep. This shows that herders in Khorasa have high knowledge about relationship between changes of plants species composition and types of livestock. Herders based on assessment and monitoring of fodder values and forage quality moves livestock (herds) to grazing landscapes with high fodder values. Because the grazing landscapes with low quality declines livestock productions. In sequence the herder income will decrease. Kgosikoma *et al.*, (2012) expressed the pastoral farmers' description of dominant vegetation differed significantly both at the local and district level, which suggests that rangelands consist of patches dominated by different grasses and woody vegetation. Most pastoralists indicated that grass composition has undergone changes, and unpalatable grasses such as *Aristida congesta* and *Megaloprotachne albescens* are increasing. The different factors perceived by pastoral farmers to cause changes in vegetation composition included rainfall, overgrazing, and fire.

Indicators for assessment of grazing suitability in landscapes

Herders to achieve the main purposes including management of grazing lands, livestock management and livestock production performances use ecological and livestock production indicators. They based on these indicators determines suitability of grazing landscapes. The grazing landscapes of the Chamanzar, Zemang and Olang in terms of slope and topography, numerous key-plant species, distance of livestock drinking water sources are similar. In addition, these factors are favorable in grazing lands of Chamanzar, Zemang and Olang. So, they have high grazing suitability for all the types of livestock. The herders recognize that some landscapes are more suited for grazing sheep than cattle or goats. Also, grazing suitability depends on the availability of key forage species.

On the other, although the quantity and quality of water and forage are of main factors to herders, other factors also determine grazing suitability of landscapes. These factors include the location of salt licks, soil conditions, other environmental factors (such as dew, excessive heat, lack of shade, presence of wildlife), avoiding pests and diseased areas, avoiding damage to crops, territorial boundaries, and social relations with others. All of these factors introduce a high degree of flexibility and high knowledge into movements and management strategies of herders. In practice herders simultaneously combine all indicators for assessment of the grazing lands, rangelands, achieving to high production and income and survival. Tesfay and Tafere (2004) represented best use of rangelands of northern Afar is achieved through the use of extensive pastoral livestock production with different animal species. The Afar have traditionally classified rangeland use into livestock suitability ratings using different parameters that span from analysis of vegetation composition to feeding preferences of domestic livestock.

Conclusion

In this research we succeeded in addressing the criteria of grazing landscapes classification, assessment of grazing landscapes by the herders and indicators for assessment of grazing suitability in landscapes. For selection of the "criteria of grazing landscapes classification" the herders used their indigenous knowledge of grazing lands classification for determining the types of grazing landscapes. They used criteria of topography, type of soils and type of grazing lands. For the "assessment of grazing landscapes" the herders used vegetation indicators including ecological status, life forms and fodder values for determine livestock grazing preferences. Based on changes in the type of cover, forage quality and plant species composition, they were altering livestock composition. Herders for "assessment of grazing suitability" used ecological and livestock production indicators. In general, northern Khorasan herders' indigenous rangeland knowledge has implications for participatory research of scholars and indigenous herders, for verifying and testing methods of ecological traditional, as well as for sharing information in order to promote scientific and practical range management. Using indigenous rangeland management knowledge for assessing impacts of traditional management of grazing landscapes on the environmental requires knowledge of indicator types, which are crucial for decision-making by herders and policy-makers. In addition, for the achieving to maximum livestock productions and grazing landscapes conservation is use of pastoralists' indigenous knowledge.

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