



The Effect of Land use Changes on Soil Quality Indicators and Carbon Sequestration in Semi-arid Areas

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Extended Abstract

Introduction: The rapid concentration of greenhouse gases (GHGs) especially carbon dioxide (CO₂) is considered as the main cause of global warming and climate change. Today, the change and conversion of forest lands and rangelands to agricultural lands has become one of the important concerns in the world in terms of environmental degradation and global climate changes. Land use change causes disturbance of the ecosystem and can influence the carbon stocks and fluxes. Soil organic carbon tends to be decreased when transforming grasslands, forest or other native ecosystems to croplands or agricultural lands. Therefore, the estimation of carbon storage would be useful to evaluate the amount of carbon potentially emitted to the atmosphere due to land use changes. The purpose of this study was to investigate the soil quality indices and amount of carbon sequestration in four land uses namely oak forest (natural), pine and cedar (plantations), agriculture, and under tree crown cultivation in oak forests in Chaghasabz forest park in Ilam.

Materials and Methods: For this purpose, 10 soil samples from each land use (total of 40 samples) were taken from 0-30 cm depth of soil using systematic random sampling method. In addition to measuring the amount of carbon content of soil, some physical and chemical properties of soil (nitrogen, phosphorus, potassium, lime, clay, silt, sand, acidity, electrical conductivity, bulk density and soil stability) were also measured in each land use. Statistical analysis of physical and chemical properties of soil for four land-uses was carried out based on a systematic randomized design with 10 replications for each land use. Normality of data using Kolmogorov-Smirnov test and homogeneity of variance of data were analyzed based on Levene test. To compare soil quality and carbon sequestration properties in different land uses, one-way analysis of variance (F test) was used and the Duncan test was used for grouping and comparing the averages at 95% confidence level.

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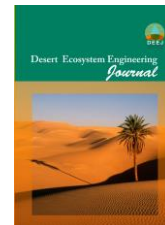
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Results: The results showed that the soil carbon sequestration in under tree crown cultivation (58.09 ton/ha) and natural oak forest (56.72 ton/ha) was significantly higher than the two other land uses namely pine and cedar plantation (37.95 t ha⁻¹) and agriculture (31.80 tons / hectare). However, there was no significant difference in soil carbon sequestration between the two land uses namely natural oak forest and under crown oak trees cultivation. The results of Pearson correlation test between soil physical and chemical indices showed that the cation and potassium exchange capacity are positively correlated and lime has a negative correlation with the amount of organic carbon.

Discussion and Conclusion: The results showed that the soil quality in the natural oak forest is more favorable than the other three land uses. Therefore, based on the results of this research, the need for preserving the natural forests and preventing it from changing into other land uses, including agriculture should be emphasized.

Keywords: Agriculture lands, Forest park, Oak forest, Under- story cultivation, Ilam province.