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Investigation on Effects of Range Management Plans, Property Size and Pastoralist Population on Rangeland Characteristics (Case Study: Zarandyeh Rangelands)

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Abstract: This study was conducted in a winter rangeland at Zarandieh, Markazi province. Firstly, property of rural rangelands including private and collective management were selected as three area levels of small (0-1000 hectares), medium (1000-2500 ha) and large (greater than 2500 hectares) were studied based on Range management Plans (RMP). A property without plan was also selected as control treatment. After determining the number and size of quadrats in each vegetation community, an area was selected as reference for data collection. Then, collected data were analyzed by nest design analysis using SAS soft ware. The results showed that the rangelands with RMP had a better condition than those without RMP. Also rangelands under private management showed a better condition in comparison with collective management. Meanwhile, range condition of large area property was better than that of medium and small ones. According to the results, range management based on private RMP in a large property was identified as the best management.

Key words: Range Management Plan (RMP) · Private and collective management · Property size · SAS software · Nested design

INTRODUCTION

In today's world, value and status of natural resources, especially rangelands are obvious to all. Nowadays, rangelands are not considered just for forage production anymore but other services such as soil and water conservation, oxygen production, preventing global warming, carbon sequestration, plant and animal gene banks, ecotourism values, industrial and medicinal plants, reducing air pollution, diversity of flora and fauna, wildlife refuge and so forth have been considered more important than forage production. Forage production of rangelands forms just 10 to 20 percent of rangeland ecosystem values [1, 2]. The area of rangelands in Iran has been reported about 86 million hectares [3]. Iran is an arid and semi-arid country with an average annual rainfall of 240 mm so important role of rangelands in rainfall storage can be understood from considering vast area of the rangelands [4]. In Iran, rangelands can meet the requirements of only 37 million animal units for a period of 7 seven months while 83 million animal units rely on the rangelands [2]. Both range managers and range experts believe that rangelands of the world are being degraded due to overgrazing, hence a balance between livestock and rangeland is essential in range management [5].

Rohde *et al.* [6] stated that long-term sustainable management not only needs the authority to establish rules to resolve the problems and conflicts, but also designing procedures and performing are very crucial. Range Management Plans (RMP) in Iran also has been known as a suitable way to reduce grazing pressure and to practice effective management on rangelands since 1968. RMP have been prepared for about 25 million hectares by rangeland technical office in Forests, Rangelands and Watershed Organization [7]. A RMP is defined as a compiled program through which soil and water resources are preserved and sustainability of the production with maximum production possible based on potential of the region is guaranteed. In fact, all measurements applied for range management, range

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improvement and suitable utilization in certain areas of the rangelands are considered in a RMP allocated to the stakeholders for a period of 30 years by Forests, Rangelands and Watershed Management Organization [2]. Walker [8] had a study on rangelands of North West Argentina and stated that sustainable management of rangelands needs a database on annual forage production, species composition and population of grazing livestock based on a RMP so that balance of livestock and grazing capacity can always be monitored.

RMP alter the sustainability indicators of rangeland. Unfortunately, in some of the ongoing RMP, grazing capacity [balance between forage production and livestock population], grazing season and period, are not clearly observed while range condition and grazing capacity of the rangelands in which technical principles of the RMP are considered have been improved. [9]. Sardari [10] studied rangelands of Chahar Mahal and Bakhtiari province and stated that under the conditions that no supervision was made, no significant differences were found between the rangelands with or without RMP and this was because of the excess livestock population in both conditions. Mousavi Nejad [11] investigated and compared three applied management methods in 18 properties (with RMP, surveyed and non-surveyed rangelands) of Semnan province. The results indicated that despite all problems which existed over the way of design and implementation, RMP had been successful so far.

