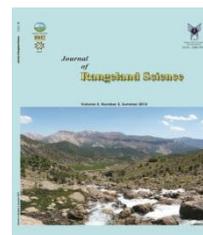


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**Research and Full Length Article:**

## **Rangelands Goods and Services Local People Views and Priorities (Case Study: Hezarjarib Rangelands, Mazandaran Province, Iran)**

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**Abstract.** Rangelands are the main sources of forage for livestock feeding by local people. Beside forage production, rangeland ecosystems provide many other goods and services such as medicinal plants, recreation, soil and water conservation, wildlife habitat, fishing, hunting, hiking, etc. Nevertheless, there are no much information about the way that local communities think about the rangelands goods and services. Therefore, a study was conducted to examine how local people think about rangelands goods and services and what their priorities are. The statistical populations were farmers, pastoralists and beekeepers of Hezarjarib, Mazandaran Province, Iran and 100 people of them were randomly selected as a sample. First, 17 indices of rangeland importance (goods and services) were identified through questionnaires and oral interviews. Each indicator was questioned using a 5-point Likert-type scale. Validity was established using a panel of experts and Cronbach's alpha was used for reliability of questionnaire. Data were analyzed and then, interpreted using coefficients of variance. Medicinal plants, beekeeping, food production for human and grazing lands for livestock were the first four priorities respectively considered as the most important indices by local people. Aquaculture and fishing and soil conservation with the highest CVs were considered as the less important indices in local people views. The results showed that the extent of range exploitation had significant relationships with the education of exploiters, number of livestock, income and farmland area. It was concluded that rangelands goods and services should be defined and evaluated based on local people views to be considered as a source of alternative income or new enterprises for local people.

**Key words:** Rangeland ecosystems, Local people, Exploiters, Rangelands goods and services, Hezarjarib

## Introduction

Rangeland is one of the most important and most valuable national assets that can play a basic role in soil and water conservation and protein requirements of country if exploited correctly along with range restoration practices (Khosroshahi and Ghavami, 2005); Rangelands have many important environmental values as well. Since rangelands have many diverse uses, they can be managed under principles of multiple-use. In fact, multiple-use is considered as a method to manage several uses or values of rangeland simultaneously with care to avoid the overuse or destruction of natural resources (Havstad *et al.*, 2007). A wide range of national parks, protected areas, natural monuments and wildlife are rangeland ecosystems that are considered as recreational areas beside their role as genetic resources and fauna and flora conservation (Mesdaghi, 2003). Although livestock production is the main output of rangelands; however, they produce a diverse array of goods and services that are economically much more important as forage production for grazing and browsing animals and some of them are critical for human survival. Nowadays, we are seeing the increased public attention to nonmarket benefits of natural resources, especially rangeland ecosystems (Eskandari *et al.*, 2008). Iran rangelands produce a diverse array of non-forage products including medicinal and industrial plants and some of them like galbanum, tragacanth and asafetida are commodities for export (Mesdaghi, 2003). The average value of rangeland in Iran stood at \$232 per hectare for a year and 25% of this amount belonged to fodder and remained 75% belonging to environmental values (Khosroshahi and Ghavami, 2005). In other words, in addition to 10.7 million tons of forage production, its indirect values stood for approximately 4 times of the average price of forage produced in Iranian rangelands that are usually ignored in the

economic calculations. However, since popularization of the term “Ecosystem Goods and Services (EGS)” and their classification into four categories have been used by the Millennium Ecosystem Assessment, There have been an increasing number of studies on ecosystem goods and services worldwide. These works reflect the researchers’ attempts to measure or quantify the importance of different ecosystems as comprehensively as possible and so, the arguments for their conservation and wise use are strengthened.

