Journal of Biodiversity and Environmental Sciences (JBES)
ISSN: 2220-6663 (Print) 2222-3045 (Online)
Vol. 6, No. 5, p. 447-455, 2015
http://www.innspub.net

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RESEARCH PAPER

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Effects of land use change on some physical and chemical properties of soil in rangelands of Kerman Province

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Article published on May 28, 2015

Key words: Soil physical, Chemical properties, Land use change, Soil degradation, rangelands, Kerman.

Abstract

This research was aimed to investigate the effects of land use change in three study regions of Kerman province. In this regard, a control site (rangeland) and a site with land use change were selected. Soil samples were taken from two depths (0-30 and 30-60 cm). Soil parameters including sand(%), clay (%), silt (%), lime (%), organic matter, total nitrogen, phosphorous, potassium, EC and pH were measured. The results of land use change from rangeland to agriculture at 0-30 cm soil depth in three studied regions showed that in,Dehsard(Orzooiyeh), soil phosphorous was doubled, sand percentage decreased to 7%, and other soil properties did not show significant difference between these two land uses. In Koohsefid, no significant difference was foundin the studied soil properties. In Kaluk, soil nitrogen was doubled and clay percentage decreased to 7% and other soil properties did not show significant differences. According to the obtained results of land use change from rangeland to agriculture at 30-60 cm soil depth in three studied regions, in Dehsard potassium and phosphorous increased significantly to 16 and 3.3 mg kg-1, respectively and no significant differences were found for other soil parameters. In Kaluk, pH declined to 1.5 and sand percentage decreased to 8.63%. In the mentioned site, EC, phosphorous and potassium increased to 0.06 dsm^{-1}, 3.3 mg kg-1 and 36.9 mg kg^{-1}, respectively and other soil properties did not vary. InKoohsefid, clay percentage increased to 9.8% and sand percentage decreased to 14.24% while no significant differences were found for other soil properties.

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Introduction

Limited soil and water resources has caused that the optimal use of land is further considered, so that the access to this optimization is possible only with proper planning and management practices. In addition, uncontrolled population growth followed by the growing human need for food, has led the farmers of different countries of the world to exploit the marginal lands in poor areas like rangeland and forests on slopes. However, these lands are mainly with high erosion and low production potential (Haj Abbasi *et al.,* 2002).

Soil quality studies in identifying the effects of different management in the areas of agriculture and natural resources, including rangeland and forest degradation and land reclamation are of great importance, reflecting the impact of the management in the short term (Yusefifard *et al.,* 2007).

Land use change of natural ecosystems to the managed ecosystems has deleterious effects on soil characteristics. Indiscriminate cutting of trees and the conversion of rangelands to agricultural lands cause to the damage or disruption of natural ecosystems and reduce the current and future production capacity of the soil (Celik, 2005).

Land degradation is a phenomenon mainly caused by agriculture on non-fertile agricultural lands. Kapoor *et al*., (2007) stated that different land uses and plowing can lead to the destruction of soil structure and even reduced performance due to changes in the pores and the pore size distribution. Martinez *et al*., (2008) reported that, due to the land use change from forest to the lands under olive cultivation, soil organic carbon decreased to 50% in the soil surface. According to Kizilkaya and Dengi (2010), land use change and continuous tillage operations result in significant reduction in organic matter, total porosity, total nitrogen, soil aggregate stability and increased bulk density. Zehtabian and Khosravi (2009) introduced agricultural activities as a factor in the decline of organic matter, nitrogen, phosphorus and potassium. Shiranpour *et al*., (2012) studied the effect of land use change from forest to tea garden on soil fertility in Guilan province and reported that after land use change the amount of minerals differed significantly while no significant difference was found in C/N ratio.

Since land use change leads to negative consequences on soil physical and chemical properties, therefore, this research was aimed to investigate the effect of land use change from rangeland to agriculture on soil degradation in the rangelands of Kaluk(Baft), Dehsard(Orzooiyeh), and Koohsefid (Rabar) in Kerman province to provide management strategies to prevent the degradations much as possible.

Materials and methods

Land uses

The geographical coordinates of the study sites are presented in Table 1. A range site was also selected as control for each land use.

