The evaluation of agricultural machines field trafficking intensity for different forage harvest technologies

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1 Background

Topsoil condition is therefore critical to many soil functions, including water infiltration and storage, biomass production, soil carbon storage, mitigation of nitrous oxide emissions, and biodiversity. Grassland soil compaction has potentially serious implications for the ability of soil to deliver important ecosystem services.

Soil compaction can result from both machinery use and livestock grazing and there is concern that changes in grassland management over the past few decades in England and Wales may have increased soil compaction, particularly through the increase in size of agricultural machinery and greater use of contractors for grass harvesting and manure spreading (Hakansson and Reeder, 1994; Batey, 2009).

2 Objectives

The main aim of our research was to map frequency of machinery passages and to evaluate wheel tracks area under different harvest technology of forage.

In this case, the intensity of passages was evaluated for grass moving, raking, tedding and harvest with chopper and baller.

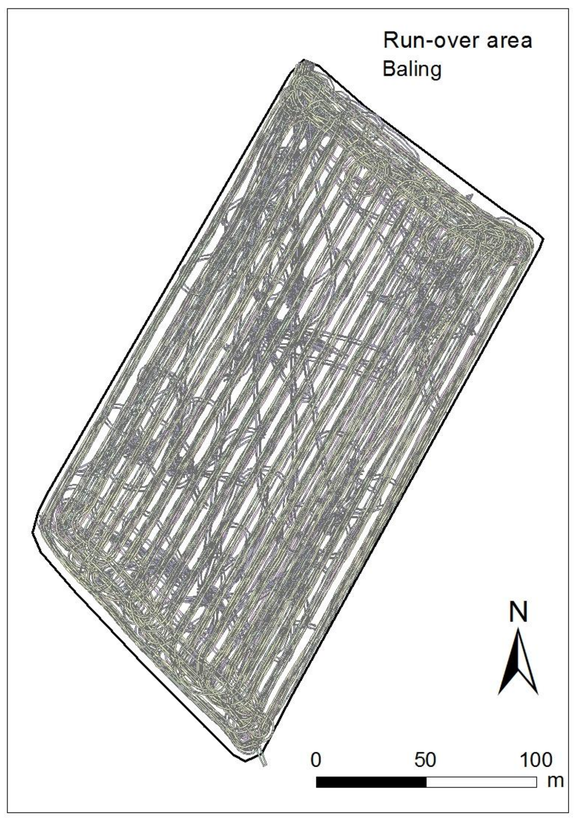
3 Methods

Evaluation of the number and frequency of agricultural machinery passes across a selection of fields was realized by means of DGPS receivers with a position recorder. All field operations and all other machinery and vehicle passes across the selected fields were monitored. Passages monitoring was carried out during harvest of forage.

Trajectories for every single machine which were present in the monitored field were made from the GPS position

Then, the area run over by the machine tyres were counted from the tyre type, tyre width and wheel spacing.

4 Results



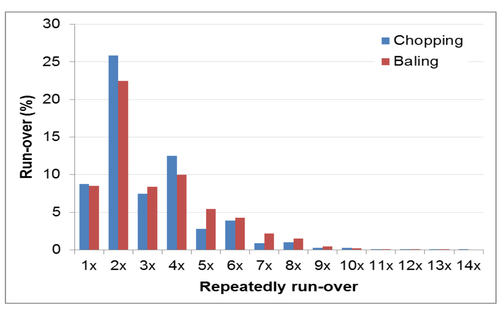
Graphical representation of machinery passes for baling.

Grass moving
↓
Raking
↓
Tedding
↙ **Harvest with baller** ↘ **Harvest with chopper**

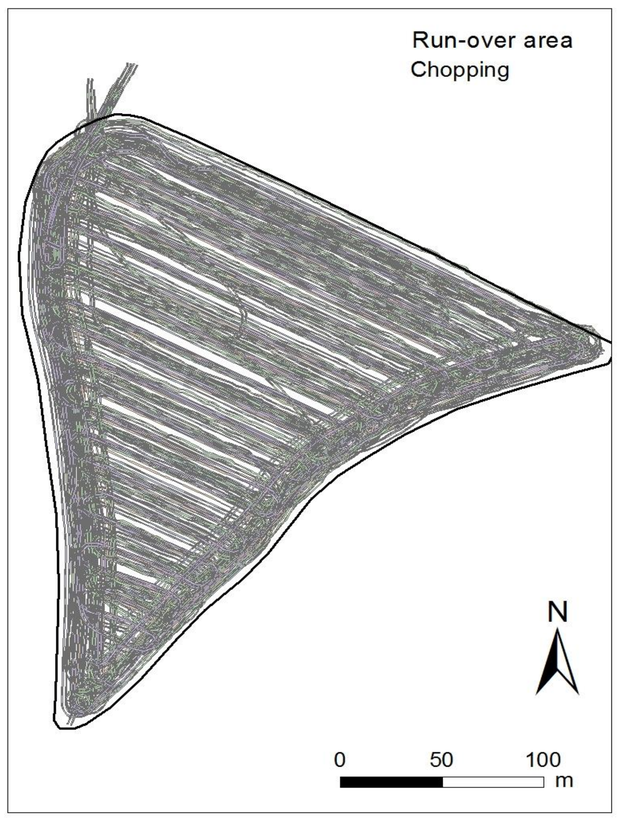
Figures show all machinery passes during harvest of grass for silage. In case of self-propelled forage chopper was run over 63.8 % of 1 ha area.

In case of round baler it was 63.4 %. The double passes are the most frequent repetitive.

The results show that total runs over area and the frequency of repeated passes did not differ between technologies.



Frequency of agricultural machinery passes across the field (area of 1ha).



Graphical representation of machinery passes for chopping.

5 Conclusions

To sum up the results, the experiments revealed enormous intensity of agriculture machinery passes, when talking about random traffic in fields, which could be a potential risk for good soil conditions. Recordings made during the work of machines showed a number of reserves and deficiencies in these activities. Better organization and cooperation of transport and passes would certainly help to reduce the repeated crossings and travelled distance.

Ref. **Hakansson, I., Reeder, R.C.,** 1994. Subsoil compaction by vehicles with high axle load–extent, persistence and crop response. Soil Tillage Res. 29, 105–110.
Batey, T., 2009. Soil compaction and soil management – a review. Soil Use and Management 25, 335–345.

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