

Carbon dioxide exchange in a young larch plantation after clearcut harvesting

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In order to evaluate carbon sequestration capacity, carbon dioxide flux has been monitored in a young larch plantation in northern Japan. The study site was located on a flat terrace in Teshio Experimental Forest, Hokkaido University (45°03'N, 142°06'E, 66 m asl). During January to March 2003, trees in an area of 13.7 ha were clearcut, and in October 2003, dense undergrowth *Sasa* bamboos were strip-cut into 4 m rows (a half of the clear cut area) in order to plant ca. 30000 saplings of 2-year old hybrid larch (*Larix gmelinii***L. kaempferi*).

Closed-path eddy covariance technique was applied to evaluate the flux at 4.6 m in height. Meteorological measurements included air temperature and relative humidity, net radiation, photosynthetically active radiation, and precipitation. Underground, soil temperature and water content profiles, and soil heat flux were measured at five points.

The tree-clearcut decreased the photosynthetic capacity of the ecosystem and turned it from carbon sink to source in the annual budgets. The net ecosystem exchange rate of carbon dioxide (NEE) decreased from +495 (2004) to +4 (2007) $\text{gC m}^{-2} \text{yr}^{-1}$. Thus the ecosystem still acted as the carbon source even 4 years after the plantation, however the absorption and emission rates of carbon dioxide were almost in equilibrium in 2007. The decrease in the emission rate was owing to the increase in Growth primary productivity (GPP). During the years from 2004 to 2007, the GPP increased year by year from 540 to 1225 $\text{gC m}^{-2} \text{yr}^{-1}$, while the increase of Ecosystem respiration was small (1035 and 1229 $\text{gC m}^{-2} \text{yr}^{-1}$ in 2004 and 2007, respectively). The GPP increase was mainly attributed to the increase in the biomass and hence, photosynthesis of the undergrowth *Sasa* bamboos. The *Sasa* bamboos formed dense understory even in the forest, and additionally the biomass increased rapidly from one year after the clearcut (LAI=6.7 in 2007). On the other hand, the larch saplings grew up to 3 m in height in 2007, however the LAI (1.7 in 2007) is still minor compared to that of *Sasa*.