



INTISARI

Penggunaan lahan merupakan faktor penting dalam dinamika Karbon organik dan Nitrogen tanah. Penelitian mengenai perubahan penggunaan lahan dari padi sawah ke jenis penggunaan lahan lainnya telah dilakukan di daerah Kumagai, Shonai, Jepang. Tujuan dari penelitian ini adalah untuk mengetahui perubahan sifat kimia tanah dasar anantara lain pH, daya hantar listrik (DHL), P- tersedia, DOC, dan N-anorganik ($\text{NH}_4^+\text{-N}$ dan $\text{NO}_3^-\text{-N}$), serta untuk mengetahui pengaruh perubahan penggunaan lahan terhadap dinamika karbon dan nitrogen setelah 15-40 tahun perubahan tata guna lahan dari sawah ke *orchard*, *wetland* dan *upland*. Sembilan petak dari enam penggunaan lahan diselidiki, termasuk hutan, 2 padi sawah, *orchard*, *wetland*, 3 *upland*, dan *parking area* di dekat kuil Kumagai, Shonai-machi, Yamagata, Jepang. Sampel tanah dikumpulkan dari kedalaman 0-15 cm dan 15-30 cm pada bulan Oktober 2015. Sifat kimia tanah pH, DHL, Bahan Organik, Total Nitrogen, P tersedia, $\delta^{13}\text{C}$, DOC dan N anorganik ($\text{NH}_4^+\text{-N}$ dan $\text{NO}_3^-\text{-N}$) dianalisis dengan tanah kering angin. Inkubasi aerob dan anaerob dilakukan untuk mengukur mineralisasi karbon dan nitrogen (CO_2 , CH_4 , dan N Anorganik). pH meningkat secara signifikan di *upland* setelah 15 tahun konversi dari padi sawah di kedua lapisan, sementara penggunaan lahan lainnya hanya mengubah pH di kedalaman 15-30 cm. DHL menurun secara signifikan di *orchard* dan *upland* di kedalaman 0-15 cm dan di semua petak yang dikonversi di kedalaman 15-30 cm. P Tersedia secara signifikan menurun di semua lahan yang terkonversi, kecuali ke *upland* di kedalaman 15-30 cm. konsentrasi DOC tidak berbeda nyata setelah perubahan penggunaan guna lahan dari sawah ke semua lahan. N anorganik dari sampel awal ($\text{NH}_4^+\text{-N}$) menurun secara signifikan hanya pada kedalaman 0-15 cm di *upland*, sementara $\text{NO}_3^-\text{-N}$ meningkat secara signifikan hanya pada kedalaman 0-15 cm di *wetland*. Mineralisasi nitrogen meningkat baik dalam kondisi aerob dan anaerobik. Mineralisasi karbon pada inkubasi anaerobik lebih tinggi daripada inkubasi aerobik. CH_4 , CO_2 , dan N anorganik dihasilkan dari padi sawah B dan *upland* B setelah inkubasi anaerob. Perubahan signifikan pada karbon dan nitrogen tanah terlihat setelah 15 tahun konversi ke lahan *upland* dan 40 tahun konversi ke *orchard* dan *wetland*.

Kata kunci: karbon, nitrogen, *orchard*, sawah, *upland*, *wetland*.



ABSTRACT

Land use is an important factor in the dynamics of soil organic carbon and nitrogen, thus an experiment mitigating the effect of land use change from paddy field to other land use types were done in a temperate region, Kumagai area, northeast Japan. The objective of this study was to determine the changes in the basic soil chemical properties including pH, electrical conductivity (EC), available phosphorus (P), dissolve organic carbon (DOC) and inorganic Nitrogen (NH_4^+ -N and NO_3^- -N) and to investigate the effect of land use change towards carbon and nitrogen dynamics after approximately 15-40 years land use change from rice paddy field to orchard, wetland and upland in northeast Japan. Nine fields from six land uses were investigated including forest, 2 rice paddy, orchard, wetland, 3 upland, and parking area near Kumagai shrine, Shonai-machi, Yamagata, Japan. Soil samples were collected from surface layer (0-15 cm) and subsurface layer (15-30 cm) in October 2015. Soil chemical properties of pH, EC, SOC, TN, available P, δC^{13} , DOC and inorganic N (NH_4^+ -N and NO_3^- -N) were analyzed by air-dried samples. Aerobic and anaerobic incubation were conducted to measure the carbon and nitrogen mineralization (CO_2 , CH_4 , and Inorganic N). The pH increased significantly in the upland after 15 years conversion from rice paddy in both layers, while other land use changes only increasing pH in subsurface layer. EC significantly decreased in orchard and upland fields in the surface layer and in all converted fields in the subsurface layer. Available P significantly decreased in converted fields, except of the upland in subsurface layer. The amounts of DOC did not have a significantly different after land use changes from rice paddy fields. The inorganic N of initial samples (NH_4^+ -N) decreased significantly only in the surface layer of upland, while NO_3^- -N increased significantly only in the surface layer of wetland. Nitrogen mineralization increase in both aerobic and anaerobic condition. Carbon mineralization in anaerobic incubation was higher than those in aerobic incubation. CH_4 , CO_2 , and Inorganic N were produced high from paddy B and Upland B under anaerobic incubation. Significant changes in soil carbon and nitrogen were observed after 15 years conversion to upland and 40 years conversion to orchard and wetland from former rice paddy field in this study.

Keywords: CO_2 , CH_4 , land use change, NH_4^+ , NO_3^- , orchard, parking, rice paddy, upland, wetland.