their respective characteristic scales, ranging from the point scale of a soil profile to the basin scale. Heterogeneity of vertical water fluxes due to varying soil and land-use properties is taken into account as sub-scale variability. Typical conditions of the semi-arid study area and the limited data availability are taken into account. All required model parameters are derived from physical data sets which were processed for the large scale in cooperation with other working groups in WAVES.

Model simulations show satisfactory results at different scales when compared to measured runoff and reservoir data. The spatial pattern of surface water availability mainly reflects the distribution of rainfall and of differing soil properties on crystalline or sedimentary bedrock, respectively. Applying a climate scenario for the time range until 2050, while keeping all other natural and water management factors constant, model simulations reveal a severe decrease in the future availability of surface water. The simulated reduction in natural river runoff is generally larger than the expected decrease in rainfall volumes. Examples of assessing the impacts of scenarios of water resources management, in particular scenarios of technical water resources development (such as construction of dams, interconnection of reservoirs, long-distance transpositions) are being presented.

Soil Water Dynamics in Agroforestry Systems

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A central biophysical agroforestry hypothesis is that trees and crops can efficiently grow together on the same site. Water and nutrient use efficiency may be optimized by the spatially and/or temporally complementary exploitation of soil resources. The development of productive and economically viable agroforestry systems thus requires an improved knowledge about the competition between plant species for the normally limited nutrient and water resources of soils. Aiming at the economical and ecological optimization of agroforestry systems experimental field studies in combination with model applications may provide necessary data and information for evaluating different land use systems. While field studies are important for the study of the system behavior under "real world" conditions, models allow a detailed insight into internal soil-plant processes and interactions (e.g. exploration of root water uptake patterns), have a high experimental potential and thus a great system analysis capacity. By using scenario techniques they may significantly contribute to optimization strategies (e.g. quantification of fluxes as indicators for sustainability, simulation of management practices like pruning or irrigation). Field studies are again necessary for providing transport parameters, initial and boundary conditions and calibration data sets. Our contribution focuses on an integrated approach of system analysis. In this context results from an ongoing experiment for the recultivation of degraded sites in the Central Amazon Basin are presented and compared to results from other field studies. Model applications with WHNSIM and HYDRUS-2D are presented and their potential use for understanding agroforestry system behavior and their optimization will be discussed.