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# Soil Properties and Crop Productivity of Kiln Sites in the Highlands of North-western Ethiopia

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**Abstract :** Ethiopian farmers traditionally produce charcoal under several kilns on cultivated land: particularly in Kasiry micro-watershed Fagita Lekoma district of Northwestern Ethiopia. However, the effects of such soil heating and remnants of charcoal leftover on soils have not been adequately documented. Hence, this study tried to quantify the effects of such kiln sites on selected soil properties and wheat crop performance. Soils from four kiln sites were thus purposively sampled at depths of 0-20 cm, 20-40 cm and 40-60 cm and were compared with the respective soil layers of none-kiln sites from similar adjacent fields. While soil moisture content was sampled at kiln and none-kiln site in wet and dry seasons from each depth. In addition, a pot experiment was conducted using two sources of biochar (Acacia decurrens and Eucalyptus Camaldulensis) with four rates (0, 10, 20, and 40 t/ha) and compared with crops grown from soils of 1kiln sites without biochar application laid out in a CRD with three replications. The data were analyzed using SAS software Version 9.4.The result revealed notable variations of kiln site soils and along soil depth. The appreciable increased ($p<0.05$) soil pH (5.5 to 5.74), organic carbon (3.89 to 4.27%), TN (0.30 to 0.32%), CEC (32.59 to 35.23 cmolckg-1), Ca (6.44 to 7.9 cmolckg-1), Mg (4.48 to 5.46 cmolckg-1), and significantly ($p<0.01$) Av. P (30.25 to 46.4 ppm) and K (2.11 to 2.82 cmolckg-1) were recorded from the none-kiln to kiln soils, respectively. On the other hand, ex. acidity and aluminum, available Fe and Mn were reduced from 2.20 to 1.54, 1.95 to 1.31 cmolckg-1 and 57.46 to 41.40 and 5.65 to 3.86 ppm, respectively, from the control to the kiln. Soil texture was significantly affected by soil heating and along soil depth. The sand content was ($p<0.05$) varied between the value of 23% to 29% from none-kiln to kiln site, and clay content was ($p<0.01$) increased from 0-20 cm (32%) soil depth to 40-60 cm (43%) deeper soil. Significantly ($p<0.05$) higher Soil moisture content was recorded at none-kiln site (45.85%) compared to kiln (40.44%) in wet season, whereas in dry season, lower moisture content was revealed at kiln site (26%) compared to none-kiln (30.7%). As wet to dry season, soil moisture was decreased from 43% to 28% respectively. Bulk density ($P<0.01$) varied between 0.88 to 0.94 gcm-3 from control to kiln in dry season. Similarly, the value of soil pH (6.10), Av. P (58.12), exchangeable bases (Ca (9.83), Mg (6.19) and K (3.67)) were ($p<0.01$) higher at the 0-20 cm soil depth as compared to the deeper soils, the result of soil moisture (30 to 42%) and CEC (31 to 36 cmolckg-1) increased down the soil profile. After wheat harvest, soil pH, Av. P, CEC, and exchangeable bases (Mg, K and Na) were significantly higher in the kiln soil, while soil moisture and OC increased by the applied biochar of 20 and 40 ton/ha. High yield 2.28 gpot-1 ($p<0.01$) was recorded in kiln soil, growth parameters of wheat were significantly increased with increasing biochar rates.

**Keywords :** biochar, kasiry micro-watershed, kiln site, none-kiln site, soil properties
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