High soil loads during sugar beet harvest leads to changes in soil functions

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From machine data to soil functions – Effects of sugar beet harvest on soil parameters

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INTRODUCTION

During field traffic, the farmer has no indication or information of what is happening in the soil below his wheels. He only sees the track depth but not the changes in subsoil. For deriving changes in soil parameters, directly related to functions, the complete chain of action must be tracked from the machine via the tire-soil interface down to the subsoil.

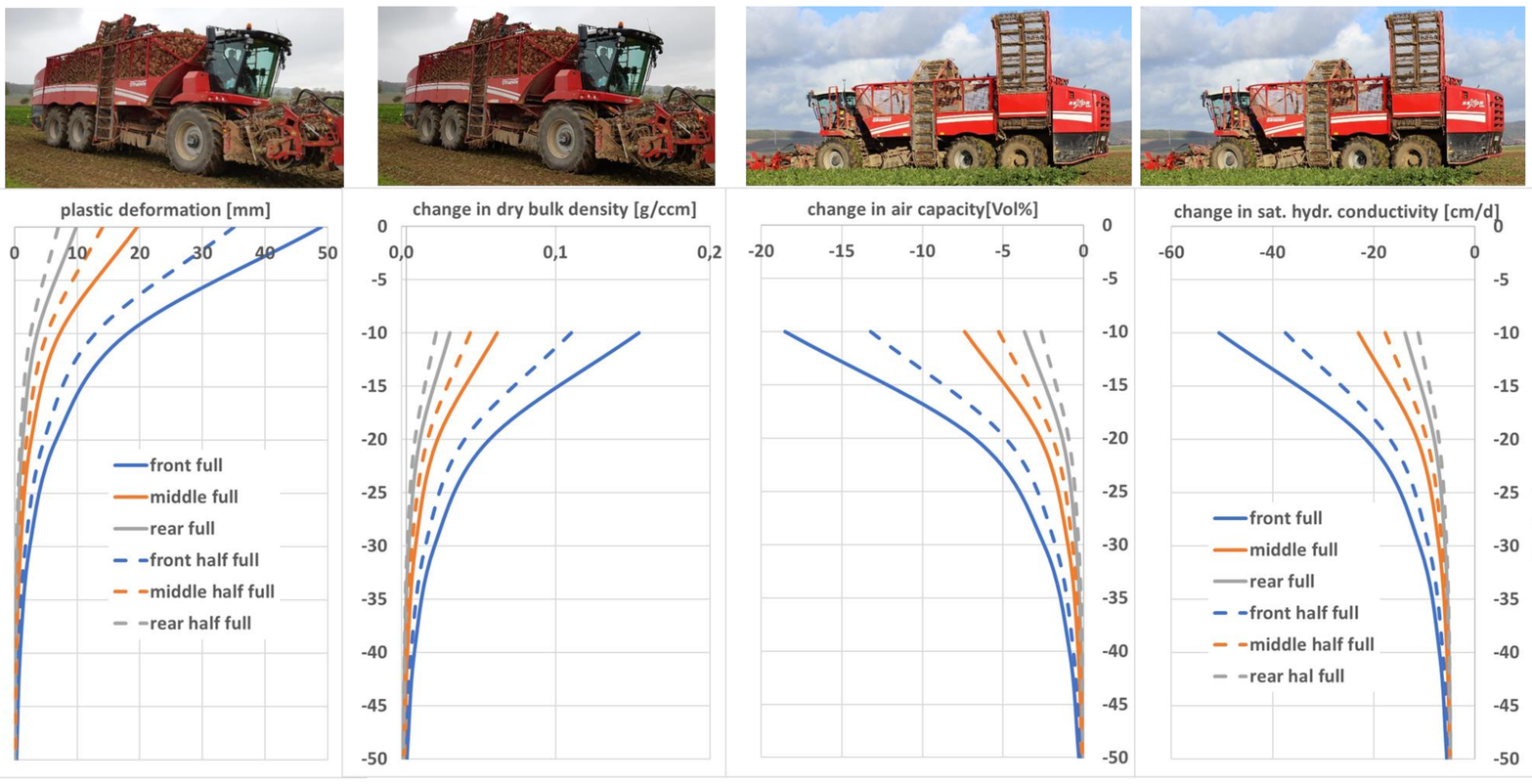
METHODS

Different information, machine and soil data were combined in the SDiF-model to estimate changes in soil parameters due to field traffic:

