

Arvidsson, J., Trautner, A., Van den Akker, J.J.H., Schjønning, P., 2001. Subsoil compaction caused by heavy sugarbeet harvesters in southern Sweden: II. Soil displacement during wheeling and model computation of compaction. *Soil Soil and Tillage Res.* 60, Vol. 1 / 2: 79-89.

Abstract

Traffic with high wheel loads in combination with high inflation pressure implies a risk for subsoil compaction, but effects will depend on the soil strength. Soil displacement during traffic with a heavy sugarbeet harvester (total load approximately 35 Mg on two axles) was determined at 0.3, 0.5 and 0.7 m depths during harvesting in the autumn. Measurements were made on one occasion on a clay loam (Eutric Cambisol) and a sand (Haplic Arenosol), and at different water contents on a sandy clay loam (Eutric Cambisol). Soil mechanical properties (precompression stress and shear strength) were determined for each traffic occasion. Field measurements were also compared with model computations of soil compaction, based on calculation of soil stresses and on the mechanical properties measured. On the sandy clay loam in the driest condition, displacement occurred only at 0.3 m depth, while it was registered down to 0.7 m depth in the wettest condition, when soil moisture was around field capacity. On the clay loam and the sand there was displacement down to 0.5 and 0.7 m depth, respectively. Model predictions of compaction correlated well with the depth to which displacement was measured in the field. One important task in subsoil compaction research is to define methods to determine soil mechanical properties that are easy to use and that still make it possible to predict compaction. The results clearly demonstrate that heavy sugarbeet harvesters may cause compaction to more than 0.5 m depth during normal field conditions in the autumn, with soil water content as the most decisive factor.