Reed *et al.* (2015) introduced new mechanisms to tackle the rangeland degradation based on retaining critical levels of natural capital whilst basing livelihoods on a wider range of rangeland ecosystem services and a move from rangeland degradation towards sustainable land management through the development of economic mechanisms (e.g. payments for rangeland ecosystem goods and services). MacLeod and Brown (2014) tried to find practical ways to relate the theory of practical ecosystem services to management practices. They suggested that rangelands have the capacity to provide different levels of ecosystem services depending on both site features and local management and the ecological site descriptions are potentially valuable for organizing the data and information related to management options in order to achieve the ecosystem service objectives and provide benchmarks for stewardship rewards or compliance expectations. Torell *et al.* (2014) tried to assess the feasibility of considering the economic values of some of the goods and services into the justification of rangeland restoration projects in New Mexico. They concluded that the economic values of some of the generated goods and services are substantial, but a little economic value exists for some of the ecosystem services used to justify the conservation efforts. Maczko *et al.* (2011) explained

Sustainable Rangelands Roundtable's (SRR) conceptual framework for the evaluation of rangeland ecosystem goods and services. In the framework, goods and services were classified as ecosystem goods, tangible and intangible ecosystem services and core processes. Havstad *et al.* (2007) dealt with the ecological services to and from the rangelands of the United States. They described the salient features of these lands which characterized their present ownership and traditional services, examined key emerging goods and services that rangelands may provide and gave a detailed description of necessary steps including incentives required for a sustained delivery of any rangeland-based goods and services.

As it can be concluded from literature review, investigating the rangeland values and functions can be an effective step in the plans and policies concerning the multiple uses of rangelands in close future, but the local people are neglected in the most studies. Potential Ecosystem Goods and Services (EGS) must be quantified and assessed for viability practicality as a source of alternative income or a new enterprise for a range management operation. As social values for rangeland EGS continue to expand and environmental markets develop, there will be opportunities for local pastorals and also policy makers to add new enterprises to their operations. However, if enough attention is not paid to local people views and proper business planning and evaluation are not performed for these potential alternative income sources, policies and plans may fail and new opportunities may turn into economic hazards. So, the objectives of this paper are to identify the rangelands goods and services based on the views of rangeland exploiters (pastorals, beekeepers and farmers) and compare their views on evaluating each service.

## Materials and Methods

### Site

The study area is the Hezar Jerib summer rangeland located in Behshahr County, Mazandaran Province, Iran (Fig. 1). Region climate is cold and dry. The study site receives about 383 mm of annual precipitation. The mean annual temperature is 12.44°C. The landscape is mountainous with many ups and downs. The elevation of the region ranges from 2000 to 2800 m above sea level. The vegetation in the area is dominated by perennials and some annual species. There are six plant communities in the region (Shokri *et al.*, 2003): shrubland deciduous scrub *Carpinus*, woodland ever green *Juniperus* and cushion-grasses formations. The main occupations of the region's inhabitants are farming, pastoralism (traditional husbandry), and beekeeping. Because of the fertile soils, most of the area inhabitants are engaged in the agricultural works and husbandry. The husbandry is mostly traditional and sheep and goats are the dominant livestock. Dairy products such as milk, yogurt and cheese and honey are common in the region.

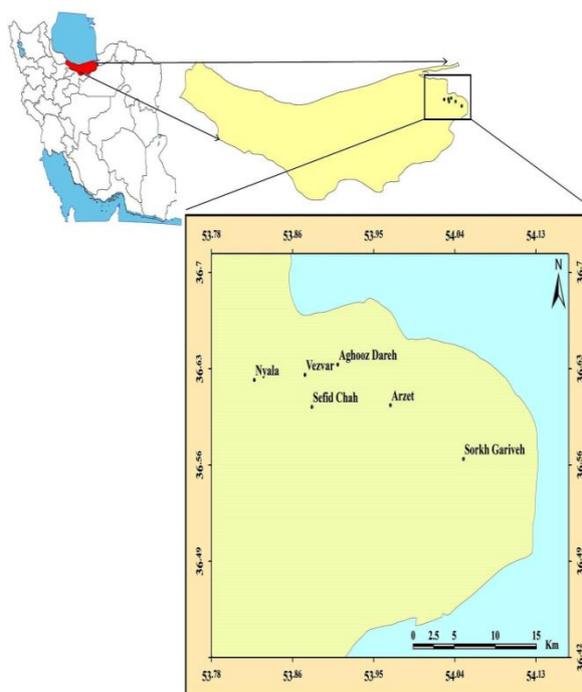


Fig. 1. Map of the study area in North of Iran

**Data collection**

Descriptive research was used to obtain information. So, data were collected using both documentary and field surveys. By attending among the regional people, we have tried to gather data through direct participation, Focus Group Discussion (FGD) technique, directive interviews and the narrative threads of key figures and experienced persons. So, ten exploiters (four farmers, four farmer-pastoralists and two beekeepers) who had several years of experience, high understanding and were familiar with the study area were selected for the interviews. Through meetings and individual and group interviews, local people were asked about the importance of rangelands and their goods and services. The results of meetings and interviews were used to identify the indices related to rangelands value and importance. Then, a questionnaire was prepared based on the identified indices. Each indicator was questioned using a 5-point Likert scale. Statistical population of the study area involved local people living in the area and 100 of them were

