SOIL COMPACTION STUDIES AT LYONS ESTATE

The changes in agricultural production techniques in industrialised countries over the past few decades have been dramatic, with economic pressure favouring the continuous increase of machinery power, vehicle weight and implement size, write **Kevin McDonnell** and **Mike O'Flynn**

To improve labour efficiency, farm equipment has increased in size. Tractors, combines, forage harvesters, grain and forage trailers and manure spreaders have become progressively bigger. This increase in the size of farm equipment may cause significant soil compaction that can negatively affect soil productivity as well as environmental quality.

Soil compaction is one of the major problems facing modern agriculture. Overuse of machinery, intensive cropping, short crop rotations, intensive grazing and inappropriate soil management lead to compaction. Soil compaction increases soil strength (bulk density) and decreases soil physical fertility through decreasing storage and supply of water and nutrients, which leads to additional fertiliser requirement and increasing production cost.

A series of trials were undertaken using different tyre widths and pressures to establish spring barley in a conversional plough and one-pass system.

One set of trials used a Fendt 716, and the other used a Massey Ferguson 6280.

The Massey Ferguson was fitted with a range of rear tyre widths from 520mm to 800mm and operated at the manufactures recommended tyre pressures. Soil compaction was measured with a cone penetrometer.

Where the tractor was fitted with a front ballast weight to counterbalance the one pass – the damage done by the front axle load outweighed any benefits associated with using a larger rear tyre on the equipment even at low tyre pressures. The graph opposite shows the significantly greater compaction done by the weight block via the front axle compared with when the tractor had the weight block removed.

This work showed that soil stress is always a function of the stress at the tyre-soil interface, which is due to a combination of both tyre inflation pressure and wheel load, as well as tyre properties and soil conditions. Hence management of the soil/vehicle interaction is critical for arable production.