FACTSHEET April 2016

Tackling soil and sward conditions after a wet winter

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Tackling soil and sward conditions after a wet winter

Sward productivity depends on good soil conditions. This factsheet looks at how to improve pasture production following the prolonged wet winter of 2015/2016. Reduced water flow through compacted soils causes waterlogging and run off. Tips on how to identify and remedy compaction, improve drainage, control rush infestations and take advantage of the benefits from reseeding are outlined.

Soil Structure

Maintaining and improving soil structure, health and fertility is fundamental to improving farm profitability and the wider environment. Good soil management depends on assessing soils and managing them to improve the biology, chemistry and structure. Soil texture is the relative proportion of sand, silt and clay which can be measured mechanically or assessed on farm by hand. Soil structure is strongly influenced by farm management i.e. cropping, stocking, drainage and farm machinery.

A good, stable soil structure:

- Increases water holding capacity
- Promotes root growth and sward yield
- Maintains aeration and drainage
- Makes cultivation easier
- Reduces erosion risk

Dig a hole

Dig vertically with a sharp spade to cut out a cube of topsoil to 40cm in depth. Check the soil for structure, rooting depth, colour, smell and earthworms. A healthy soil has:

- A crumbly structure
- Cracks vertically when slice is dropped
- Good root development
- A range of earthworm types
- Good 'compost' smell indicating a high level of organic matter and microbial activity

SOIL COMPACTION

Compaction caused by livestock grazing and poaching is usually in the surface layer (0-10cm). Compaction caused by heavy machinery can be throughout the topsoil (down to 50cm). Compacted soil results in:

- Erosion and run-off
- Poor nutrient utilisation
- Slower manure breakdown
- Reduced yield

PREVENTING COMPACTION

- Work soils when friable and moist. Wet soils, especially when freshly cultivated, compact easily
- Use wide tyres or dual wheels at minimum inflation
- Use light machinery – heavy machines on wide tyres can compact the soil deeper than lighter machines on narrower tyres
- Use the same wheel ways for all operations

Improving soil structure

There are two main types of machine to choose from depending on compaction depth and soil type. How effectively compacted layers are fractured depends on the soil moisture, structure, texture, type, composition, porosity, density, and clay content.

a) SOIL AERATORS or PASTURE SLITTERS

These are tractor-mounted with blades fitted concentrically on a horizontal shaft. Long, sharp, narrow blades give greatest penetration and slot volume. These are best used in the spring or autumn, on established pasture when the soil conditions are right. They create slits in the surface layer about 15cm deep which lead to:

- Better drainage
- Earlier soil warming and grass growth in the spring
- A denser sward
- Improved soil nutrient utilisation
- Increased moisture retention due to less bare soil and fewer weeds

b) SUB-SOILERS

These are tractor mounted tined implements operating up to 40-45cm deep with winged, angled or vibrating tines.

Soils should be mostly dry and friable. If the soil is too wet, the subsoiler will slide through the ground without breaking up the soil and glaze the soil which will increase compaction. If the soil is extremely dry, it is hard to get the subsoiler into the ground requiring powerful tractors to pull the shanks through. High clay content soils can break into large clods if conditions are too dry. The efficacy of a subsoiler can be checked by digging a hole and looking for lifting and cracking in the soil profile.

Cross compliance and soil

Cross compliance standards for good agricultural and environmental conditions (GAEC) require farmers to keep a regularly updated soil assessment record for each field. A review of the state of the soil and actions required to remedy issues must be completed annually between 1 January and 31 January. Farmers should map their farm highlighting areas vulnerable to soil erosion and soil run-off.

