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# Carbon fluxes above a Cacao agroforestry system in Central-Sulawesi, Indonesia

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The ongoing conversion of tropical forests into agricultural used land as in Indonesia especially by small-stake landowners demonstrates the importance of understanding the factors regulating the rates of uptake and net sequestration of carbon dioxide against the background of worldwide rising levels of carbon dioxide. Within the framework of the project STORMA "Stability of rain forest margins" (SFB 552, University Goettingen, financed by the German Research Foundation), carbon fluxes above a Cacao agroforestry system (AFS), a common and profitable land-use in Central Sulawesi, Indonesia, were investigated using the Eddy-Covariance (EC) technique. Simultaneous measurements of meteorological variables and the components of the radiation budget were conducted to investigate the dependencies of the turbulent exchange processes on canopy and atmospheric boundary layer conditions. A SVAT model was used to serve as a plausibility test to the measured fluxes, and to investigate the component fluxes within the canopy. In addition, the photosynthetical active radiation was measured with the EC-System to quantify the effects of fast changes in the radiation input, like clouds for instance, on the CO2-Fluxes. Measurements were conducted for one year.

Cacao agroforestry systems (AFS) are a dominant and profitable land-use type in the research area, that is covered with small Cacao fields which form to one big area of Cacao. Cacao trees are understorey trees imported from neotropical rain forests, and need wind breaks and sun shades especially when younger. Hence, shadow trees had been planted and remnants of the former forest had been left standing. The Cacao AFSs also serve as environment and home to the landowners, and the whole area is interspersed with wooden farm houses and small vegetation fields. The computation of the fluxes of carbon dioxide above such complex terrain thus entails a detailed footprint analysis of the origin of the measured signal. We analysed the response of

the carbon dioxide flux to changes in radiation and canopy surface temperature of the Cacao trees. In order to estimate the human contribution to the measured signal, e.g. due to cooking or small power plants, a detailed mapping of the area surrounding the EC measurement mast was conducted. The mapping also adressed the quantification of the human contribution of carbon dioxide into the investigated ecosystem. This research was funded by the DFG.