Social Studies Institute of the University of Tehran [12] studied sixty RMP in Fars and Kohkiloyeh Provinces. The results showed a better economic and livelihood condition for ranchers who had RMP and also larger property. Kepe *et al.* [13] concluded from economic and ecological observations that relationship between sustainable development and large lands is stronger than other important factors. Laurent *et al.* [14] in an economic research conducted in South Africa showed that land area of many farmers was so limited as the result of dividing the land between the children and increasing of the pastoralist population. He concluded that for sustainable utilization of natural resources and fighting poverty, dividing large properties to small ones should be avoided. Scoones [15] also introduces increasing human and livestock population and lack of land continuity as the main reasons for degradation of natural resources and lack of implementation of sustainable natural resources management in Ethiopia. Continuity and being large rangelands are considered as two main factors for successful management by many scientists [16, 17 and 18]. World Bank [19] introduces six important and fundamental factors as the causes of poverty in rural communities including small property size and low productivity.

Hassanzadeh [20] stated that increased population of pastoralist households will raise rangeland degradation index and it is decreased with increase of land area per household. Ramezani [21] evaluated privatization of rangelands in the form of RMP in Fars province and concluded that the area assigned to each household must be adequate for family expenses. He also found that the best assignment is the form which contains less population of households. Hardin [22] reported from South Africa that development and conservation of natural resources, especially in collective rangelands was still in the hands of local communities and native shepherds and collective utilization has no results except degradation of natural resources. Khalighi [23] studied various methods of rangeland utilization [collective, private and council] and their effects on rangeland degradation or improvement in 24 common areas of Amir Kabir Dam watershed. Range condition, range trend and rangeland production were compared and finally private utilization with RMP was determined as the best one in view of range improvement, less surplus livestock population and higher property size for each household.

The main objective of the current research was to determine the best range management and rangeland dedication considering different management in terms of property size, population of pastoralist and RMP. There are many studies in this field while the effects of the mentioned factors have been considered separately. Comprehensive investigation with regard to the property size, population of pastoralist and RMP which carried out simultaneously can be considered as the main difference between the current study and other researches.

MATERIAL AND METHODS

For this research, it was tried to select similar rangelands as much as possible; so all rangelands were selected from winter rangeland of Zarandieh, Markazi province with maximum similarity with climate, topography and vegetation. Two kinds of management (private and collective) and three sizes of land area (0-1000, 1000-2500 and more than 2500 ha) were considered for selected rangelands in a RMP and for each case, a rangeland without RMP was selected as control treatment. In each site, a key area was identified and number of the required quadrats was calculated based on statistical method (60 quadrats). The quadrat size of 2 m^2 was selected based on

vegetative form of the plants. Data of vegetation cover, forage production and plant density were recorded for each site at a certain time which coincided with the range readiness. In each vegetation type, four transects of 300 m length with 100 m intervals were created on which 15 quadrats of 2 m^2 were established. All the measurements made within total of 60 quadrats for each vegetation community. Plant species were categorized into three palatability classes of I, II and III, based on the Code book of Forest and Rangeland Organization [2] and considering indigenous knowledge.

Canopy cover percentage of each species was estimated within the quadrats. Double sampling method suggested by Arzani and King [24] was applied for forage yield estimation. In this method, forage production of 15 quadrats was measured using clipping and weighing method. In the remaining of the 45 quadrats, forage production was calculated based on the correlation between data of canopy cover and forage production. Density was estimated by recording the number of individual plants of each species within the quadrats along transects. Data were analyzed in a nested design using SAS software.

Table (1) shows the property those were sampled for this study and the design of study have illustrated by figure (1).

The hypotheses of the research were that vegetation cover, density, litter and forage production of RMP rangelands, private management and large properties were respectively higher than those of the without RMP rangelands, collective management and medium and small properties.

