Geophysical Research Abstracts
Vol. 13, EGU2011-2904-2, 2011
EGU General Assembly 2011

Evaluation of soil resource of historical parks in Tokyo Metropolis

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Urban area due to the inflow of population has expanded with developing its land use highly intensive. As a result, many problems concerning, atmospheric environment and hydrological cycle, such as "urban heat island" and "urban flood", occur in mega cities. For the sustainable development of metropolis, we should intend to recognize the function of "urban nature" based on investigation of the roles and significance of "nature" remaining in urban area. Soil ecosystem of urban green spaces are expected to have various functions; mitigation of heated atmosphere, recovery of infiltration capacity, conservation of bio-diversity, storage of carbon, and so on. Green space park is one of the large infrastructures to support comfortable life in metropolis.

World Reference Base (FAO/ISRIC/ISSS) defined Technosols as a new Soil Group in 2006, which stimulated the researchers to discuss the resource of urban soils. Yet, the evaluation of soil resources in urban area is insufficient in Japan due to her policies, which pay strong attention to cultivated land and serious attention to soil pollution in urban and industrial areas. Moreover, data soil resources of urban green space are very limited due to the lack of practical methodologies for examining urban park soils. This study aims to develop the methodology to conduct soil survey in urban green park and to collect fundamental data for understanding soil forming process and function of urban soils in consideration with land use history, land creation method, current land coverage and management.

Three historical urban parks were studied here, which are the Kitanomaru Garden, a part of Kokyogaien National Gardens situated in the center of Tokyo, the Shinjyuku Gyoen Park and the Nature Study Park. Through the land creation history since the Edo era (17c), Kitanomaru Garden contains construction wastes in the base of park and the intensity of grading is stronger compared to Shinjyuku Gyoen Park and Nature Study Park. The matrix soil material of these parks is Andosols. The Kitanomaru Garden (ca19.3 ha) currently connected to the North Garden of the Imperial Palace was opened to public as the National Garden in 1949. Prior to this date, the National Gardens was part of the Imperial Palace grounds and Kitanoamru district was occupied by the Konoe Military Regiment (Special Imperial Guard) or government buildings from 1874 until early 1945. While, Shinjyuku Gyoen Park was constructed on the site of a private mansion belonging to Lord *Naito*. Completed in 1906 as an imperial garden, it was re-designated as a national garden after the World War and opened to the public in May 1949. In present, French Garden, English Landscape Garden and Japanese Traditional Garden, are arranged in the 58.3 ha area. The Nature Study Park became the residential site of lord *Matsudaira* during the Edo era and then was occupied by gunpowder warehouses by military in 1872. This area became an Imperial estate in 1917 and was opened to the public in 1949.

Soil compactness measurement using a 90cm cone penetrometer (Hasegawa-type Penetrometer) demonstrated the characteristics of urban park soils as the appearance of the alternated solidified layers caused by compaction of heavy vehicles, buildings, and pedestrians, and soft layers originated by ground filling, soil dressing or litter deposits from planted trees. Soil pH (H_2O) was acidic to strong alkaline in Kitanomaru Garden, while Shinjyuku Gyoen Park and Nature Study Park had weak to strong acidity. Total carbon content was 10-100kg^{-1} which depended on land creation and land use management. The high content of total Fe and amorphous Fe, probably originated from artifacts, suggested that high concentration of Fe could be one of the chemical characteristics of urban soil. A clear difference in the behavior on heat transmission was observed by comparing two difference types of soil pedons in Shinjyuku Gyoen Park. Thermal behaviors of urban park soils were strongly regulated by specific soil compression process related to initial grading method.