

Should you be concerned about soil compaction by grazing livestock?

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Existing scientific information suggests that livestock compacting soil may be less of a concern than many producers think and that they should

consider introducing forage pastures into cropping land.

Numerous studies have been conducted to determine the effect of compaction

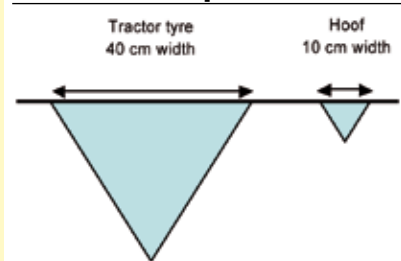


Lindsay Bell discussing forage crops and soil compaction during a 2009 field walk.

SUMMARY OF COMPACTION RESEARCH RESULTS

- Stock apply similar pressures on the soil to unloaded vehicles.
- Treading by livestock can reduce soil porosity and infiltration rate, and increase soil bulk density and soil strength, although these effects are mainly in the soil surface – top 5–10 cm (Figure 1).
- Despite these effects, rarely have reductions in crop performance been measured, possibly because effects are too small in magnitude or depth to influence plant growth significantly.
- Crop simulations with reduced root growth and surface conductivity suggest that even in the most severe case a 10–15 per cent reduction in yield on average could occur.
- The risk of compaction can be reduced by removing stock during wet conditions and maintaining soil organic matter.
- Because compaction from livestock is shallow it is not long-lasting and is rectified by natural processes or tillage.

FIGURE 1: The width of the applied pressure from livestock is less than vehicle traffic so the depth of influence is shallower at the same contact pressure



from grazing livestock on plant growth. Only a few have found significant effects. In 2008, Radford *et al*'s two year study on grey vertisol in Central Queensland found that grain yield was reduced by 15 per cent when cattle grazed when the soil was wet.

When cattle grazed when the soil surface was dry there was no impact on subsequent crop growth or grain yield.

In Western Australia, Proffitt *et al* in 1995 found there was no effect on grain yield, although reduced wheat plant density occurred when sown no-till into areas that were continuously grazed the previous year.

At SQFS we have also conducted a modelling study using APSIM (Agricultural Production Systems Simulator) to investigate how sensitive simulated wheat yield is to the major surface compaction effects of livestock.

The study was conducted over a 50 year period (1956–2006) and explored the two main effects, reduced root growth and reduced surface water conductivity, independently and when combined. The model did not account for the possible impacts of diseases or waterlogging.

Averaged over 50 years, the results show that mild surface soil compaction from livestock, would result in reductions in grain yield of less than 10 per cent (Table 1).

These mild compaction effects are simi-

TABLE 1: Changes in average crop grain yield (% change from control) at five locations in sub-tropical Australia due to different severities of soil compaction by livestock

Location	Compaction severity		
	Mild	Moderate	Severe
Emerald	-4	-10	-10
St George	-4	-10	-12
Clifton	0	-6	-8
Goondiwindi	-3	-9	-14
Narrabri	1	-4	-6

lar to most documented changes in soil conditions after treading by livestock. This implies that in most cases the impacts of compaction by livestock on crop performance are small, which is supported by the few studies that have investigated this experimentally.

Crop losses could be higher if more severe soil compaction occurred, especially if surface conductivity is greatly reduced and ground cover levels are low. Yield losses in the severe scenarios averaged 10–15 per cent but might be as high as 30 per cent.

But these very severe reductions in root growth (that is, 10 per cent of control) and surface conductivity are unlikely to occur in most cases.

The modelling also found that crop biomass was more sensitive to soil compaction than grain yield, and that crop growth and yield were reduced more by lower surface conductivity and rainfall infiltration than to reduced root growth in surface layers.

While this study uses computer models to explore the effects of compaction from livestock, there is a need for more experimental data to investigate how crops respond to changes in soil surface condition from livestock grazing

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Field walk of forage crop trials near Goondiwindi in September 2009. Soil compaction caused by grazing livestock may be less of a concern than many growers think.



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A message from Ergon Energy. For safety advice, call our Community Safety Team on 1300 736 349.