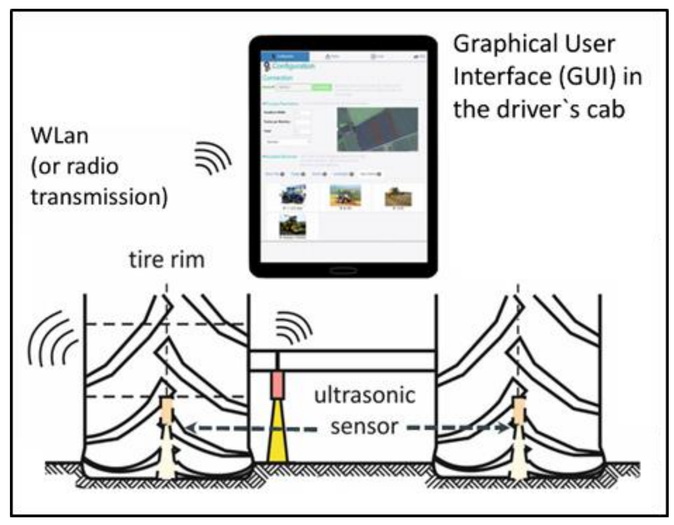
- Soil deformation at the tire-soil interface (track depth)
- Soil data on soil texture and soil moisture for different soil layers
- Modeling soil deformation for different soil depths.
- Modeling changes in soil parameters due to soil deformation.

RESULTS & DISCUSSION

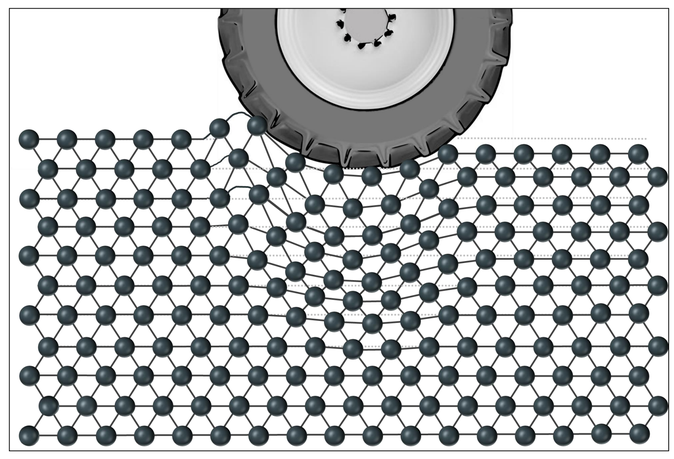
By combining machine data with soil data within the SDiF-model, the load can be tracked from the machine to the subsoil. The amount of soil deformation directly influences changes in soil parameters such as AC, Ks and DBD. For sugar beet harvest with a three-axle harvester and soil moistures of ~30 Vol% (ca. 82%FC) the soil is deformed to a depth of ca. 45 cm. This is associated with an increase in DBD and a reduction in AC and Ks. In addition, the results show the effects of the three passes of the axles and the reduction of the bunker filling. It leads to reduced soil deformation and changes in parameters.



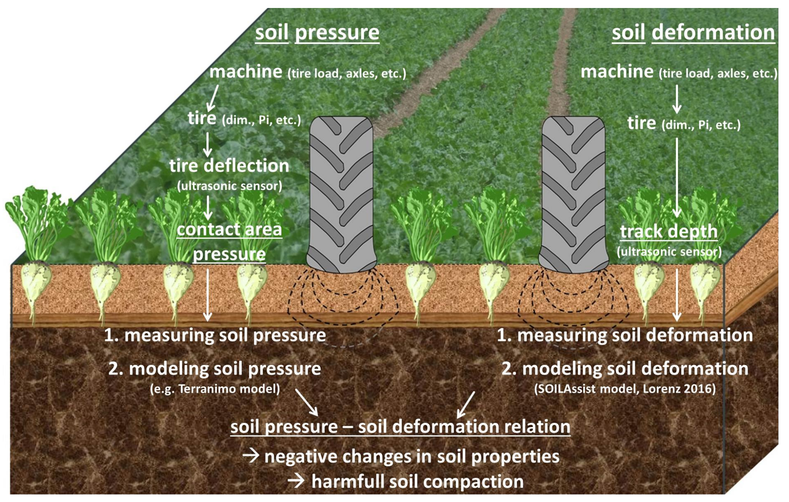
Results of the SDiF model on soil deformation and changes in dry bulk density (DBD), air capacity (AC) and sat. hydr. conductivity (Ks) during sugar beet harvest



Ultrasonic sensors in the tire rim and under the axles



Exemplary movement of the soil during wheel passage



Concept of soil pressure and deformation modelling (SDiF-model)

Recommendations

Results from the SOILAssist Sensor system, field measurements, the route planning tool and the modelling show a lower overall soil load in the field with adapted bunker filling to the field length.

→ Recommendation for an improved soil protection is the **adaption of bunker filling to the field length** and an improved headland management.

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