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Research Article

EFFECT OF CONVERSION OF FOREST LAND TO THE TEA GARDENS ON THE ORGANIC CARBON NITROGEN AND PHOSPHORUS IN THE SOIL (CASE STUDY: NORTH OF IRAN)

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ABSTRACT
Conversion of forest land to the tea gardensis one of the important human interferences in natural ecosystems, which is effective on ecosystem processes particularly soil. In order to effect the conversion of forest land to the tea garden, on some physical and chemical properties of the soil (nitrogen, organic carbon, phosphorus, carbon to nitrogen ratio, carbon to phosphorus ratio), Series 2 Gamble in the area of watershed 26 forests were selected. The systematic random sampling method for soil and 0 to 30 cm depth was used. A total of 40 soil samples (20 samples for each region) to measure soil parameters were taken and transferred to the laboratory. After normalization of the data, by using Kolmogorov-Smirnov method, using the software SPSS 18, in order to evaluate and compare the average data related to all parameters considered for the soil in two fields of forest and tea garden, the Non-paired t test was used. The results showed that, Carbon to nitrogen ratio, and the ratio of carbon to soil phosphorus in forested area is more than tea gardens area, and on the contrary, the percentage of organic carbon, nitrogen and phosphorus content in tea garden soil is more than forested areas, which it shows increasing soil quality due to conversion of forest land to the tea gardens in the forested areas destroyed.

Keywords: *Land Use Change, Forest, Tea, Soil, Gamble*

INTRODUCTION
Soil quality is considered as one of the most important factors considered in the evaluation of soil management and biological realm sustainability. Soil properties have been heavily influenced by soil management systems and land use. Land use change on ecosystem processes, especially carbon and nitrogen mineralization rate, is effective. Effect of different land uses, with the addition of their litters on the soil surface, in natural forests and tea gardens can be positive or negative impact on the physical, chemical and biological properties of the soil. Changes in land use and agricultural practices in the virgin lands lead tothe reduction of entry of the crop residues to the soil. Decrease in carbon stocks in soil leads to a decrease in microbial biomass and activity of micro-organisms insoil. This important part of soil plays an important role in organic matter decomposition and return of necessary nutrients. Land use change from forest to agriculture, especially in steep terrain and erodible lands, is a major problem, which with direct impact on soil quality parameters in addition to the damage and loss of potential of the soil, damage through increasing soil Erodibility (Marinari *et al.*, 2006). Soils of forest lands, due to high organic matter, and suitable buildings, have always been considered, but changes in management and their use and tillage practices, mainly huge impact on the amount of organic matter and other physical and chemical properties of the soil (Li *et al.*, 2007; Yimer *et al.*, 2007). Therefore, land use change from forest to agriculture reduces soil organic matter and In contrast to that the conversion of agricultural lands to natural vegetation can lead to increase of soil organic matter (Dawson and Smith, 2007; Stoate *et al.*, 2001). The results of forest land use changes on some soil physical and chemical properties in part of Berenjestanak watershed in three users of the forest, dry land farming (wheat) and garden indicated that the amount of organic matter in the agricultural lands and garden, respectively, 44.24 and 45.45 percent in layer0-10 cm, 42.69 and 43% in the layer10-20 cm was lower than forested land. The maximum total nitrogen in the layer0-10 cm in the forest land equal to30 percent, its lowest in the layer10-20 cm in the

garden lands was observed equal to0.19 percent (Soleymani and Azmoodeh, 2010). Given the importance of land use changes on soil properties, this study examines the impact of conversion of forest land to the tea gardens in Series 2 Gamble in the Gilanprovince.

MATERIALS AND METHODS

Series 2 Gamble with area of 4076 hectares is the central and northern part of the watershed of the Koohrood and a part of jurisdiction of the Department of Natural Resources of Lahijan, in Gilan province. It is located on between longitudes 49^0 59' 0" to 50^0 7' 30" east and Longitude 37^0 5' 0" to 37^0 5912' 30" north. The minimum and maximum its height from sea level is equal to 50 to 830 m, and its general direction is north. The average annual rainfall is 1264.5 mm and the mean annual temperature is 16 ° C (Untitled, 2007).

Figure 1: Geographical location of the area studied

The systematic random sampling method from the soil of two regions was used. Thus, after design of a grid 50 × 50 mm, 30 points for each region were selected, after a survey of the fields studied, sampling was done from 20 points in each region of 0 to 30 cm depth. The samples of soil (40 samples) were extracted transported to the laboratory, and organic carbon by using block-Vakly method, soil nitrogen by using Kjeldahl method and phosphorus of the soil by using flame photometry method were extracted (ZarinKafsh, 2001; Salardini, 2005). Analysis and comparison of mean data, using the software SPSS 18 and unpaired t-test was performed, and graphs were plotted in Excel software.

