

## Relationships between biomass of *Sasa* dwarf bamboo (*Sasa senanensis*) and multiple ecosystem functions in forest soil

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There is a growing recognition that understanding the relationships among multiple ecosystem services is crucial in order to avoid unintended tradeoffs in ecosystem management. Understanding the functions and processes behind interactions among multiple services is therefore important. Understory vegetation plays an important role in ecosystem processes in forest soil. However, it has not been paid much attention in previous ecological works. *Sasa* dwarf bamboo is a common understory plants in Japanese forests. They usually form dense undergrowth and dominate forest floor. In Hokkaido, Northern Japan, *Sasa* is a major component of forest ecosystem which occupies some 90% of forest area. Understanding the contribution of *Sasa* to ecosystem functions in forest soil is essential to help establish a future ecological management. Our objective is to understand the multiple functions in forest surface soil contributed by *Sasa* and the mechanism behind the interactions of among these functions. We hypothesized that the ecosystem functions in surface soil are correlated with the aboveground biomass of *Sasa*. The ecosystem functions examined in this study were carbon sequestration, soil fertility and buffering of soil acidity in surface soil of forest.

We established experimental sites in Uryu Experimental Forest of Hokkaido University, northern Hokkaido, Japan. The vegetation of the site is a cool-temperate mixed forest with dense *Sasa* understory. According to the biomass of *Sasa*, three plots with five sampling spots (1m<sup>2</sup>) were established as Large (L), medium (M) and small biomass (S) plots. The L plot was located in a gap area, whereas the S plot was located under a dense canopy of coniferous stand. The distance between the three plots is within 10m. The mean *Sasa* biomass of L, M and S plot were 1.61, 0.46 and 0 kgDW m<sup>-2</sup>, respectively. Parameters describing each ecosystem functions were measured from samples of litter layer and mineral soil at the depth of 0-10cm (Upper soil) and of 10-20cm (Lower soil) from the plots.

With carbon sequestration parameters, the sum of litter dry mass and the dry root mass was higher in S plot than other plots. Soil microbial respiration rate was higher in L plot than in S plot. In regards to soil fertility, the concentration of inorganic nitrogen in upper soil was higher in L and M plots than S plot. Nitrogen mineralization rate was highest in M plot in Upper soil. With buffering of soil acidity, although there was no significant difference in the soil pH, the ratio of exchangeable (K+Ca+Mg)/exchangeable-Al increased as the *Sasa* biomass increased. The soil and litter in L plot contained higher Ca than M and S plots, while the soil and litter in S plot was high in Al than other two plots. This means that the soil acidity decreased as *Sasa* biomass increased. High Ca concentration in soil in L plot probably contributed reducing soil acidity in the plot. Ca in soil might be supplied from *Sasa* litter as litter in L plot had high Ca concentration. The reason why soil acidity was higher in S plot could be explained by supply of organic acid from the coniferous leaves. One possible relationship among multiple ecosystem functions was found between soil fertility and acid buffering functions. The increase of soil acidity due to the small biomass of *Sasa* (with higher density of coniferous trees) reduced soil microbial activity which led less fertility. Further analysis will be carried out and discussion will be included in the presentation.

Keywords: biogeochemistry, forest ecosystem, understory vegetation