randomly selected as a statistical sample. Validity was established using a panel of experts and Cronbach's alpha of 0.741 was used for the questionnaire reliability.

To prioritize the exploiters' views and examine the importance of rangelands, the Coefficient of Variance (CV) was used with the explanation that the lower CV, the higher priority. To investigate the relation between the individual variables and importance of rangelands, Spearman correlation coefficient was used. One-way ANOVA was used to assess the differences between different exploiter groups. ANOVA was followed by LSD for the means comparisons among three kinds of exploiters. The SPSS<sub>21</sub> was used for statistical analyses.

**Results**

The meetings and interviews resulted in identifying 17 indices (Table 1) of rangeland values that were then used to design the required questions.

**Table 1.** The rangeland values indices (i.e. goods and services) based on local people views

Indicator	Pastoralist	Farmer-Pastoralist	Beekeeper-Pastoralist
Grazing	*	*	*
Food for livestock	*	*	*
Food for human	*		*
Medicinal plants	*	*	*
Wildlife	*	*	*
Aquaculture and Fishing		*	
Hunting	*	*	*
Recreation	*	*	*
Fuel wood	*	*	*
Construction materials	*		*
Soil conservation		*	
Bee keeping	*	*	*
Breeding birds		*	*
Hiking		*	*
Clear air	*	*	*
Landscapes to observe	*	*	
Spiritual satisfaction		*	*

All the interviewees were male and most of them were in the age group of 30-40 years old. The respondents were in the age groups of > 20 and 60-70 years old and both of them with 8% had the lowest frequency. Out of total number of respondents, 80% were literate out of which 38% were educated up to primary class and 29% were educated up to middle class. Only 13% of the respondents had higher education and out of which 8% were educated up to higher class and 5% were qualified up to higher education. On the other hand, just 20% of

the respondents were illiterate. About 61% of the respondents were engaged in farming and bee keeping in addition to animal husbandry. In other words, out of total number of respondents, 87% were pastoralist out of which 48% were engaged in farming too. Only 13% out of total number of respondents were bee keeper and occupied to animal husbandry too. Out of total number of respondents, 29% had 150-200 heads of livestock (the highest frequency) and only 7% had over 200 heads of livestock (the lowest frequency) (Table 2).

**Table 2.** Personal characteristics of respondents

Age Group	(%)	Education	(%)	Occupation	(%)	Livestock No	(%)
20>	8	Illiterate	20	Pastoralist	39	50>	22
20- 30	14	Primary class	38	Pastoralist-Farmer	48	50- 100	27
30- 40	31	Middle class	29	Beekeeper-Pastoralist	13	100- 150	15
40- 50	17	Higher class	8			150- 200	29
50- 60	22	Higher education	5			>200	7
60- 70	8						

In order to determine the values of rangelands based on local people views, the identified indices (Table 1) resulted from meetings and interviews were questioned by a five-point Likert scale (Table 3). The results showed that 47% of the respondents rated “grazing lands for livestock” as very important and 34%

rated it as important. Only 10% of people rated it as less important. Spiritual satisfaction (65%), medicinal plants production (63%) and beekeeping (62%) were respectively considered as sum of very important and important classes by local people.