Table 1: Studied rangelands in Zarandieh with different utilizations

Winter Rangeland		Collective		Private	
		RMP	Without RMP	RMP	Without RMP
	Small	1-Khoram Abad laghu	1-Tukhda	1-Gangh Dareh	1-Dezlu
		2-Khan Kahriz	2-Rasfyjan	2-Ghezel Cheshme	2-Ali Abad
		3-Hagi Abad Vakily	3-Mehdi Abad		3-Feiz Abad
	Medium	1-Shir Ali Beyglo	1-Aghzigang	1-Azablu	1-Abbas Abad
		2-Esmaeil Abad	2-Tavakol Abad	2-Ahmad Abad-Adinehlu	2-Nazarlu
		3-Ebrahim Abad	3-Dolat	3-Nazar Abad Adamkhar	
	Large	1-Darband Goy Dagh	1-Bidlu	1-Bakhsh Ali Nemati	
		2-Hagi Bolaghi	2-Sabz Ali	2-Kachalu	
			3-Rahmat Abad	3-Aghcheh Gol	

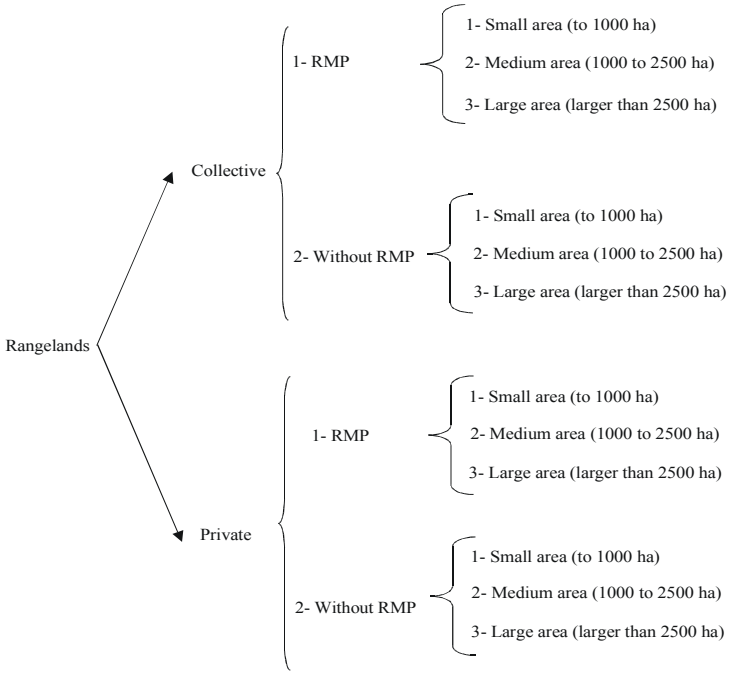

Fig. 1: Diagram of different utilizations in Zarandieh rangelands.

Table 2: Results of Statistical analysis with nest design

	DF	Total vegetation Cover %	vegetation Cover of Class I %	vegetation Cover of Class II %	Vegetation Cover of Class III %	Shrub Cover %	Forb Cover %	Grass Cover %	Total density [number]	Density of class I
Type of rangeland	1	2050**	170**	3876**	908**	3486**	15n.s	117**	31*	8**
Type of management	2	117ns	544**	1320**	1828**	352*	267**	403**	38**	49**
Type of area	7	3083**	300**	3771**	1205**	4567**	150**	238**	136**	19**
Error	1770	101.5	3.9	45.4	70.2	83.9	18.7	7.8	4.9	0.3

Continue table 2-Results of Statistical analysis of SAS software with nest design

	DF	Density of class II	Density of class III	Total production [kg]	Production of class I [kg]	Production of class II [kg]	Production of class III [kg]	litter %	Bare soil %
Type of rangeland	1	216**	126**	3196 ns	2066**	10224 ns	8105*	74**	135 ns
Type of management	2	97**	74**	8363 ns	2416**	11338 ns	4880*	436**	22162**
Types of area	7	44**	184**	66950**	1950**	52990**	7849**	75**	5014**
Error	1770	1.52	3.6	6806	75.2	5734	1521	2.5	135.9