Sampling method

Before carrying out field studies, the study area was determined with preliminary studies using topographic maps. To investigate the effects of land use change on soil properties, 24 soil profiles were taken in a random-systematic method at two depths of 0-30 cm and 30-60 cm in three replications. Soil samples were air-dried, ground and passed through a 2-mm mesh sieve. Soil texture (hydrometer method), available potassium (Flame photometer method), organic matter (titration method), total nitrogen (Kjeldahl method), available phosphorus (Olsen method), pH (pH meter), EC (EC meter), and lime (titration method) were measured.

Data analysis

The comparison between each land use and the control site was performed using an unpaired t-test. To determine the variations for the study factors among all land uses, data were analyzed with SPSS 16 software using a one way ANOVA in a completely randomized design. Mean comparisons were performed using Duncan's multiple Range Test.

Results

Comparison of soil properties between the two land uses of rangeland and abandoned agriculture inDehsard region at 0-30 cm depth showed that, except for phosphorus, clay and sand percentage, there was no significant difference for other soil properties between these two land uses ($p<0.05$).

Table 1. Geographical coordinates of the study sites.

Row	Site	Longitudes	Latitudes
1	Kaluk	45° 69' 13"-45° 85' 81"	32° 31' 83"- 32° 32' 35"
2	Dehsard	45° 54' 93"-45° 60' 40"	31° 69' 90"-32° 32' 39"
3	Koohsefid	48° 00' 19"-48° 13' 24"	32° 37' 49"-32° 38' 05"

Comparison of soil properties between the two land uses of rangeland and abandoned agriculture inDehsard region at 30-60 cm depth showed that, except for potassium and phosphorus, there was no significant difference for other soil properties between these two land uses ($p<0.05$), so that the values of potassium and phosphorus were higher than those of abandoned agriculture ($p<0.05$).

Table 2. Effects of land use change from rangeland to abandoned agriculture on soil properties at two soil sampling depths (Dehsard region).

Soil properties	0-30 cm				30-60 cm			
	Abandoned agriculture	Rangeland (control)	T	Sig	Abandoned agriculture	Rangeland (control)	T	Sig
pH	8.01 ± 0.03^{a}	$8/07\pm0/01^{a}$	-1/60	$0/89^{ns}$	$7/94\pm0/03^{a}$	$7/98\pm0/01^{a}$	-0/98	$0/37^{ns}$
EC	$0/11\pm0/00^{a}$	$0/14\pm0/02^{a}$	0/32	$0/62^{ns}$	$0/16\pm0/00^{a}$	$0/15\pm0/00^{a}$	1/19	$0/28^{ns}$
Nitrogen	$0/10\pm0/01^{a}$	$0/14\pm0/01^{a}$	0/29	$0/72^{ns}$	$0/18\pm0/00^{a}$	$0/17\pm0/02^{a}$	-1/23	$0/27^{ns}$
Phosphorous	$9/9\pm0/44^{a}$	$4/9\pm0/44^{b}$	0/25	0/00**	$9/01\pm1/16^{a}$	$5/81\pm1/78^{b}$	0	0/05**
Potassium	$170/21\pm9/3^{a}$	$164/37\pm8/08^{a}$	1/91	$0/11^{ns}$	$146/43\pm0/8^{a}$	$130/13\pm1/24^{b}$	2/64	0/05**
Organic matter	$0/95\pm0/08^{a}$	$0/88\pm0/15^{a}$	0/38	$0/71^{ns}$	$0/49\pm0/03^{a}$	$0/84\pm0/29^{a}$	-1/26	$0/26^{ns}$
Lime	$17/9\pm0/7^{a}$	$16\pm1/41^{a}$	-0/07	$0/94^{ns}$	$73/33\pm1/55^{a}$	$75/66\pm0/16^{a}$	1/45	$0/2^{ns}$
Clay	$17/16\pm0/22^{b}$	$21/83\pm0/3^{a}$	11/25	0/03*	$17/14\pm0/25^{a}$	$21/33\pm0/40^{a}$	24/5	$0/54^{ns}$
Silt	$19/18\pm0/47^{a}$	$21/83\pm0/42^{a}$	-1	$0/36^{ns}$	$21/20\pm0/47^{a}$	$18/34\pm0/42^{a}$	-7	$0/41^{ns}$
Sand	$63/66\pm0/33^{a}$	$56/33\pm0/33^{b}$	-32/07	$0/04^{**}$	$61/66\pm0/33^{a}$	$59/82\pm0/33$	41/80	$0/3^{ns}$

* and ** indicate significant at 5% and 1 % levels of significance, respectively.

ns indicates not significant.Means with the same common letters in each column are not significantlydifferent.

