Farmers' point of view on within-field variation

Sanne Heijting, Sytze de Bruin, Arnold Bregt
Centre for Geo Information, Wageningen University, The Netherlands
Sanne.heijting@wur.nl

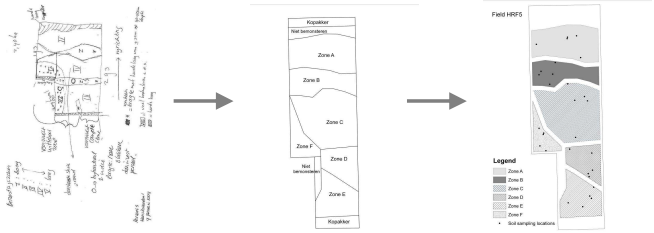
Introduction

Within precision agriculture research much emphasis has been put on technology, whereas farmers' knowledge has received little attention. This research characterizes and examines the farmers' spatial knowledge about their fields and explores whether it is a suitable starting point to map within-field variation of soil properties.

Materials and methods

The study was performed at four arable farms in the Hoeksche Waard, the Netherlands. A combination of semi-structured interviews and field work was used to map spatially implicit knowledge on within-field variation.

At each farm, a field was divided into internally homogeneous units upon indication by the farmer. The soil of the units was sampled at five random geo-referenced locations and the data were analyzed.



Initial sketch by farmer -> Geo-referenced zones -> Soil sampling scheme

Results

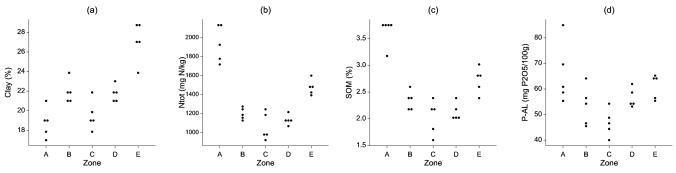
The farmers showed to have extensive spatial knowledge allowing them to divide a field into management zones. Division was based on crop performance, soil texture, land use history, drainage quality, weed density, height, soil colour, aerial photographs, etc. Fields were divided in 2 to 6 zones.

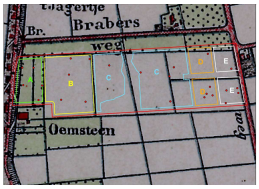
Characteristics of zones of field K according to farmer K. Individual soil sampling locations are shown.

The farmers in this study aim for a uniform yield, although there is within-field spatial variation of the soil.
None of the farmers currently uses automated site-specific management, but they apply their knowledge intuitively during various field management activities such as fertilizer application, soil tillage and herbicide application if they consider this to be technically and economically feasible.

Ploughing and other soil tillage activities were regarded by all farmers as the most important for sensing within-field variation in texture, structure, soil organic matter content and variation in thickness of the topsoil layer.

Below, clay %, Ntot, SOM% and P-Al values at individual sampling locations for one field are shown. Variation within zones is clearly smaller than variation between the management zones. All data were analysed using ANOVA.





Comparison of a 1900 topographic map with farmer defined management zones for field K illustrates the importance of land use history for within-field spatial variation.

Conclusions

1. Farmer defined management zones show significant differences for texture, organic matter and nutrients.
2. Farmers have extensive spatial knowledge of their fields.
3. Part of spatial knowledge is already actively applied during field management, if technically and economically feasible.
4. Land use history and geomorphology are reflected in differences between management zones.
5. Spatial knowledge of farmers on within-field variation as shown in this study forms a suitable starting point for soil sampling.
6. A huge loss of knowledge may take place with the current trend towards increasing farm sizes managed by less farmers with an increase in outsourcing activities.

Centre for Geo-Information, Wageningen-UR
P.O. Box 47, NL-6700 AA Wageningen, The Netherlands
E-mail: **sanne.heijting@wur.nl**