

Alleviating Soil Compaction

Soil compaction has become a significant problem on many farms with the typical wet Northern Irish climate, the trend towards heavier machinery and more intensive grazing systems. This combined with a lack of maintenance of drainage systems has led to a breakdown of soil structure and increased compaction.

Olwen Gormley, CAFRE Senior Dairying Adviser in the West, states that 'soil compaction causes poor drainage, increased weed infestation, lower nutrient uptake from fertilisers and ultimately reduced grass growth'.

Compaction occurs where soil has been squashed into a solid, impermeable layer, either at the surface or within the topsoil. The compacted layer restricts the movement of air, water and nutrients down through the soil profile. This leads to poor root growth, which stresses the plant and reduces its response to nitrogen and other nutrients. Compaction can cause temporary waterlogging and surface run-off of water and potential loss of nutrients. Wet soils stay colder for longer, reducing the number of available grazing days. However compaction can also severely reduce grass yield in a dry season like this spring, due to restricted root growth in the compacted layer and lack of moisture.

Initially it is important to look closely at how badly compacted the soils are and to what depth. To check the depth of compaction, take a sharp spade and dig a test hole approximately 50 cm square and at least 40 cm deep. Examine the removed soils and side of the test hole carefully. Compacted soils will have a blocky grey structure which is hard to break up. Roots will appear shallow and grow horizontally. Compacted soils are lifeless with no or few earthworms and can have a bad smell due to anaerobic conditions. It will normally be possible to see the compacted layer and determine how deep the soils have been compacted. This will determine the type of machine that should be used to rectify the problem.

Soil aerators and pasture slitters are machines that are used to alleviate shallow compaction, down to a depth of 15 cm (6 inches). They are tractor-mounted, ground-driven machines with sets of blades fitted concentrically on a horizontal shaft. Weights can usually be added to adjust the depth of blade penetration into the soil. Some farmers have found that using a shallow aerator on dairy paddocks can sufficiently alleviate compaction caused by poaching with grazing cows.

Machines that have deeper blades such as sub-soilers, sward lifters and shakerators are only recommended where deep compaction (deeper than 15 cm) caused by heavy machinery is evident and are not a substitute for necessary drainage repairs. The soil must



be dry at working depth, subsoiling wet soils will do more harm than good. Only subsoil as deep as required by accurately setting the blade depth. The aim is to crack the soil layer rather than cultivate and so it will not be as prone to re-compaction.



Sub-soilers, sward lifters and shakerators can pull up sods and those fitted with a light roller at the back will re-instate the loose material leaving a more effective result. The use of roller spikers can be effective on silage fields if ground is uneven or damaged and would benefit from rolling. This machine offers the dual benefit of aeration and rolling, reducing the effect of a heavy roller which would normally cause compaction. If the ground has suffered deep

compaction over a sustained period of time and as a result grass quality and yield is poor, then it may be advisable to carry out full conventional ploughing, to loosen and regenerate the soils, and reseed.

The best time to alleviate compaction is in late summer or autumn to allow the soils to dry out and then to rest and recover during the winter. Many farmers took the opportunity to use spikers and aerators in the exceptionally dry months of March, April and May this year only to find the soil was too dry for the blades to adequately penetrate the ground.

In summary, the trend towards heavier machinery, more intensive stock numbers and poor maintenance of drainage systems has made soil compaction an increasing problem on farm land. There is no better prevention of compaction than to take care how the land is treated however in practice machines to alleviate compaction may be needed. Choose carefully which machine to use depending on depth of compaction and always operate in dry soils.