In abandoned agriculture inKaluk region at 0-30 cm soil depth, there was no significant difference for soil properties ($p<0.05$), except for nitrogen and clay percentage. At 30-60 cm soil depth, the comparison of soil properties between the abandoned agriculture and rangeland in Kalukregion showed that, except for clay, sand and silt percentage, there was no significant difference for other soil properties ($p<0.05$).

In abandoned agriculture in the Koohsefidregion at 0-30 cm soil depth (Table 4), the comparison of soil properties with rangeland showed that there was no significant difference among the soil properties studied ($p<0.05$). At 30-60 cm depth, except for pH, EC, potassium, phosphorous, clay and sand percentage, there was no significant difference for other soil properties studied between abandoned agriculture and rangeland($p<0.05$).

Table 3. Effects of land use change from rangeland to abandoned agriculture on soil properties at two soil sampling depths (Kalukregion).

Soil properties	0-30 cm				30-60 cm			
	Abandoned agriculture	Rangeland (control)	T	Sig	Abandoned agriculture	Rangeland (control)	T	Sig
pH	8.17±0.01 [a]	8/07±0/01[a]	5/32	0/43[ns]	7/69±0/01[b]	8/18±0/01[a]	-11/61	0/05*
EC(dS/m)	0/10±0/01[a]	0/14±0/02[a]	1/13	0/13[ns]	0/21±0/01[a]	0/15±0/00[b]	3/80	0/01**
Nitrogen	0/04±0/01[a]	0/02±0/01[b]	42/1	0/05*	0/08±0/01[a]	0/07±0/02a	0	74[ns]
Phosphorous	5/14±1/6[a]	6/9±0/44[a]	-0/44	35[ns]	9/14±1/08[a]	5/81±1/78[b]	1/19	0/00**
Potassium	100/52±1/37[a]	112/21±1/08[a]	1/7	0/14[ns]	150±0/88[a]	113/13±1/24[b]	3/38	0/02*
Organic matter	1/22±0/12[a]	0/88±0/15[a]	1/00	0/20[ns]	0/77±0/12[b]	0/84±0/29[a]	-0/24	0/81[ns]
Lime	73/91±0/90[a]	74/00±1/41[a]	-0/44	0/96[ns]	75/29±0/66[a]	75/66±0/16[a]	-0/59	0/57[ns]
Clay	14/16±0/15[a]	21/84±0/18[a]	12/00	0/05*	34/16±0/16[a]	24±0/3a	22/13	0/00**
Silt	29/18±0/17[a]	27/83±0/12[a]	-0/43	0/39[ns]	38±0/25[a]	38/66±0/21[a]	-1/58	0/17[ns]
Sand	56/66±0/23[a]	50/33±0/21[a]	-16/66	35[ns]	27/83±0/16[b]	36/50±0/22[a]	-41/18	0/00**

Analysis of variance and comparing the effects of different land uses on soil properties

The comparison of soil properties in the land uses studied at 0-30 cm depth (Table 5) showed that, except organic matter and pH, other soil properties had significant differences ($p<0.05$).

Maximum EC was recorded for the abandoned agriculture inKoohsefid, and its control while minimum EC was obtained for the abandoned agriculture inDehsard. Maximum nitrogen was obtained for the Dehsardrangeland and minimum phosphorous was recorded in Kalukrangeland. Maximum phosphorous and potassium was recorded for the abandoned agriculture in the Dehsard and Koohsefid, respectively. Maximum organic matter was measured for the abandoned agriculture inKaluk, and minimum organic matter was detected at three control rangelands.Maximum and minimum lime was measured for the abandoned agriculture in Koohsefid and Dehsard rangeland, respectively.The maximum values of clay, silt and sand was recorded for the Koohsefid rangeland, abandoned agriculture in Kaluk and abandoned agriculture in Dehsard, respectively.