Ns: No significant difference. *: Significant difference at 5 percent. ** Significant difference at 1 percent

RESULTS

Total vegetation cover showed significant differences between rangelands with and without RMP (P=0.0001) (Table 2). Although no differences were found between private and collective management, total vegetation cover significantly differed among small, medium and large rangelands. Also in rangelands with and without RMP, collective and private management and small, medium and large rangelands, significant differences were observed in vegetation cover and density of plant species of class I, II and III. The same trend was also found for forage production of class I species, grass vegetation cover and litter percentage ($p<0.001$). Shrub cover percentage showed significant differences between rangelands with and without RMP, collective and private management and among small, medium and large rangelands (Table2). The same was also observed for forbs except rangelands with and without RMP.

The type of rangeland (with and without RMP) and type of management (private and collective) had no significant effect on total forage production and forage production of class II while the rangeland size significantly affected the mentioned factor. All results of the study have been shown in Table 2.

DISCUSSION

According to the results, as expected, there were significant differences in the most studied factors among rangelands with or without RMP, private and collective management and finally among large, medium and small properties. However some exceptions were also observed for example no significant differences were found between total vegetation cover of the private and collective management although average of total vegetation cover in private properties was higher. Two reasons may be mentioned for the obtained result as firstly, although no differences were found between average of total vegetation cover in private and collective management, vegetation composition of the rangelands differed in terms of palatability classes. Secondly, the role of social issues should be considered as in Zarandieh region, some collective management are owned by several people without any family relationship while sometimes they are owned and managed by people with family relationship like father and his children or several brothers. Wherever collective management are owned and managed by relatives, range condition is better compared with those without family relationship because all relatives do all their best to conserve quantity and quality of the range species to meet the family needs and consequently there is a sincere cooperation among them in managerial issues. But in collective management with no family relationship among pastoralists, each beneficiary will always try to have the maximum harvest from the rangeland more than its grazing capacity to increase short term income. Consequently, managerial cooperation like balance of livestock population and rangeland grazing capacity and grazing season are implemented poorly.

With regard to the vegetation composition of classes I and II, average values of the studied parameters were significantly higher in rangelands with RMP, private management and large properties compared to the rangelands without RMP, collective management and medium or small ones. An inverse trend was observed for class III plant species i.e. despite significant difference, the values of rangelands with RMP, private management and large properties were lesser. Unlike undesirable

species (Class III), desirable and moderate desirable species (Class I and II) were dominant in rangelands with better condition. According to the results of life forms and as stated above, total vegetation cover of the properties with RMP and large rangelands was more than that of without RMP, medium and small rangelands but it is noteworthy that allocation of shrub species was higher than others. It means that although the role of management in increase of vegetation cover of the rangelands with RMP and large properties is undeniable, this increase is mainly seen for shrubs due to the aridity of the region.

Results of the density showed that average density of palatable species (Class I and II) in RMP, private and large management were significantly higher compared with no RMP, collective, medium and small properties. An inverse trend was observed for unpalatable species (Class III).

The results of forage production showed that total production and production of Class II plant species did not differ between RMP and private management with no RMP and collective ones while significant differences were observed between the production of Class I and Class III plant species in all types. The main reason why no differences were observed between the forage production of RMP and private management with rangelands without RMP and collective ones is that when rangelands with good condition are degraded, their total production is not reduced firstly but desirable plants are declined and undesirable plants are increased. Consequently, although total production remains constant, vegetation composition will differ. The results are also in agreement with above interpretation since there are significant differences between forage production of Class I and Class II plant species in RMP and private management with no RMP and collective ones. With regard to the fact that forage production in large properties was higher than that of medium and small rangelands, it could be concluded that the effect of the area is more important than the effect of management type and RMP in forage production.