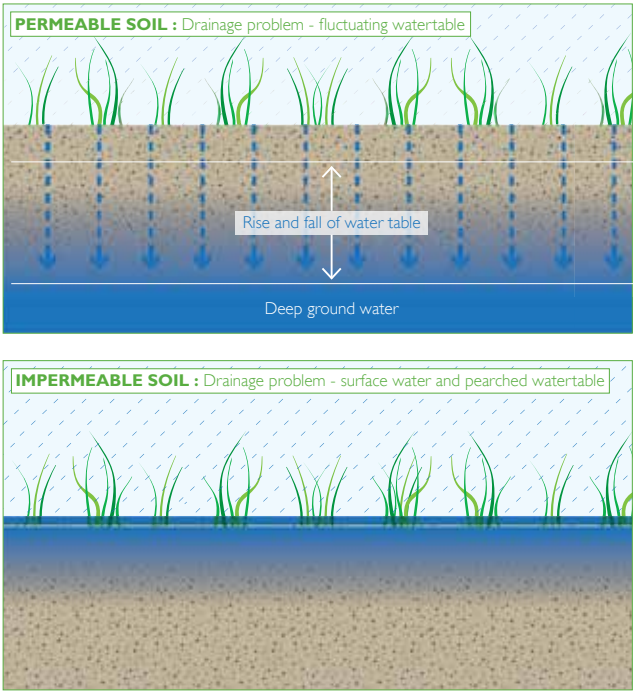
Land Drainage

Half of the agricultural land in Wales has artificial drainage ranging from an open ditch to intensive under drainage. These are often combined with mole ploughing or subsoiling to improve water flow through soils.

Why drain land?

- More versatile land-use
- Increase crop yield and maintain sward quality
- Reduce poaching by livestock
- Reduce run off
- Lengthen grazing season
- Increase manure and fertiliser use efficiency

Figure 1: Soil Water Movement



Drainage Types

OPEN DITCHES

This simple form of drainage is cheap and effective. Ditches are dug to suit each situation. Regular maintenance to clear vegetation and silt prevents blockages and poor performance.

Mole Ploughing

Drainage Types

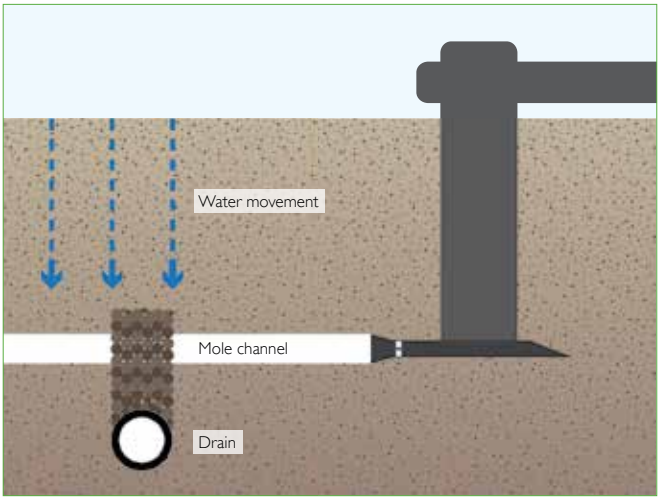
UNDER-DRAINAGE

Compaction reduces the ability of rain water to move through the soil to the water table. Waterlogging in the topsoil, even for a few days, is detrimental to crop growth and health. Modern drainage systems are designed to remove excess water within 48 hours of a major rainfall event.

The heavier the soil, the slower water moves through it. In heavier soils, drains need to be closer together to reduce the distance (and the time) that water has to travel. However, the cost of the drainage means that often pipes are too widely spaced and mole ploughing or subsoiling are also needed to increase water movement.

Mole ploughing is used in soils with high clay content (30% and above) where channels are formed which behave like pipe drains. The mole plough is pulled through the soil at a depth of at least 450mm and a spacing of 2.0m – 2.5m.

