Changes in vegetation and fire regimes since the mid-Holocene around Lake Rara, western Nepal

Nao Miyake1*, Arata Momohara2, Atsunori Nakamura3, Yusuke Yokoyama3, Makoto Okamura1, Hiromi Matsuoka1, Hideaki Maemoku4, Hiroshi Yagi5, Vishnu Dangol6, Toshiki Osada7

1Faculty of Science, Kochi University, 2Chiba University, 3University of Tokyo, 4Hiroshima University, 5Yamagata University, 6Tribhuvan University, 7National Institutes for the Humanities

Vegetation and fire regime changes since the mid-Holocene were investigated using pollen, plant macrofossil and macroscopic charcoal records in a core sediment (Rara09-4) (29.5347°N, 82.0933°E and 3,000 m a.s.l.) from Lake Rara in western Nepal. The pollen record was divided into two local pollen assemblage zones (I and II), even though it was co-dominated by Quercus and Pinus, with Abies, Picea and Betula pollen throughout the core. In zone I (ca. 6,000 to 3,000 yr B.P.), Quercus pollen had high values of more than 50% of total tree pollen. On the other hand, zone II (ca. 3,000 yr B.P. to present) is characterized by the decrease in Quercus pollen and increase in Pinus pollen. Most of fossil Quercus and Pinus pollen grains were Q. semecarpifolia and P. wallichiana types, based on their SEM identification. Fossil leaves of Q. semecarpifolia type were founded frequently in the both zones. Macroscopic charcoal influx increased progressively in zone I. Based on these fossil records and spatial patterns of forest vegetation in the present, during the mid to late Holocene, Q. semecarpifolia and P. wallichiana predominated in the forests mainly on the south-facing slopes, whereas especially on the north-facing slopes evergreen conifer forests consisting of Abies and Picea with Betula were established. The decline of Q. semecarpifolia and dominance of P. wallichiana in zone I may have been caused by changes in fire regimes associated with combined effects of climate changes and intensified land-use activities around the lake.

Keywords: fire regime, Holocene, Lake Rara, plant remains, pollen, vegetation