



Tropentag, September 20-22, 2017, Bonn

“Future Agriculture:
Socio-ecological transitions and bio-cultural shifts”

A New Paradigm for Evidence-Based Land and Soil Management Recommendations

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Abstract

There has been a failure in developing evidence-based land, soil and crop management recommendations due to two fundamental limitations. The first limitation is that target areas have not been defined and properly sampled when setting up experiments or observations, which has prevented sound inference of results to the area of interest. The second limitation is that uncertainty in the evidence used to make the recommendations has been ignored, thereby pushing the decision risk on to the farmer or land user, and robbing the researchers of the knowledge required on how to reduce uncertainty and improve recommendations. Currently, the data used to develop recommendations are rarely traceable. Recommendations are rarely validated in a systematic way.

A surveillance framework for making evidence-based land, soil and agronomic recommendations is presented and illustrated with an example of developing fertiliser recommendations in the Africa Soil Information Service (AfSIS). The cropland areas of a country are first identified as the region of interest. A statistically valid sampling scheme is used for siting soil sampling campaigns and agronomic trials. Low cost and rapid spectral measurement methods are used to handle the large numbers of sample analyses required. The approach permits unbiased estimates of soil constraints and crop responses to be made and mapped with the aid of remote sensing covariates. Uncertainty in recommendations is presented to end users and value-of-information analysis used to pinpoint where further information is required to improve recommendations and reduce end-user decision uncertainty. Iterative Bayesian updating is used to systematically improve recommendations over time.

Keywords: Bayesian, inference, land, recommendations, soil