

The effect of controlled traffic farming systems and low inflation pressure tyres on soil properties and crop development for 3 tillage systems

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Background

- Farm vehicle traffic results in soil compaction. Every year up to 86% of the field area is covered by wheelways under random traffic with conventional tillage practices (Kroulik *et al.* 2009)*.
- Controlled traffic farming (CTF) is a concept aimed at restricting the compacted area by confining traffic to the permanent wheelways, which limits wheeled area to 30% or less.
- The use of low pressure tyres is a recognised method to mitigate the contact pressure and soil compaction.
- This study hypothesised that compaction mitigation measures such as controlled traffic (CTF) or low tyre inflation pressures (LTP) result in better root development and consequently improved crop yields in comparison to random traffic with standard tyre inflation pressures (STP).
- Kroulik, M., Kumhala, F., Hula, J. and Honzik, I. 2009. *The evaluation of agricultural machines field trafficking intensity for different soil tillage technologies. Soil&Tillage Research, 105 (1) pp.171-175.*

Results

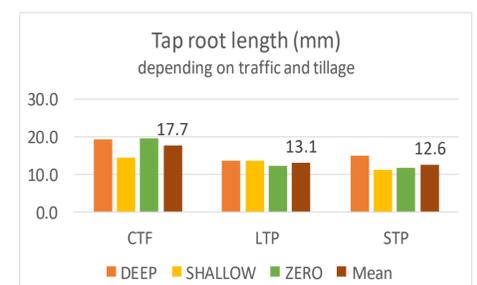
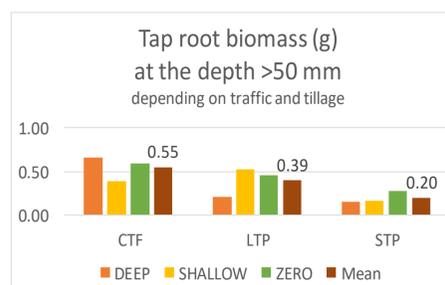
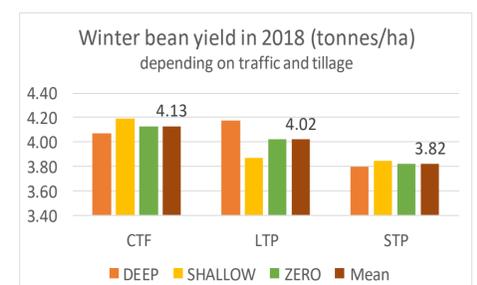
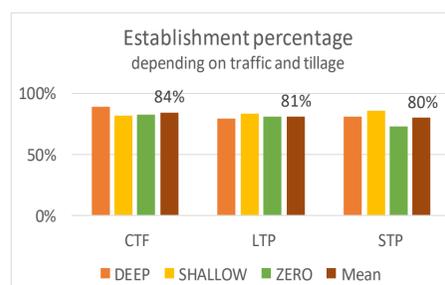
- Controlled Traffic Farming resulted in a significantly better plant establishment percentage, improved root development and greater yield of winter bean, in comparison to random traffic with standard tyre pressures.
- Tillage did not have significant effect on the bean yield, despite increased seed rate by 25% for zero tillage plots.
- Random traffic with standard tyre pressures (STP) subject to zero tillage featured the poorest establishment percentage.
- Plant establishment percentage, root development and crop yield of the low tyre pressure treatments (LTP) was greater but not significantly different from the standard tyre pressure treatments (STP).

Materials and methods

- The study is located at Harper Adams University, TF10 8NB, Newport, Shropshire, UK.
- Since 2011 the field has served for a traffic and tillage study: 3x3 factorial design in 4 randomised blocks, i.e. 3 traffic systems: random traffic with standard tyre pressures (STP), random traffic with low tyre pressures (LTP) and controlled traffic farming (CTF), subject to 3 tillage depths: no-tillage, 100 mm (shallow) and 250 mm (deep).
- Each traffic/tillage system is associated with a certain wheeled area: 75% on STP and LTP plots with DEEP tillage; 60% on STP and LTP plots with SHALLOW tillage; 45% on ZERO tillage plots; 30% on CTF plots - as a consequence of permanent wheelways for tillage and seeding operations.
- This poster reports the results on crop establishment (percentage of seeds germinated), root morphology (tap root diameter, tap root length, number of lateral roots, and biomass of tap and lateral roots in depth 0-50mm and >50 mm) and combine harvested yield of **winter bean** (*Vicia faba*) cv. Tundra in 2018.
- Data was analysed with ANOVA in Genstat 18th Edition; significant differences reported for $p < 0.05$.



Aerial view of the field by courtesy of Jonathan Gill



Conclusions

- Controlled traffic farming delivered better crop yield of winter bean as a result of improved root development.
- Plant establishment percentage, root development and crop yield of the low tyre pressure treatments was greater but not significantly different from the standard tyre pressures treatments.

Acknowledgements

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