Table 4. Effects of land use change from rangeland to abandoned agriculture on soil properties at two soil sampling depths (Koohsefid region).

Soil properties	0-30 cm				30-60 cm			
	Abandoned agriculture	Rangeland (control)	T	Sig	Abandoned agriculture	Rangeland (control)	T	Sig
pH	8.11±0.00 [a]	8/00±0/00[a]	2/58	0/79[ns]	8/01±0/02[a]	7/98±0/01[a]	0/94	0/38[ns]
EC	0/18±0/00[a]	0/18±0/01[a]	0/00	0/19[ns]	0/16±0/01[a]	0/15±0/00[a]	1/19	0/33[ns]
Nitrogen	0/05±0/00[a]	0/06±0/00[a]	17	0/23[ns]	0/07±0/01[a]	0/06±0/02[a]	0	47/0[ns]
Phosphorous	6/23±2/17[a]	7±0/000[a]	0/44	0/14[ns]	5/00±1/49[a]	5/81±1/78[a]	0	79/0[ns]
Potassium	233/4±4/1[a]	189/21±3/58[a]	1/91	0/56[ns]	110/25±1/12[a]	100/13±1/24[a]	0/66	0/53[ns]
Organic matter	0/94±0/17[a]	0/88±0/15[a]	0/20	0/92[ns]	0/6±0/13[a]	0/84±0/29[a]	-0/74	0/48[ns]
Lime	74/62±1/42[a]	74/10±1/41[a]	0/32	0/51[ns]	75/75±0/17[a]	75/66±0/16[a]	0/34	0/74[ns]
Clay	24/18±0/22[a]	28/83±0/40[a]	-3/54	0/53[ns]	29/10±0/32[a]	19/30±0/2[b]	-13/48	0/00**
Silt	19/78±0/47[a]	19/83±0/32[a]	-43/11	0/26[ns]	24/8±0/31[a]	20/30±0/28[a]	-24/26	0/38[ns]
Sand	56/66±0/33[a]	51/33±0/73[a]	45/97	0/31[ns]	46/16±0/43[b]	60/40±0/77[a]	-29/82	0/00**

* and ** indicate significant at 5% and 1 % levels of significance, respectively.

ns indicates not significant.

Means with the same common letters in each column are not significantlydifferent.

The comparison of soil properties in the land uses studied at 30-60 cm depth (Table 6) showed that, except lime and pH, other soil properties had significant differences ($p<0.05$), so that maximum EC was recorded for the abandoned agriculture in Kaluk.Maximum and minimum values of nitrogen was obtained for the abandoned agriculture in Dehsard and abandoned agriculture in Koohsefid.Maximum phosphorous and potassium was measured for the abandoned agriculture in Kaluk. The three control rangelands had maximum organic matter and the minimum value of organic matter was recorded for the abandoned agriculture in Dehsard.The maximum values of clay, silt and sand was recorded for the abandoned agriculture in Kaluk, the Kaluk rangeland and abandoned agriculture in Dehsard, respectively.

Table 5. Effects of different land uses on soil properties at 0-30 cm soil depth.

