

Soil N and C dynamics changes along stand age in a forest ecosystem in central Japan

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Stream nitrate (NO_3^-) concentration is a good index for nitrogen (N) cycling of the watershed (Aber et al. 1998). It is well known that disturbance causes NO_3^- leaching loss through the change of nutrient cycling change by decreasing vegetation uptake (ex. Likens et al. 1969, Vitousek et al. 1982). After a few decades NO_3^- leaching decreases and returns to the level of pre-disturbance (Fukushima and Tokuchi 2008). At that time it is considered that N cycling also returns to the pattern of pre-disturbance. However, it is still unknown whether the pattern of N cycling is same as the pre-disturbance. The purpose of this study is to examine the pattern of N cycling with stand development.

Soil nitrogen transformation, soil N availability and soil microbial biomass were measured along the stand age to examine soil N dynamics with forest development. Ecosystem properties such as N budget changed with stand development. It indicates that the N cycling changed from open cycle to closed cycle. Soil microbial biomass (SMB) N was the dominant available N pool irrespective of stand age and SMB increased with stand development. It is consistent with Gonzalez-Prieto and Villar 2003. Net N transformations rates was not significantly different between the stands in 7 and 32 years old and 90 years old stand, while gross N transformation rate was different among 7, 32 and 90 years old stand. ^{13}C and ^{15}N values increased with age for 30 years after clear-cutting, while those values decreased after 30 years. Decomposition process of organic matter seems to dominate for 30 years after clear-cutting and it changes to accumulation of relatively fresh organic matter after 30 years. These results show that N cycling changes from small pool and fast turnover to large pool and slow turnover in this study site.