

THE CHALLENGE OF THE SCALE AND TYPE OF SOIL SAMPLING ON PERMANENT MONITORING PLOTS

DIE HERAUSFORDERUNG DES UMFANGS UND DER ART DER BODENPROBENAHMEN AUF DAUERBEOBACHTUNGSFLÄCHEN

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SUMMARY

In agricultural trials, often only pooled samples are taken, which reflect the homogeneity of the cultivated and mostly ploughed sites. However, on a non-arable long-term experimental (LTE) site with permanent crops the soil sampling design is much more challenging. This is particularly the case when different crops coexist, as in agroforestry systems.

In order to obtain an indication of the small-scale variability and representativeness of a pooled sample from an agricultural site, 36 soil samples were taken in a regular grid (4x4 m) with a soil auger from four 24x24 metre plots. For the comparison of pooled and individual samples, the pooled sample was obtained in equivalent proportions from the 36 individual samples. Both the individual samples and pooled samples were analysed for soil chemical properties.

The equivalence test was used to statistically determine whether the generated pooled sample corresponds to the mean value of the 36 individual samples. In addition, the sample size required for a hypothetical second sampling was determined, so that it deviates only on a tolerable level from the first sampling.

The results of the equivalence tests show that the pooled samples are only representative for the plots to a limited extent. These limitations are particularly relevant for plant-available and easily mobilised soil parameters like carbon, nitrogen and phosphorus. The statistical calculations of the sample size underline this result. Due to the small-scale variability of these soil nutrients, the number of individual samples is only partially representative.

This implies either an increase of the sample size or the analysis of individual samples in order to obtain representative results. Individual samples should be analysed in particular when dealing with small-scale and temporal changes in ecosystems with high diversity.