



## **Using close-range photogrammetry to measure temporal changes in soil surface roughness and sealing of tractor tramlines**

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Soil compaction is a major issue facing much of the world's agricultural systems owing to increased traffic loads and increased tillage operations. Soil compaction, an alteration of soil structure, leads to reduced soil porosity with negative effects on aeration, hydraulic conductivity, and microorganism habitat. The soil surface is an important factor in soil compaction studies, being the interface between the pedosphere and atmosphere. Processes such as gas exchange and rainwater infiltration (important for soil functioning) are impaired when the soil surface is smeared and sealed when wheeled by heavy farm traffic. Combined with deeper alterations to soil structure, these wheelings (tractor tracks) pose a detrimental problem to soil productivity and have been linked with high rates of soil erosion from sloping fields.

This study focuses on soil compaction along tractor wheelings, common features in arable systems, which serve as routes for equipment applying agrichemical and fertiliser amendments to cereal crops. This paper will report on a study which aims to: (1) use close-range photogrammetry to image tractor tramline wheelings over a winter cropping season in southern England; (2) produce digital terrain models (DTM) of tramline surfaces using photogrammetric algorithms; (3) quantify differences between DTMs - temporally and between treatments - to measure of erosion losses and surface roughness; and (4) compare results of close-range photogrammetry of tramline surfaces with a laser surface-scanner and a conventional pin-meter.