

Arvidsson, J., Sjöberg, E., Van den Akker, J.J.H. 2003. Subsoil compaction by heavy sugarbeet harvesters. III. Risk assessment using a soil water model. *Soil & Till. Res.* 73: 77-87. [Arvidsson_2003.pdf](#)

Abstract

Due to its persistence, subsoil compaction should be avoided, which can be done by setting stress limits depending on the strength of the soil. Such limits must take into account soil moisture status at the time of traffic. The objective of the work presented here was to measure soil water changes during the growing period, use the data to calibrate a soil water model and simulate the soil susceptibility to compaction using meteorological data for a 25-year period. Measurements of soil water content were made in sugarbeet (*Beta vulgaris* L.) from sowing until harvest in 1997 on two sites classified as Eutric Cambisols in southern Sweden. Sampling was carried out at 2-week intervals in 0.1 m layers down to 1 m depth, together with measurements of root growth and crop development. Precompression stress of the soil at 0.3, 0.5 and 0.7 m depth was determined from uniaxial compression tests at water tensions of 6, 30, 60 and 150 kPa and adjusted as a logarithmic function of the soil water tension. Soil water content was simulated by the SOIL model for the years 1963–1988. Risk calculations were made for a wheel load of 8 t and a ground pressure of 220 kPa, corresponding to a fully loaded six-row sugarbeet harvester. Subsoil compaction was expected to occur when the major principal stress was higher than the precompression stress. The subsoil water content was very low in late summer, but increased during the autumn. At the end of August, there was practically no plant available water down to 1 m depth. There was in general good agreement between measured and simulated values of soil water content for the subsoil, but not for the topsoil. In the 25-year simulations, the compaction risk at 50 cm depth was estimated to increase from around 25% to nearly 100% between September and late November, which is the period when the sugarbeet are harvested. The types of simulation presented here may be a very useful tool for practical agriculture as well as for society, in giving recommendations as to how subsoil compaction should be avoided.