RESULTS AND DISCUSSION

Results

1. Organic Carbon

The results of the disintegration of variance and comparison of mean data by using non-paired t-test showed that the percentage of organic carbon in forest area has a significant difference in the 99% confidence level with tea gardens (Sig = 0/000) (Figure 2).

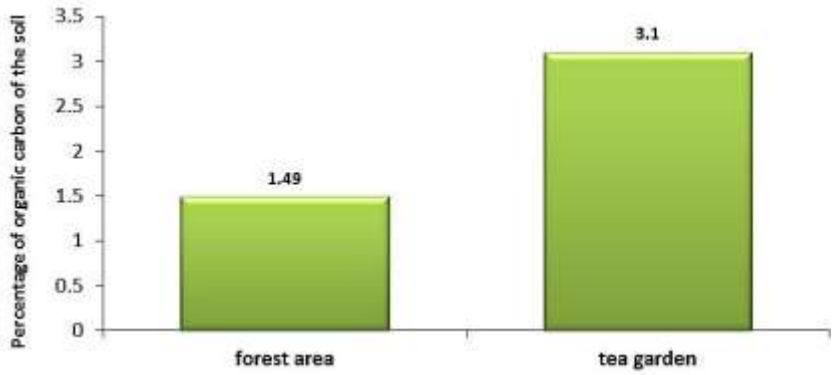

Figure 2: Average percentage of soil organic carbon in forests and tea gardens

2. Nitrogen

The results of the disintegration of variance and comparison of mean data by using non-paired t-test showed that the percentage of nitrogen of the soil in forest area has a significant difference in the 99% confidence level with tea gardens (Sig = 0/000) (Figure 3).

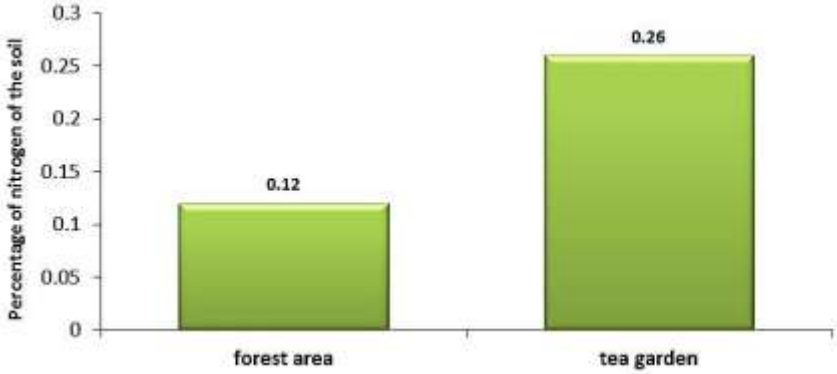

Figure 3: Average percentage of nitrogen in the soil in the forests and tea gardens

3. ***Phosphor***

The results of the disintegration of variance and comparison of mean data by using non-paired t-test showed that the percentage of phosphor of the soil in forest area has a significant difference in the 99% confidence level with tea gardens (Sig = 0/000) (Figure 4).

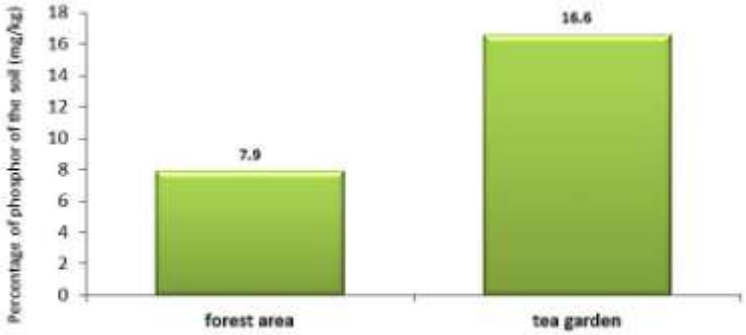

Figure 4: Average soil phosphor of the soil in forest and tea gardens

4. Ratio of the Carbon to Nitrogen

The results of the disintegration of variance and comparison of mean data by using non-paired t-test showed that the percentage of carbon to Nitrogen ratioin forest area has no significant difference in the 95% confidence level with tea gardens (Sig = 0.13) (Figure 5).

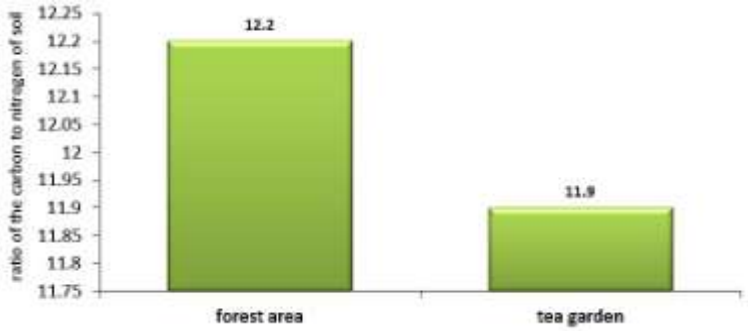

Figure 5: Average ratio of carbon to nitrogen in forests and tea gardens

5. Ratio of the Carbon to Phosphor

The results of the disintegration of variance and comparison of mean data by using non-paired t-test showed that the percentage of carbon to phosphorratioin forest area has no significant difference in the 95% confidence level with tea gardens (Sig = 0.725) (Figure 6).