**Table 3.** Types of rangelands values (goods and services) and their importance based on local people views using Likert scale (i.e. 4 to very important, 3 to important, 2 to moderately important, 1 to less important and 0 to unimportant)

Indicator	Degree of Importance				
	Very Important	Important	Mid Important	Less Important	Unimportant
Grazing lands for livestock	<b>47</b>	34	9	10	0
Food production for livestock	20	<b>38</b>	29	11	2
Food production for human	5	11	30	26	28
Medicinal plants production	<b>43</b>	21	26	10	0
Fuel wood production	12	20	18	15	<b>35</b>
Construction materials	0	8	9	28	<b>55</b>
Soil conservation	<b>32</b>	24	16	20	8
Bee keeping	<b>35</b>	27	23	11	4
Breeding birds	5	10	33	7	<b>41</b>
Wildlife	1	8	21	<b>43</b>	27
Aquaculture and Fishing	0	5	28	<b>57</b>	10
Hunting	10	10	32	<b>33</b>	15
Recreation	22	37	<b>41</b>	0	0
Hiking	0	12	25	<b>36</b>	27
Clear air	19	<b>39</b>	30	12	0
Landscapes to observe	27	20	<b>48</b>	5	0
Spiritual satisfaction	<b>36</b>	29	22	10	3

The CV was used to valuate and rank the rangelands indices (goods and services) (Table 4). CVs indicate the importance of indices so that the lower CV, the higher priority. Based on variations in respondents' rankings, grazing lands for livestock, food production for livestock and medicinal plants production were the most important indices from pastoralists' view. Medicinal plants production and construction materials production were the most important indices from farmer-pastoralists' views. Medicinal plants production, bee keeping and food production for human are of the most importance for bee keepers.

Rangeland exploiters found soil conservation less important than the other indices. Although this index was ranked as the last priority, at least it shows that

exploiters care about the rangeland soil and its erosion. As medicinal plant production received the highest importance based on all the exploiters' views, it shows that medicinal plants are generally harvested by the exploiters. Pastoralists mostly gave more importance to grazing lands for livestock whereas recreation values, spiritual satisfaction and natural beauties had higher importance from the views of farmers and bee keepers. The results clearly show that exploiters ranked the rangelands goods and services (indices) based on their own uses of rangelands. Some of indices had the same CV which received identical ranks showing that the exploiters had the same view about their importance.

**Table 4.** Ranking rangelands importance indices (goods and services) based on exploiters views

Indicator	Pastoralists		Farmers		Beekeepers		Total	
	CV	rank	CV	rank	CV	rank	CV	rank
Grazing lands for livestock	0.27	1	0.28	3	0.48	11	0.34	4
Food production for livestock	0.30	2	0.35	7	0.53	12	0.39	7
Food production for human	0.33	4	0.23	1	0.35	6	0.30	3
Medicinal plants production	0.31	3	0.23	1	0.26	2	0.27	1
Fuel wood production	0.36	7	0.45	10	0.61	14	0.47	10
Construction materials production	0.35	6	0.27	2	0.42	9	0.35	5
Soil conservation	0.56	15	0.59	14	0.57	13	0.57	12
Bee keeping	0.34	5	0.29	4	0.22	1	0.28	2
Breeding birds	0.49	13	0.51	12	0.41	8	0.47	10
Wildlife	0.48	12	0.64	15	0.45	10	0.52	11
Aquaculture and Fishing	0.51	14	0.57	13	0.72	16	0.60	13
Hunting	0.37	8	0.34	6	0.68	15	0.46	9
Recreation	0.43	11	0.31	5	0.33	5	0.36	6
Hiking	0.43	11	0.37	8	0.38	7	0.39	7
Clear air	0.39	9	0.41	9	0.29	3	0.36	6
Landscapes to observe	0.41	10	0.49	11	0.33	5	0.41	8
Spiritual satisfaction	0.43	11	0.31	5	0.30	4	0.35	5

To calculate the rangelands importance or value the exploiters views, a score was assigned to each point of Likert scale (i.e. 4 to very important, 3 to important, 2 to moderately important, 1 to less important and 0 to unimportant). Then, the summed scores of each point were classified to four ranges. The range intervals were calculated by dividing the difference between the highest and lowest scores to four (number of classes) (Table 5). All

the rangeland exploiters evaluated the rangelands importance as high and very high reflecting the high value of rangelands for them (Table 5).