Litter was also higher in RMP, private and large properties compared with no RMP, collective, medium and small ones. Results of the bare soil percentage also showed significant differences between private and large properties with collective, medium and small ones while no significant differences were observed between RMP and without RMP rangelands. It is obvious that the effect of property area and population of pastoralist on increasing vegetation cover is more than that of RMP.

According to the results, it can be concluded that a better range condition can be obtained from RMP compared without RMP ones. The results are in agreement with the findings of Asrari [25], Abbasi [26], Khalilian and Shams al-Din [1], Azarnivand [27], Savory [28], Walker [8] and Teague and Dowhower [29]. In other words, range management based on RMP would be more appropriate.

In contrast the results of other researchers like Hagh Shenas [30], Kazemi [31] and Sardari [10] indicated that RMP have no effects on range condition or other rangeland characteristics. In other words, the mentioned studies do not ignore RMP efficiency in range improvement and believe that low supervision and inappropriate implementation have been of main reasons for RMP inefficiency.

Range condition of private management is also better than that of collective ones because in private, the owner has a sense of ownership to the rangeland and its income and usually will try to increase the income through appropriate management like management of grazing season and balance between grazing capacity and population of livestock. But in collective management, there is no sense of ownership and each owner just tries to have more utilization over the grazing capacity and that is why range management principals are less considered in these rangelands. Our results are in agreement with the results of studies done by AbdolahPour [32], Azkya [33], Ghandaly [34], Ramezani [21], Azarnivand [35] and [27], Hardin [22] and Antje Burke [36]. Almost, all researchers have the same view and believe that range condition of private management is better compared with collective ones. For example, Antje Burke [36], studied arid rangelands of Namibia for 11 years and stated that grazing intensity in private management was less than that of collective ones and private management were more economically efficient for the owner. Ghandaly [34] compared forage utilization methods and their effects on natural resources in Semnan province. He stated that range condition of the rangelands in which less pastoralists are existent is better compared with rangelands with more pastoralists. Azarnivand [35] also had an investigation on rangelands of Semnan province and stated that private RMP was more effective and they should be assigned to the pastoralists individually if possible.

Finally, it is realized that large properties have a better range condition than medium and small ones since forage production is higher in large properties which let

the pastoralists enter more livestock to earn higher income. This issue affects the range condition from two aspects: the first is that the rancher has more economic potential for investment in the rangeland and the second is that no surplus livestock are entered by the rancher to earn more money since he can meet the costs of living. However, in small properties firstly the rancher has a low income without any investment potential in the rangeland and secondly he will try to enter more livestock to earn more money and to meet the living costs. In early years, plant composition is changed and forage quality is decreased while no changes occur to the forage quantity. In this situation, despite forage feeding, the livestock lose weight due to the decrease of forage energy content. If this trend continues, forage quantity will also be decreased as far as range goes ahead to desertification and the rancher will have no attention to the range condition and range improvement anymore because of the low forage quality and production, low economic potential and small area of the rangeland. These results are in agreement with those reported by Abedini [37], Ramezani [21], Laurent *et al.* [14], Kepe *et al*. [13], Teague and Dowhower [29], Bailey *et al*. [18], Stulth [17], Boon and Coughenour [38] Calvin *et al*. [39] and World Bank [19]. For example, Teague and Dowhower [29] studied the effect of different types of rangeland management on range condition and concluded that size of the rangeland has impacts on range condition as the larger properties is, the range condition is better and believed that range management based on RMP was better than those without RMP. Abedini [37] examined the social factors affecting rancher's participation in RMP and concluded that rangeland area and the ownership had an important role in the participation of indigenous people which should be taken into consideration by government administrators. Arzani and Sanjari [40] concluded that degradation was higher in land units with none optimal economic size.

CONCLUSIONS

Generally according to the results RMP is the best way for of promoting range condition and making balance between animal and forage. However its performance is much better when it applied in large properties with single owner. So it is necessary RMP be written for all rangeland also encourage people to sell small properties to medium sizes. Large properties would be economic and it is possible to run academic grazing management in such properties. Of occurs depends on economical and social condition of each country. It is important to say that if population of the livestock does not correspond with grazing capacity, RMP will not function as expected.

