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## Evaluation of Soil Fertility on Cacao Plantations in Central Sulawesi

THOMAS DUWE<sup>1</sup>, JANA JUHRBANDT<sup>2</sup>, GERHARD GEROLD<sup>3</sup>

<sup>1</sup>*Technical University Braunschweig, Institute for Geoecology, Germany*

<sup>2</sup>*Georg-August-Universität Göttingen, Department of Agricultural Economics and Rural Development, Germany*

<sup>3</sup>*Georg-August-Universität Göttingen, Department of Landscape Ecology, Germany*

### Abstract

Soil fertility is a key factor for crop production, especially where the availability of or capital for agrochemicals is lacking. Sulawesi produces 80 % of the Asian cacao production (FAOSTAT). For Central Sulawesi sufficient data on soils and cacao is missing. Within multidisciplinary research project STORMA (SFB 552) a soil survey was conducted on 48 smallholder cacao plantations. On each plantation soil mapping was conducted (6 to 15 Pürckhauer augering) to select a representative soil profile and three 5 m × 5 m subplots. Depth wise mixed samples were taken (0–10 cm, 10–30 cm, 30–50 cm) for chemical analysis (C/N, pH, P [Bray], CECEff, total Ca, K, Mg, P). Yield was surveyed within a one year household survey by weekly reports (JUHRBANDT). Soil parameters were classified for the qualitative appraisal of the soil inventory and for fertility status of the soils. Principle component analysis (PCA) was used on soil parameters for an empirical definition of latent dimensions that comprehensively characterise the investigated soils (including data for yield and water logging classes). Linear regression analysis was conducted to assess the degree of explanation of the yield variance through soil parameters.

The soils found are dominated by Cambisols and Gleysols, which fit the claims of cacao for most parameters. Available phosphorus is limited and so is nitrogen. Organic matter is at medium rates regarding the topsoil. Ca and Mg can be taken up in luxury rates. Al and Fe concentrations are low and do not inhibit growth. Physical properties are good, groundwater near sites and skeleton rich soils compromise the situation. PCA reveals three main components. The first PC represents pedochemical parameters and can be interpreted as the main fertility component (CECEff, ex. Ca, ex. Mg, pH [H<sub>2</sub>O]). The second PC summarises the humus content and biological activity (Ct, Nt, av. P). The third PC pools the most influential soil parameters for yield (av. P, Pt, Water logging). Linear regression analysis affirms influence of phosphorus and water logging on yield. The explained variance of these two parameters is, however, low ( $r^2 = 0,232 - 0,313$ ).

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