MICROCLIMATE AND ENVIRONMENTAL STRESS INDICATORS IN DIFFERENT COCOA PRODUCTION SYSTEMS IN ALTO BENI, BOLIVIA

BESTANDSKLIMA UND UMWELTSTRESSINDIKATOREN IN UNTERSCHIEDLICHEN KAKAOANBAUSYSTEMEN IM ALTO BENI, BOLIVIEN

DISSERTATION
AN DER FAKULTÄT FÜR GEOWISSENSCHAFTEN UND GEOGRAPHIE
DER GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN

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SUMMARY

The study was conducted in the frame of the research project "Farming Systems Comparison in the Tropics" of the Research Institute of Organic Agriculture (FiBL) on their project site in Alto Beni, Bolivia. The ongoing long-term experiment aims to compare the environmental, economic and social impacts of five different cocoa production systems, comprising mono-cultures (MONO) and agroforestry systems (AF), both under conventional (CONV) and organic (ORG) farming, and a successional agroforestry system (SAFS) with no external inputs. The cocoa plots were established in 2008 together with a fallow plot (BAR) of the same age to compare the effect of managed systems with a natural area. Plots are repeated four times in a randomized complete block design.

The overall goal of this PhD-study was to analyze the influence of different land-use systems on main factors of the vertical water cycle within the different land-use systems. Following hypotheses were tested: (1) agroforestry systems act as buffers that shelter the understory co-coa from harsh climate and reduce the water needs of the cocoa by reducing transpiration; (2) soil moisture under agroforestry systems is exploited rather complementary than competitive due to different rooting depths; and (3) cocoa bean chemical composition (and by this also the bean quality) is related to water availability over the season and in the production systems.

Main management activity with shade tree and cocoa pruning increased canopy openness within a short time and made AF canopy openness similar to that in MONO. That in turn affected the internal microclimate. The canopy of AF had a buffering capacity, which lowered