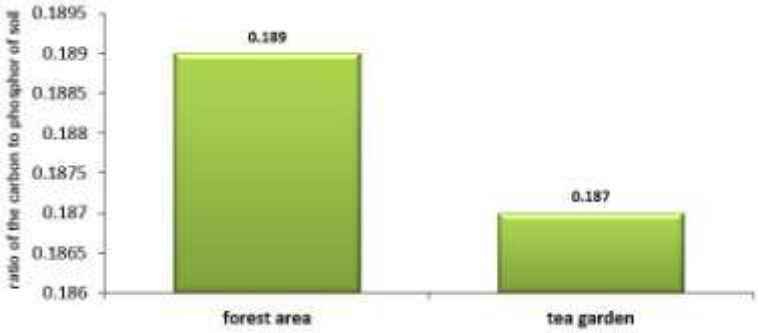

Figure 6: Average ratio of carbon to soil phosphorin forests and tea gardens

Discussion

Amount of nitrogen and organic carbon in the soil in first place is closely related to the amount of humus, plant debris and plant growth, which depending on the type ofrelevant humus and plant changes. In different soil horizons, the amount of the total nitrogen, varies hugely, so that, the A horizon in the different soil types has the highest and the C horizon has the lowest nitrogen. In the depths of the underworld, which the biological activity of the soil completely stops, nitrogen can be reduced to zero (August and Ranger, 2001). High levels of nitrogen and organic carbon in the tea gardens in comparison with forests, due to litter and plant debris is more than the tea gardens.Percentage of nitrogen in leaf tissues is more than any other plant organs and aredecomposed and returned to the soil earlier (Johnson *et al.*, 1990; Hagen *et al.*, 2004). Leaf loss during the year, because of the evergreen plant has caused soil of tea garden areas has more nitrogen than forests. Research conducted by Augusto (2001) has shown that the amount of nitrogen, carbon and organic matter of the soil depends on the available species, which leads to improve physical and biological properties of soil and increase of concentration of main cautions of the soil. Increase or decrease the amount of organic carbon can be attributed to the plant residue and leave of these plants, which improve soil physical and biological properties (Fisher and Binkliy, 1999). With the increase in the slope areas, as well as the amount of nitrogen and organic carbon content is reduced, which is due to more leaching at high levels of slope. Phosphorus in an organic form can't absorb by the plant and its inorganic form can be absorbed with microorganisms' intervention accordingly, and placed at the disposal of plant. The high activity of microorganisms in the tea gardens in comparison with the forests causes this difference. It seems that habitat condition, particularly biological conditions of the soil, on this issue has been effective (Fakhari, 2005). Probably different coverage will have a different and opposite effectonorgan phosphorus compounds and cycling and storage of the

phosphor in the soil (Hagen *et al.*, 2004). HabibiKaseb (1992) suggests that the mineralization of organic phosphor on Moore humus-rich soils with low biological activity have been slow, and vice versa, in soils with high biological activity and humus like moles, this mineralization and stabilization is faster (Fakhari, 2005). Fertility factors, the ratio of carbon to nitrogen and carbon to phosphorus ratio of the soil in the tea gardens showed no significant with forests at the 95% confidence level. And the average these ratios in the present study in the forestsare more than the tea gardens. The low ratio of carbon to nitrogen and carbon to phosphorus ratio in the tea garden areas than in the forests suggests that organic matter is more in the tea gardens (ZarinKafsh, 1997). ZarinKafsh (1997), in another study, concluded that, whatever the amount of nitrogen in leaves is higher, the relationship between C/N and C/P are smaller and mineralization and litter decomposition are done faster. Ratio of carbon to nitrogen and carbon to phosphorus fertility rate, have an inverse relationship (ZarinKafshin, 2001).The forests studied are a part of the forestsdestroyed with species of hazel, hornbeam, Gleditchiacaspica and Diospyros lotus, and within a rural road, with beautiful natural scenery, and on the weekends, many tourists come to these forests. These factors cause more erosion of the soil in the forests than the tea garden areas, and the penetration and porosity of the water is reduced, and in some cases, cause to make Water weed, which in turn will lead to erosion (Azmoodeh and Soleimani, 2010; Fays *et al.*, 2001). Tea Gardens area studied was surrounded, and with evergreen and its leaves autumn annually, while providing required nitrogen for soil fertility causes osteoporosis and increase of permeability of the soil in this area, and with decrease in bulk density, the soil porosity is increased (Elias, 1995). This issue doubles the importance of the existence of the tea gardens in the forest areas destroyed to conserve soil and water, and maintain soil fertility.

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