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Impact of a low severity fire on soil organic carbon and nitrogen characteristics in Japanese cedar soil Yamagata Prefecture, Japan

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Slash and burn practices are widely used around the globe with different degrees of success which are mostly related to the impact of fire on the soil properties. In Japan slash and burn practises, known as Yakihata, have a long history and are still used in Yamagata Prefecture today. The purpose of this study was to determine the impact of a low severity controlled fire on Japanese cedar (Cryptomeria japonica) forest soil (Cambisol) which is the dominant species among plantations in Japan. We measured organic carbon and nitrogen content as well as changes in carbon (δ13C) and nitrogen (δ15N) stable isotope composition in a steep west facing slope under heavy precipitation ($\sim$2600 mm/a) and heavy snowfall ($\sim$3-4 m/a). The results show that Ctotal and Ntotal values as well as the isotopes ratios of C and N change with decreasing elevation in the forest as well as in the burned site being consistent with leaching and erosion. The accumulation of Ctotal and Ntotal at the bottom of the slopes was remarkably higher at the slash and burned site than in the control forest site. After slash and burn δ15N isotopes in the slope in general became significantly lighter than in the control forest while the δ13C did not show any significant difference between the two sites except at the bottom of the slopes where δ13C was heavier in the forest. The reason for these changes in nitrogen and carbon isotopes appears to be related to the physical changes in soil horizon sequence of the original forest soil layer.

Keywords: high precipitation, Japanese cedar forest soil, low severity fire, stable isotopes, steep slopes