**Table 5.** The importance of rangelands for different exploiters

Exploiter	Degree of Importance			
	Very High	High	Medium	Low
Pastoralist	77	21	2	0
Farmer-pastoralist	62	30	5	3
Beekeeper	65	28	7	0

The correlation coefficients of the studied variables were analyzed (Table 6). The results of Pearson's correlation coefficient show that there were positive relationships between the rangeland importance, age and education ( $p < 0.01$ ), and also between the rangelands importance and the extent to which rangelands are exploited ( $p < 0.05$ ). In other words, it seems that understanding the rangelands values and importance increases with the increased age and education. There was a negative relationship between the extent to which rangelands are exploited and the age of exploiters ( $p < 0.01$ ); in other words, the

higher the age, the lower the extent to which rangelands are exploited. In contrast, there were positive relationships between the extent to which rangelands are exploited and education, the number of livestock, income and farmland area. The results indicate that people who exploit the rangelands to higher extents had better understanding of rangelands values and importance. This could be owing to 1) rangelands are their only income source, 2) they mostly harvest the non-forage products of rangelands for various reasons, and 3) exploiters are the first people who benefit from natural beauties of rangelands.

**Table 6.** Relationship between the rangelands importance and studied variables

	Age	Education	Number of Livestock	Income	Farmland Area	The Extent to Which Rangelands Exploited
Education	0.102					
Number of livestock	0.477**	0.007				
Income	0.140	0.154	0.388**			
Farmland area	0.122**	-0.398	0.058	0.109**		
The extent to which rangelands exploited	-0.535*	0.438**	0.497*	0.521**	0.366**	
Values of rangeland	0.620*	0.811*	0.341	0.119	0.340	0.469**

\* and \*\*=significant at 0.05 and 0.01 probability levels, respectively

One-way ANOVA was used to compare different exploiters based on their views about rangelands values and importance (Table 7). The results showed that there were significant differences between the exploiters based on their views about rangelands values and importance ( $p < 0.01$ ). Pastoralists had significantly different views about the rangelands

importance from farmer-pastoralists and beekeepers. There were no significant differences between farmer-pastoralists and beekeepers. Pastoralists had higher extents to which rangelands are exploited in comparison to two other exploiter groups (i.e. farmer-pastoralists and beekeepers).

**Table 7.** Means comparison among exploiter groups for the extents to which rangelands are exploited and the rangelands value and importance

Exploiter groups	Value of rangelands	The extent of rangelands exploitation
Pastoralist	26.51 <sup>a</sup>	20.16 <sup>a</sup>
Farmer/pastoralist	9.55 <sup>b</sup>	13.00 <sup>b</sup>
Beekeeper	12.72 <sup>b</sup>	11.25 <sup>c</sup>

The means of the exploiter groups with the same letters are not significantly different based on LSD ( $P < 0.05$ )

## **Discussion and Conclusion**

Natural ecosystems, particularly rangelands can be the source of many environmental goods and services (Foley *et al.*, 2005) whereas these lands have been providing a part of local communities needs during past centuries (Havstad *et al.*, 2007). There was a unique feature resulted from the intrinsic environmental values of the rangeland ecosystems (Dale *et al.*, 2000). Rangelands are primarily exploited for grazing and animal production (Squires and Sidahmed, 1997). So, these ecosystems are important for food (for livestock as well as human), fuel wood and timber. Other services of these ecosystems are biodiversity, clean water production and carbon pools (Campbell *et al.*, 1997). So, the values of rangelands are not limited to forage and meat production and other goods and services such as soil conservation, groundwater enrichment, clean water production, non-timber products, wildlife and environmental conservation put more values on the rangelands that cannot be exchanged by money (Mesdaghi, 2003). The relationship between the exploiters and managers is one of the ways that can have close relationships with the environmental, social and economic factors (Steurer *et al.*, 2005). The complexity and dynamic nature of the environmental issues involve a set of flexible and transparent policies that requires a variety of knowledge and values. So, the participation of exploiters in decision makings has a rising trend and plays an important role in national and international policies (Reed, 2008).