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REFERENCES

1. Khalilian and O.R. Shams al-Din, 2000. economic analysis of assigned Range Management projects, Fars Province (Mamasani city case study). Journal of Agricultural and Development Economics, 30: 145-171.
2. Forest, Rangeland and Watershed organization, 2009. Public news magazine of Ministry of Agriculture.
3. Range Technical Office, 2004. vegetation cover studies, Forest, Rangeland and Watershed organization.
4. KhajoDin, S.A. and C. Basiri, 1994. Proceedings of the First National Seminar in Range and Range Management, Forest, Watershed organization.
5. Kellner, K. and O.J.H. Bosch, 1992. Influence of patch formation in determining the stocking rate for southern African grasslands. Journal of Arid E-30.
6. Rohde, R.F., N.M. Moleele, M. Mphale, N. Allsopp, R. Chanda, M.T. Hoffman, L. Magole and E. Young, 2006. Dynamics of grazing policy and practice: environmental and social impacts in three communal areas of Southern Africa. Environmental Science Policy, 9: 302-316.
7. Eskandari, N., A. Alizadeh and F. Mahdavi, 2007. the policies of rangeland management in Iran, rangeland Technical Office, pp: 190.
8. Walker, B., 1993. Rangeland ecology: understanding and managing change. Ambio, 22: 80-87.
9. Alizadeh, A., M. Bigdeli and H. Moaen al-Din, 2001. Results of Range Management plans in a country assessment, Proceedings of Second National Conference of Range and Range Management, Research Institute of Forests and Rangeland.