			Mean					
Soil properties	Sig	F	Abandoned agriculture (Dehsard)	Abandoned agriculture (Koohsefid)	Abandoned agriculture (Kaluk)	Rangeland (control) (Dehsard)	Rangeland (control) (Koohsefid)	Rangeland (control) (Kaluk)
pH	0/09^{ns}	3/14	8/01±0/02a	8/11±0/00^{a}	8/17±0/01^{a}	8/07±0/01^{a}	8/00±0/00^{a}	8/07±0/01^{a}
EC(dS/m)	0/05*	3/07	0/11±0/000^{c}	0/18±0/00^{a}	0/10±0/01	0/14±0/02^{b}	0/18±0/00^{a}	0/14±0/00^{b}
Nitrogen	0/05*	1/10	0/10±0/00^{a}	0/05±0/00^{b}	0/04±0/01^{b}	0/14±0/01^{a}	0/06±0/00^{b}	0/02±0/01^{a}
Phosphorous	0/05*	0/30	9/40±0/44a	7/28±2/17^{ab}	6/14±1/60^{b}	5/32±0/44^{b}	6/30±0/000^{a}	6/51±0/24^{ab}
Potassium	0/00**	1/55	17/02±9/30^{b}	233/40±4/10^{a}	107/02±1/37^{c}	166/37±8/08^{b}	178/21±4/08^{b}	115/21±1/00^{c}
Organic matter	0/34^{ns}	1/18	0/95±0/08^{a}	0/94±0/17^{a}	1/22±0/12^{a}	0/88±0/15^{a}	0/88±0/15^{a}	0/88±0/15^{a}
Lime	0/03*	0/08	17/91±0/50^{b}	74/62±1/42^{a}	73/91±0/90^{a}	16±1/41^{b}	74/10±1/41^{b}	74±1/41^{a}
Clay	0/04*	113/8	17/16±0/21^{b}	24/18±0/22^{a}	14/16±0/15^{b}	21/83±0/30^{a}	28/83±0/4^{a}	21/84±0/18^{a}
Silt	0/04*	145/04	19/18±0/17^{b}	19/78±0/47^{b}	29/18±0/17^{b}	21/83±0/42^{a}	19/83±0/32^{b}	27/83±0/18^{a}
Sand	0/05*	157/4	63/66±0/37^{a}	56/66±0/33^{b}	56/33±0/23^{b}	56/33±0/33^{b}	51/33±0/73^{b}	50/33±0/11^{b}

* and ** indicate significant at 5% and 1 % levels of significance, respectively.

ns indicates not significant.

Means with the same common letters in each column are not significantly different.

Discussion

In order to achieve sustainable management of land and improve its quality, the quantitative assessment of factors and indicators affecting the sustainability of land is essential(Mohammadi *et al.,* 2010). Soil properties are among the most important determinants of the sustainability of forest and range ecosystems. Among the soil chemical properties studied at 0-30 and 30-60 cm depths, potassium and phosphorous were higher in abandoned agriculture lands.This is due to the farmers' use of fertilizers and vegetation. Given that the land uses studied (abandoned agriculture), on the one hand, have specific climatic conditions and, on the other hand, have the same soil conditions, therefore, no significant changes were observed in the results and laboratory results confirm the accuracy of the measurements. In relation to the yield or production per unit area of plants in different land uses, what is important, is considering the elements required by plants. In this regard, considering macronutrients including nitrogen, phosphorus and potassium (KPN) is important. Assuming there are plenty of the mentioned elements, they are necessarily reduced due to the consecutive planting and harvesting during several years, so that to increase or bring the production to normal level or close to it, farm management is very important. Therefore, the soil samples taken in the consecutive years could determine the deficiency and excess of these elements in the land.

