POTENTIALS OF SUB URBAN FOREST: PROJECTING SUSTAINABLE BIOMASS YIELD ON DOMINANT SPECIES

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ABSTRACT

Currently the sub urban (Satoyama) forests in Japan have become the important areas to restore management activities. Historically these forests derived multiple benefits to the environment and society. Before 1950-60s these forests were managed in a sustainable way to produce wood for fuels, leaf–litter for organic fertilizer etc and after abrupt shift to fossil fuel in 1950-60s these forests remained underused. In the last two decades thousands of volunteer groups have been formed for the conservation and restoration management of sub urban (Satoyama) forests. Recently, Japan government has also taken initiatives to manage the sub urban forests in a sustainable way to combat global warming in the light of low carbon society initiative. Therefore, determining strategy for sustainable management of sub urban forests can play a significant role in achieving the goal of sustainability. In this study our aim was to formulate a strategy for the sustainable management of sub urban forest in Japan and to ascertain the potential contribution of these forests to the environmental sustainability in their vicinages. The semi-natural sub urban (Satoyama) forest of Oaota, in Kashiwa, Chiba Japan was selected for the study with legal permission from non-profit organization (NPO). The sub urban (Satoyama) forest spans over a total area of 42 hectares, of which, only 4 hectares area is under NPO management. Within the NPO managed forest areas we identified Plantation Forest (PF)

site and Natural Forest (NF) site and two quadratic plots were set in each site to get the forest inventory data. We measured sectional diameters at 2 m intervals starting from 0.3 m from the ground by diameter tap alongside the total canopy height of trees using the Criterion RD 1000. Lengths and diameters of branches were also measured from photographs by using ArcGIS 10.0. We then used these data to obtain existing biomass stock (in the year 2010) of the forest. Afterwards we cut 16 trees of four dominant species viz., *Quercus serrata*, *Chamaecyparis obtusa*, *Cryptomeria japonica*, and *Carpinus tschonoskii* and 139 stem discs of 5 cm thick were collected for the growth ring analysis by WinDENDRO Reg2002b software. According to our finding, most of the trees in this forest are 50 years in age (approximately). Based on the early growth pattern of the dominant species, *Quercus serrata* and *Carpinus tschonoskii* exhibited higher biomass yields in the Oaota forest followed by *Chamaecyparis obtusa* and *Cryptomeria japonica*. As per our biomass calculation using Mitscherlich growth model, the total wood biomass of Oaota forest in 2010 was 4994 m^3 which will reach 6654.27 m^3 by 2020 adding 1660.27 m^3 biomass to the stock; under the assumed 2 % mortality rate. We suggested that 80 % of the yield over this period be felled after keeping aside 20 % for estimation error or future risk, may be one of the options for sustainable forest management. The structured questionnaire based interview of the NPO members and local people in Oaota area revealed their interest in harvesting some wood from Oaota forest at 10 years interval. Therefore, the information on future wood biomass accumulation will assist them in sustainable management of the sub urban (Satoyama) forest. In addition, we measured the carbon contents of soil at 0-15 cm and 15-30 cm depth, tree leaves by taking five conical shaped leaf traps of 1 m diameter in each plot and wood of the forest (inventory in 2010). According to our calculation, the total carbon sequestered by Oaota forest stood at 3399.9 tC for soil, 68.67 tC for tree leaves / y and 3200.085 tC for wood

upto the year 2010. In the light of projected future growth, we concluded that the sustainable management of sub urban (Satoyama) forest contributes not only towards wood production but also in environmental sustainability through providing substantial carbon sequestration service. However, to answer the question ‘how much biomass needs to be conserved in the context of sustainable management’, we need further research.

Key words: Satoyama, NPO, Dominant species, Semi-natural forest