Dynamic wheel loads show partly significant differences between tillage systems

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SOILAssist Sensor System (SASS): Dynamic soil loads with different tillage systems

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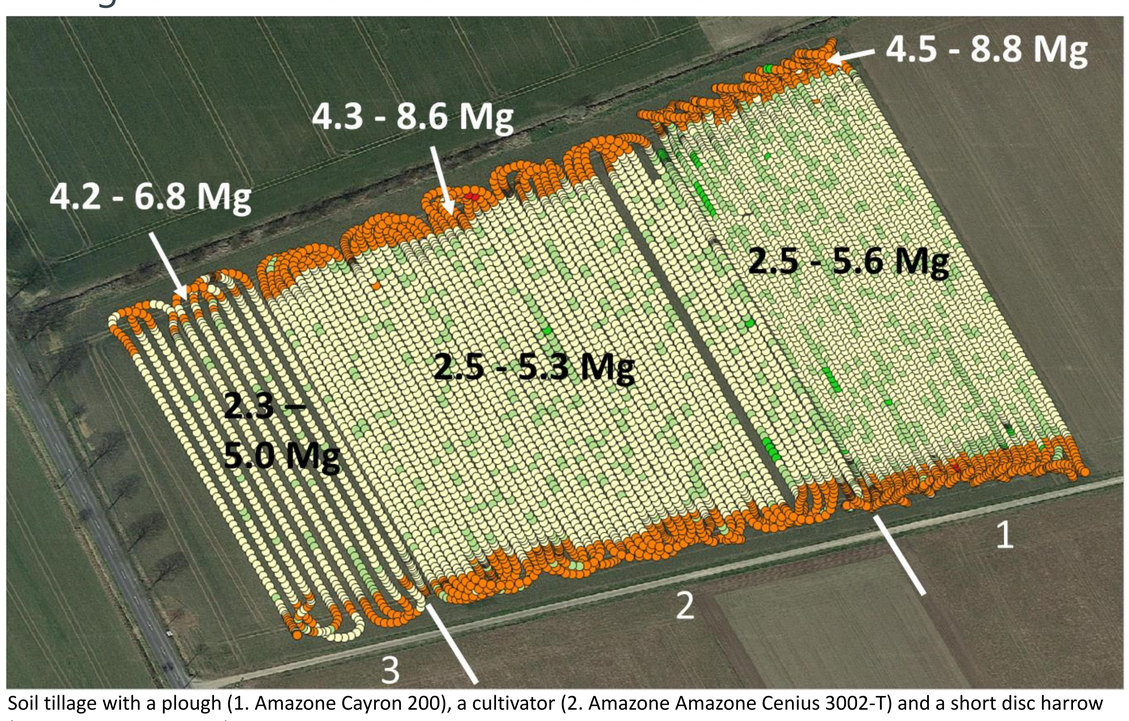
INTRODUCTION

Usually, wheel loads are determined by static weighing (e.g. portable scales) and are assumed to be static. In practice, they are highly dynamic and change continuously e.g. during seeding, fertilizer application, slurry spreading and harvest. Even during soil tillage, different wheel loads occur within the field. For deriving hot spots on the fields within a crop rotation, the spatial distribution of wheel loads is a prerequisite.

METHODS

- Measuring tire deflection in every wheel of the test vehicles
- Deriving dynamic wheel load from tire deflection and inflation pressure
- Tracking of field traffic with a high-resolution RTK-GPS
- Comparing different techniques according to their differences in wheel loads



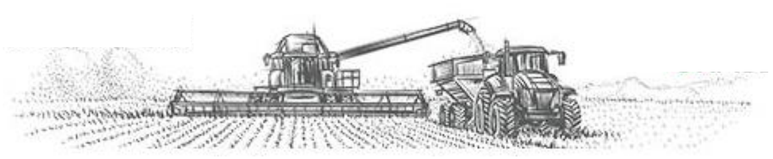
Soil tillage with a plough (1. Amazone Cayron 200), a cultivator (2. Amazone Amazone Cenius 3002-T) and a short disc harrow (Amazone Catros 5001-2)

RESULTS & DISCUSSION

The results show partly significant differences in wheel load between the three different tillage systems, in the inner field and in the headlands.

In the inner field, the highest dynamic loads occur for the plough (2.5-5.6 Mg) and the cultivator (2.5-5.3 Mg). Due to the reduced working depth, the short disc harrow leads to lower soil loads (2.3-5.0 Mg).

In the headlands, the implements were pulled out of the soil and produce higher loads on the rear axle. The highest dynamic loads occur for the lifted plough (4.5-8.8 Mg) and the lifted cultivator (4.3-8.6 Mg). The short disc harrow is trailed, so there is less additional weight on the rear wheels (4.2-6.8 Mg) due to hydraulic lifting by the roller. Additional investigations with the same cultivator in lifted and trailed version come to similar results. The reduction of wheel load in the headland was about 2.3 Mg with lifted cultivator. The results show that the spatial distribution of soil loads varies between agricultural techniques and within the field. From the results, the recommendations for an improved soil protection are the use of **trailed implements** instead of lifted implements.



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Recommendations

Results from the SOILAssist Sensor system show a reduced soil load especially in the headlands with trailed implements, compared to lifted implements, and reduced working depth.

→ Recommendation for an improved soil protection are **trailed implements** and a reduction of the working depth (if possible).

→ However, trailed implements require higher investment costs.

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