With respect to declining trend of elements, these elements must be added in the form of organic and chemical fertilizers in to the ground each year. Potassium is one of the macronutrients, after nitrogen and phosphorus, which due to its role in regulation of photosynthesis, carbohydrate transmission, protein synthesis etc., its consumption in plants, after nitrogen, is more than any other elements; however, since soils often contain large amounts of the available potassium, plants are less likely to suffer from a lack of this element(Jafari and Sarmadian, 2003). According to the results, potassium showed significant difference between rangeland and abandoned agricultural land uses.However, the amount of potassium in the rangelands studied was lower as compared to abandoned agricultural land uses. Mojadadi *et al.*, (2012) investigated the effects of forest land use change on soil chemical properties and showed that organic carbon, total nitrogen and pH decreased due to the land use change from forest to other land uses while available potassium and phosphorous increased. The reason was due to the potash and phosphate fertilizers added to the soil.Nitrogen is one of the macronutrients for plant growth. Phosphorus is among the essential elements affecting the fertility of the soil in agricultural production. Soil phosphorous is classified into organic and inorganic phosphorus.The main part of phosphorus in the soil is inorganic.Plants absorb phosphorus in the form of ions (Salardini, 1995). The plants need for nitrogen is more than phosphorus; however, both elements are important, since the growth and energy production mechanisms are dependent on nitrogen and phosphorus.In addition, the production of nitrogen chemical fertilizers is three times the phosphorous fertilizers, indicating the plants need for nitrogen.However, the amount of fertilizer need be in accordance with the recommendations of scientific centers and according to the soil analysis. Our results clearly showed that the highest and lowest amount of phosphorous was recorded in abandoned agricultural lands and rangelands, respectively.In agricultural lands, due to the high dependence of plants on nitrogen and phosphorus and the use of soil nitrogen and phosphorus reserves by plants, the amount of nitrogen and phosphorus in the soil decreases with cultivation.Therefore, to improve the conditions for crop production these elements should be added to the soil as organic and chemical fertilizers.In rangelands that there is no human intervention through cultivation and fertilizing (organic and chemical) is not done, the amount of nitrogen and phosphorus is lower compared to other land uses.However, Yusefifard *et al.,* (2007) showed that the amount of phosphorous in rangelands, previously cultivated, was more than that of native rangelands.Soil Organic Matter (SOM) is an important part of soil, with an important role in soil fertility and productivity (Stevenson, 1994). The changes and storage of soil organic matter in any time depends on its amount and speed of entry to the soil, provided through aerial and underground parts of plants.In addition, decomposition and mineralization of organic matter, due to the soil microbial activity, control the amount of organic matter in the soil. These processes are influenced by biotic and abiotic factors, including climate, vegetation, ecosystem management and more important soil physical, chemical and biological properties.Therefore, the amount of organic matter in the soil in arid regions is very small, representing a reduction of soil fertility in arid areas.The lack of organic matter or its low levels causes reduced soil fertility, soil and plant anionic and cationic exchange as well as the lack of water-holding capacity in soil.However, our results showed that the content of soil organic matter in rangeland was higher than that of abandoned agriculture, although the difference was not significant. With reference to the laboratory results, the lack of organic matter in the studied land uses is evident.The higher content of organic matter in rangeland indicates a better soil quality and, consequently, soil fertility.The reduced content of organic matter indicates microbial biomass reduction and that is why the content of organic matter in abandoned agriculture is low(Jones,1971).According to Agusilar and Kelly (1998), reduced content of organic matter due to the cultivation is resulted from accelerated biodegradation of organic matter, intensified soil erosion, and consequently organic matter loss with run off. Jones (1971) stated that decreased content of organic matter indicates reduced microbial biomass as well as reuse of organic matter. Cultivation is the most important factor reducing the content of organic matter in agricultural land.During plowing, the decomposition of soil organic matter increases.Carbon mineralization and CO2 release cause organic carbon to remove from the soil.Intensified erosion in agricultural lands is another factor reducing soil organic matter. Due to the land use change, soil erosion increases and organic matter is transferred to the soil surface.Meanwhile, during the tillage, the lower layers of the soil, having a low percentage of organic carbon, mix with the soil surface, possessing higher percentage of organic carbon, and as a result, soil surface organic carbon decreases as compared to the initial state (Aguislar and Kelly, 1998). Solaimani and Azmudeh (2010) studied the effect of land use change on soil chemical and physical properties, and soil erodibility. They similarly reported that the content of organic matter in agricultural lands was less than that of forestlands.In addition, maximum and minimum total nitrogen were observed in forest and garden land uses, respectively, and soil pH increased due to the forest land use change.Results of mean comparison showed an increased EC value in the abandoned agricultural land use in comparison with rangeland use.However, the condition of the study area was different from the condition of whole province, so that this region possessed maximum precipitation as compared to other regions of the province and the minerals forming the soil were not harmful.Therefore, the results of EC indicated non-saline soils of the studied land uses.However, continuous cultivation in abandoned agriculture and gardens made a slight change in EC.

Table 6. Effects of different land uses on soil properties at 30-60 cm soil depth.