10. Sardari, M., 1999. reviews the role of various ways to exploit and manage the rangelands in Bakhtiari province, M.Sc. Thesis, Department of Natural Resources, Tarbiat Modarres University.
11. Mousavi Nejad, A.S.R., 1997. review of the management situation, trends, production capacity of rangeland of Semnan province. MSc thesis, Department of Natural Resources, Karaj, Tehran University.
12. Institute of Social Studies, 1995. Tehran University, Roundtable of social, economic and technical aspects of Range Management Plans.
13. Kepe, T., R. Wynberg and W. Ellis, 2005. Land reform and biodiversity conservation in South Africa: complementary or in conflict. International Journal of Biodiversity Science Management, 1: 3-16.
14. Laurent, C., J. Van Rooyen, P. Bonnal, J. Carstens and B. Hubert, 1998. Systems approaches for agriculture and rural development in the South African transition situation. 15th International Symposium of the association for farming Systems Research-Extension. South Africa: 30 November-3 December 1998. Pretoria. Environments, 22: 99-105.
15. Scoones, I., 1995. Contrasting savanna dynamics: implications for livestock populations in Zimbabwe's dry land communal areas. In: G.F. Campbell, (Ed.), Sustainable Land Management in Semi-arid and Sub Humid Regions. Proceedings of the SCOPE Workshop, Dakar, Senegal. CIRAD, Montpellier, France.
16. Senft, R.L., L.R. Rittenhouse and R.G. Woodmansee, 1985. Factors influencing patterns of cattle behavior on shortgrass steppe. Journal of Range Management, 38: 82-87.
17. Stulth, J.W., 1991. Foraging behavior. In: R.K. Heitschmidt and J.W. Stulth, [Eds], Grazing Management: an Ecological Perspective, pp: 65-83. Portland: Timber Press, pp: 259.
18. Bailey, D.W., J.E. Gross, E.A. Laca, L.R. Rittenhouse, M.B. Coughenour, D.M. Swift and P.L. Sims, 1996. Mechanisms that result in large herbivore grazing patterns. Journal of Range Management, 49: 386-400.
19. World Bank, 1990. Malvi: Growth through poverty reduction report, pp: 814.
20. Hassanzadeh, M., 2001. the study of traditional systems of exploitation of rangelands in Sarali Abad district of the city of Gorgan, abstract of Master degree thesis in Range Management, Range Technical Office of Forests and Rangelands Organization Iran, 2: 45-46.
21. Ramezani, A.S., 1998. evaluation of privatization schemes in the form of Range Management, Fars Province. MSc thesis in Range Management, Department of Natural Resources. Tarbiat Modarres University.
22. Hardin, G., 1968. The tragedy of the Commons. Science, 162: 1243-1248.
23. Khalighi, Mirmansur and N. Farahpur, Mehdi, 2004. review various ways to exploit pastures and rangeland its effects on degradation and improvement, (Amir Kabir Dam case study areas), Third National Conference on Rangeland management Iran.
24. Arzani, H. and G. King, 1994. A double sampling method for estimating forage production from cover measurement, in proceeding of 8th Biennial Australian rangeland conference, pp: 201-202.
25. Asrari, C., 2000. economic investment assessment conducted in pastures of Kurdistan (Sanandaj city case study). MSc thesis. Faculty of Agriculture. Tarbiat Modarres University.
26. Abbasi, AH., 1996. the final report of reviews the issues and problems of Range Management Plans in the Central Province. Research Center of Natural Resources and Animal Affairs of Central Province.
27. Azarnivand, H., 2004. effect of Range Management projects on the production, rangeland condition and trend. Proceedings of Third National Conference in pasture and Range Management, Forest and Rangeland Organization Publications.
28. Savory, A., 1987. Aholistic approach to range management. Using short ration grazing pro. Int. rangeland.
29. Teague, W.R. and S.L. Dowhower, 2002. Patch dynamics under rotational and continuous grazing management in large, heterogeneous paddocks, Journal of Arid Environments, 53: 211-229.
30. Haghshenas, R., 2007. economic assessment of Range Management projects in the city of Damavand, Range Management Master degree thesis, Islamic Azad University, Tehran Science and Research Branch.
31. Kazemi Rudy, M., 2006. Affect of Range Management projects on income (case study winter pastures of Behshahr city), Master thesis in Range Management, Islamic Azad University, Tehran Science and Research Branch.

32. Abdolah Poor, M., 1994. why and how should provided the appropriate fields of investment by the private sector in the ranges. Proceedings of the First Seminar in Range and Range Management, Forest and Rangeland Organization, pp: 57-75.
33. Azkya, 1995. review socio-economic and technical dimensions of Range Management plan projects in Fars province and Kohgiluyeh-Boyer Ahmad, Volume I, Faculty of Social Sciences of Tehran University.
34. Ghandaly, Karamly, 2001. review and compare methods of forage utilization of pastures and its effect on pasture areas in Semnan, M.Sc. Thesis, Tehran, Imam Khomeini Education Center.
35. Azarnivand, H., 2001. the impact of Range Management projects on the production, rangeland condition and trend. Proceedings Second National Seminar in Range and Range Management, Forest and Rangeland Organization Country Publications, pp: 248-253.
36. Antje Burke, 2004. Range management systems in arid Namibia-what can livestock population tell us? Journal of Arid Environments, 59: 387-408.
37. Abedini, 2001. social factors affecting farmer participation in Range Management Plans, regional scope of mount Damavand, Tehran Province, Journal of Forest and Range, pp: 24-53.
38. Boon, R.B. and M.B. Coughenour, 2001. a system for integrate management and assessment of African pastoral land, Colorado state university and university of Nairobi, USA. Range, pp: 208-228.
39. Calvin, K.A. and P.K. Thorenton, 2001. Human ecology, economics and pastoral household modeling. Global livestock CRSP, IMAS Report university of California, Davis, USA.
40. Arzani, H. and G.H. Sanjari, 1999. Investigation of minimum rangeland area required for Sistanian nomads. XIX International grassland congress.