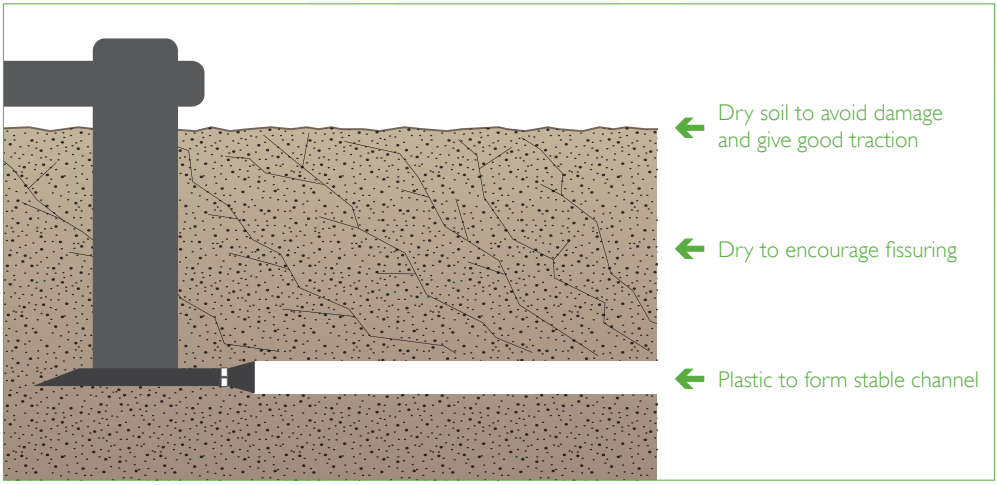
Figure 2: Mole drainage



Mole drains rely for outfall on a system of wide spaced pipe drains with a permanent, permeable backfill (e.g. gravel, crushed stone) over the pipes. Mole channels are drawn, at right angles, over these drains so that the bullet of the mole plough passes through the permeable fill. Water passes down through the moling fissures to the mole channel and then, via the permeable fill into the drain.

Timing of mole ploughing is critical, the surface needs to be dry enough for good traction, whilst the subsoil where the mole channel is drawn, should be firm but plastic enough to compress into a channel. Above moling depth, a drier soil leads to a greater number of fissures and more efficient water removal. A good mole channel is effective for several years but deteriorates so regular remoling is needed.

Figure 3: Soil conditions for effective mole draining



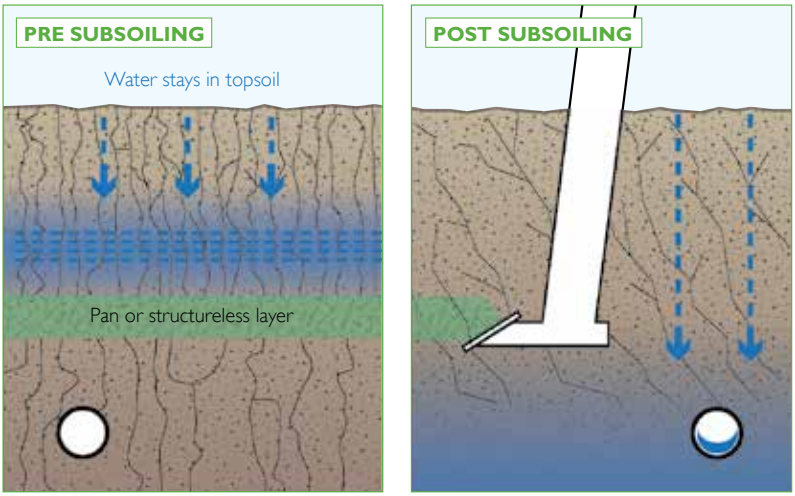
Subsoiling

Soil compaction at the surface or smearing below the plough layer, reduces water movement and root development. Subsoiling disrupts the subsoil by moving it upwards and shattering larger soil blocks to create a more permeable structure. It is important to identify the depth of compaction and to subsoil just below it.

The width between passes can range from 0.6m to 1.2m depending on soil type to achieve complete and uniform soil disturbance at full working depth. Use trial runs and dig a hole in the disturbed area to check that it is effective.

Land should only be subsoiled when the subsoil is dry and friable, so that it shatters, and the ground surface is firm enough for good traction.

