Detection of soil compaction using soil electrical conductivity

Abstract

Conventional methods of measuring soil compaction using penetrometers although highly accurate, work as time consuming and resource intensive. On-site electrical conductivity (EC) measurements such as those undertaken as part of this work, are affected by key soil properties including water content, moisture content and compaction. They offer a possible rapid alternative for detecting the within-field variability of soil compaction. Using soil electrical conductivity for improved soil management is key for long term soil health and sustainable management practices. A methodology for identification of within-field variability and for comparison of soil conditions leading to soil compaction was developed using equipment that contains 8 instrumented wedge probes attached to the leading edge of a soil cone penetrometer. A randomised block design experiment was created and the areas for targeted soil loosening were determined.

A key finding was the development of application maps for targeted soil loosening based on soil electrical conductivity measurements. The construction utilisation of this method assumes the presence of two maps that would be compared. The initial map has to be created for the soil in desirable location conditions and will be used as a standard for further comparisons. Further map will characterise the conditions present in the compacted soil. It is recommended that both maps would be collected on identical conditions and that the map will be created either manually using visual comparison of both initial (desirable condition) and further map (compacted condition) or using an appropriate data analysis tool, in this case a ratio of the two maps.

September 2007

This thesis is submitted in fulfilment of the requirements for the degree of Master of Science

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