

Statistical soil grouping and modelling of soil spatial distribution in southern Cameroon

Martin Yemefack¹ and David G. Rossiter²

¹ Institute of Agricultural Research for Development (IRAD), Nkolbisson, P.O. Box 2067 Yaounde, Cameroon. E-mail: myemfack@yahoo.fr ou yemefack@itc.nl

² International Institute for Geo-Information Science and Earth Observation (ITC), P.O. Box 6, 7500 AA Enschede, The Netherlands. Email: Rossiter@itc.nl

Soil survey is commonly based on mapping, in which we approximate a mappable soil unit that corresponds with a soil class. Statistical and geostatistical methods were used in this study to evaluate the spatial distribution of soil units in the humid forest of southern Cameroon based on soil samples collected at 30-50 cm depth throughout a 2 000 km² area. Analysis of variance, Principal component analysis, cluster analysis and geostatistical modelling were applied. Statistical soil classification and landscape zoning showed, with more than 80% coincidence between methods, that the soils of the study area can be grouped in two classes of the World Reference Base (Ferralsols and Acrisols) and five subclasses. Both soil groups showed strong spatial clustering following soil numerical classification, meaning that this classification captures important mappable differences in soils of the area, leading to a sound basis for stratification for agricultural and environmental studies. Soil pH and clay content were the best explained by regional soil-forming factors of soil variation. Using these two soil properties, geostatistical analysis models revealed a moderate spatial dependence, up to about 2.5 km, with a large unexplained (nugget) variance. This implies that, for a reliable map of the area, a sampling density in the order of 1 km² would be required to map regional variability which is not due to land use or environmental covariates. However, the result of kriging mapping suggested that at the actual sampling scheme a mixed interpolator such as factorial kriging may provide a better insight into the spatial structure of soil variations, with integrated regional and local spatially-dependent processes.