Soil properties	Mean							
	Sig	F	Abandoned agriculture (Dehsard)	Abandoned agriculture (Koohsefid)	Abandoned agriculture (Kaluk)	Rangeland (control) (Dehsard)	Rangeland (control) (Koohsefid)	Rangeland (control) (Kaluk)
pH	0/9^{ns}	9/52	7/94±0/01^{a}	8/01±0/01^{a}	7/69±0/01^{a}	7/98±0/01^{a}	7/97±0/01^{a}	8/16±0/01^{a}
EC(dS/m)	0/05*	12/63	0/16±0/00^{a}	0/16±0/01^{a}	0/21±0/01^{b}	0/15±0/00^{a}	0/15±0/00^{a}	0/15±0/00^{a}
Nitrogen	0/05*	2/98	0/18±0/00^{a}	0/05±0/01^{b}	0/07±0/01^{b}	0/17±0/02^{a}	0/08±0/02^{b}	0/08±0/02^{b}
Phosphorous	0/05*	1/28	9/01±1/16^{a}	5±1/49^{b}	9/14±1/08^{a}	5/81±1/78^{b}	5/81±1/78^{b}	5/81±1/78^{b}
Potassium	0/05*	3/28	146/43±0/8^{a}	110/25±1/12^{b}	147±0/88^{a}	130/13±1/24^{a}	102/23±1/24^{b}	113/13±1/24^{b}
Organic matter	0/05*	18/93	0/49±0/03^{b}	0/6±0/13^{b}	0/77±0/12^{a}	0/84±0/29^{a}	0/84±0/29^{a}	0/84±0/29^{a}
Lime	0/08^{ns}	115/90	73/33±1/55^{a}	75/75±0/17^{a}	75/29±0/66^{a}	75/66±0/16^{a}	75/66±0/16^{a}	75/66±0/16^{a}
Clay	0/04*	2/95	17/14±0/25^{c}	29/1±0/32^{b}	34/16±0/16^{a}	21/33±0/4^{bc}	19/30±0/2^{c}	24±0/3^{bc}
Silt	0/04*	17/26	21/20±0/47^{b}	24/80±0/31^{b}	38±0/25^{a}	18/34±0/42^{b}	20/30±0/28^{b}	38/66±0/21^{a}
Sand	0/05*	3/18	61/66±0/33^{a}	46/16±0/43^{b}	27/83±0/16^{c}	59/82±0/33^{a}	60/40±0/77^{a}	36/5±0/22^{a}

* indicate significant differences from control ($P < 0.05$).Means with the same common letters in each column are not significantly different.

According to the obtained results, the soil EC in abandoned agricultural lands increased due to the land use change. Sanchez *et al.,* (2002) investigated the effect of land use change on soil properties of tropical regions and reported that the changes of soil pH and EC were due to the management activities including fertilization.

Soil texture is one of the physical properties of soil affecting other soil properties including soil bulk density, soil moisture storage, soil structure, soil permeability, cation exchange capacity, saturation percentage and organic matter content (Jafari Haqiqi, 2003).Organic matter has a significant role in the formation of soil structure and makes it more stable.In sandy soils (light), organic matter leads to the formation of soil structure by binding soil particles, and in clayey soils (heavy), prevents the adhesion of soil particles and provides a better soil condition.Therefore, soil organic matter leads to the formation of more stable soil structure.Most of the soil properties are influenced by soil structure. For instance, water infiltration, soil ventilation, soil porosity, water retention in the soil, and root penetration in the soil are all influenced by soil structure.It is noteworthy mentioning that anion and cation exchange depends on the content of clay and silt, and results of soil texture analysis for the studied land uses showed that the content of clay was low.In fact, a suitable soil is a soil in which the ratio of clay, silt and sand are equal and organic matter causes the development of soil aggregates, having a large share in soil fertility and increased production. Consequently, land use change from rangeland to abandoned agriculture significantly changed soil texture, so that the average content of silt and clay showed significant difference ($p<0.05$).Since clayey soil has a higher water-holding capacity in comparison with loamy and sandy soil, organic matter would enhance water-holding capacity through binding soil particles together (Zarrinkafsh, 2002). Mofidi *et al.,* (2012) stated that land use change from rangeland to dry farming did not affect soil texture.However, the clay content in the abandoned agriculture increased significantly as compared with rangeland.It seems that this may cause the change of soil texture in the long term.

Obviously, the potential of soil degradation is increased by the effects of land use change from rangeland to the agricultural lands, gardens and abandoned agricultural lands.In addition, a complete change in the type and nature of vegetation, as a result ofland use change, causes the changes in the morphology of soil porosity through changing the depth of rooting.Since, in the study area, a complete reclamation of rangelands is impossible, therefore, reduced tillage practices and adding organic mattertothesoil could be considered as a long-termsolution toimprovethe current problems of soil physical properties in the agricultural lands.

Intherangelands, the exit of excess livestock and preventing livestock entry to the rangeland before range readiness could improve the soil properties in the long term.

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