Current study emphasized more on local people in identifying the rangeland Ecosystems' Good and Services (EGS). Local people in the study area (i.e. farmers, pastoralists and beekeepers) introduced 17 indices as the values and functions of rangelands ecosystems (goods and services). The results showed that 81% (the highest frequency) of the

local people considered grazing lands for livestock as one of the values of rangelands and ranked it as important and very important. Spiritual satisfaction (65%), medicinal plants (64%) and beekeeping (62%) were indices ranked as important and very important by local exploiters, respectively. Renewed in the spirit with 65% and providing herbs and beekeeping with 64% to 62%, respectively were the indicators that the villagers had chosen as the options of high and very high. The results of the ranking indices in different exploiter groups show that grazing land for livestock, food for livestock and medicinal plants had more priorities for pastoralists; food for human and construction materials had more priorities for farmer-pastoralists; medicinal plants, beekeeping, food for human had more priorities for beekeepers. This suggests that local people ranked the rangeland indices (goods and services) based on their own exploitation from rangelands; for example, grazing lands for forage production for pastoralists and beekeeping and medicinal plants for beekeepers were ranked as important values of rangeland ecosystems. Soil conservation had less importance than other indices in view of pastoralists. This index was ranked as the last priority but it could be shown that exploiters care about the rangelands soil and its conservation. The results of calculating the rangelands value and importance suggested that the importance of rangelands with respect to different indices is high and very high among all the exploiters indicating high awareness of rangelands values and functions by local people. It can be concluded that this is helpful in proper and sustainable management of rangelands while avoiding their possible destructions and damages.

The results of correlation coefficient showed a negative relationship between the age of the respondents and the extent to which rangelands are exploited. In

other words, as the exploiters get older, the extent to which they exploit rangelands will decrease. There were positive relationships between the extent to which rangelands are exploited, education, number of livestock, income and farmland area. The results of one-way ANOVA showed significant differences between the extents to which different exploiters exploit the rangelands and the rangeland values and importance. This shows more dependency of pastorals on the rangelands as compared to two other groups due to their income conditions.

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**چکیده.** قسمت عمده غذای مورد نیاز دام‌های جوامع محلی از مراتع به دست می‌آید. مراتع افزون بر تولیدات دامی دارای فوایدی از جمله تولید گیاهان دارویی، خوراکی، مناطق تفرجگاهی، حفاظت آب و خاک، حیات وحش، ماهیگیری و شکار، پیاده روی و غیره هستند. با این وجود اطلاعات زیادی در رابطه با نگرش جوامع محلی به کالاها و خدمات مرتعی وجود ندارد. از این رو، تحقیق حاضر با هدف بررسی دیدگاه و اولویتهای بهره‌برداران نسبت به کالاها و خدمات اکوسیستم‌های مرتعی انجام گرفت. جامعه آماری متشکل از کشاورزان، دامداران و زنبورداران منطقه هزار جریب استان مازندران بود که از بین آنها ۱۰۰ نفر به عنوان حجم نمونه به طور تصادفی انتخاب شدند و از طریق مشارکت و مصاحبه، ۱۷ شاخص اهمیت مراتع (ارزش و خدمات) تعیین گردید. هر شاخص در طیف پنج گزینه‌ای لیکرت مورد سوال قرار گرفت. روایی پرسشنامه توسط متخصصان و کارشناسان و اعتبار پایایی آن نیز به کمک ضریب آلفای کرونباخ محاسبه گردید. داده‌های جمع‌آوری شده تجزیه و تحلیل شد و سپس با استفاده از ضریب تغییرات مورد تفسیر قرار گرفتند. شاخص‌های دامپروری، جمع‌آوری گیاهان دارویی، تفریح و استراحت و پرورش زنبورعسل، به ترتیب چهار اولویت اول را به عنوان مهمترین و شاخص‌های کوهنوردی و تهیه مصالح ساختمانی، به عنوان کم‌اهمیت‌ترین شاخص‌ها در مراتع حریم روستا، از طرف روستاییان منطقه معرفی شدند. یافته‌ها نشان داد بین میزان استفاده بهره‌برداران از مراتع با سطح سواد، تعداد دام آنها، میزان درآمد و میزان زمین‌های زراعی، رابطه مثبت و معنی‌داری وجود داشت. همچنین نتایج بیانگر تفاوت معنی‌دار گروه‌های مختلف بهره‌برداران در زمینه اهمیت و میزان استفاده آنها از مراتع بود. بنابراین نتیجه‌گیری شد که کالاها و خدمات مرتعی بایستی در رابطه با دیدگاه مردم محلی مورد ارزیابی قرار گیرد تا به عنوان شغلی جدید یا درآمدی جایگزین قابل پذیرش باشند.

**کلمات کلیدی:** اکوسیستم مرتعی، مردم محلی، بهره‌برداران، کالاها و خدمات مراتع، هزارجریب