Figure 4: Subsoiling



ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

New drainage work – or significant changes to existing systems – on semi-natural/uncultivated land requires the approval of the Welsh Government. Check that plans for drainage do not contravene any agri-environment schemes or breach cross compliance. Contact the local Welsh Government Divisional Office for information.

Reseeding Swards

Well managed grassland is the cheapest feed for ruminant livestock. It can provide over 90% of beef and sheep diet needs and between 50 to 80% for dairy cows. There are a range of benefits to reseeding old leys but to make the most of a reseed the soil, drainage, weed control and grassland management need to be excellent to reap the rewards of the £450/ha investment. Reseeding can boost production compared to older long term leys by £3,100/ha (£1,270/acre) over five years and improve profits and free up areas of land for other use.

Re-seeding benefits of using new varieties of ryegrass and clovers

- Increase production
- Improve sward quality and feed value
- Use clover to increase nutritional value of the total forage up to:
  - 10% higher live-weight gain in cattle
  - 20% more milk from dairy cows
  - 25% higher live-weight gain in sheep
- Use clover to replace purchased nitrogen (N) in low input systems
- Introduce new varieties with better disease and drought resistance
- Better response to applied N
- Grow more grass in early spring and late autumn
- Re-grow faster
- Support higher stocking rates
- Higher sugar content to improve stock growth rates and reduce methane emissions

MIXTURE SELECTION

Ensure the ley is "fit for purpose"; a perennial ryegrass and small leaved white clover is best for continuous sheep grazing and a hybrid ryegrass with medium/large leaved white clover for silage cutting or cattle rotational grazing. Other species like chicory, cocksfoot or timothy may be included to suit dry or wet conditions respectively and increase mineral content and biodiversity.

Typical livestock performance (milk production or daily live-weight gain) on a new and old grazing ley

	New ley: (70% ryegrass, 30% clover)		Older ley: (40% grass, 10% clover)	
	Potential intake kg DM/head	Potential production/ head/day	Potential intake kg DM/head	Potential production/ head/day
Dairy cow (600kg)	12	17 litres	13	11 litres
Growing beef (250kg)	7.2	1.4kg	5.8	0.9kg
Weaned lamb (25kg)	1.0	180g	0.8	90g

Reseeding tips

- Measure grass yield to identify which fields to reseed
- Correct soil compaction, pH, P and K levels
- Choose varieties from the Recommended List for Grass and Clover
- If soil structure is good; oversow or direct drill to save cost and time
- If the sward may contain less than 25% of improved agricultural sown species, obtain an Environmental Impact Assessment (EIA)

EFFICIENT GRASSLAND MANAGEMENT TO MAKE THE MOST OF RESEEDS

Keep sward quality high

Energy (ME) needed for meat and milk production, drops as grass plants mature and stem to leaf ratio increases. After heading, ME drops by about 6 MJ per week so grazing grass when it is young and leafy and when each plant has between 2.5 and 3 leaves is key to benefitting from high D values in new varieties. Ensiling grass to meet livestock needs means cutting when young and leafy (72 D value for productive stock) to save on concentrates. For maintenance needs (eg suckler cows) leave the grass to 'bulk up' for a higher yield but lower quality.

Rush Control

Rush infestation on pasture is an increasing problem in Wales linked to higher rainfall. Wet ground conditions limit the opportunities for soil and pasture management and for rush control.

Options for prevention and control of rushes depends on the pasture.

Control or management must:

- Not breach Cross-Compliance, e.g. inappropriate application of herbicides or destruction of habitats (Environmental Impact Assessment rules).
- Avoid cutting, topping or chemical control between March and mid-July where there are ground nesting birds (e.g. snipe or lapwing).
- Be compliant with Glastir and other agri-environment schemes, which may not allow spraying of habitats or other areas. Some Glastir options restrict rush cutting, e.g. Glastir Advanced marshy grassland.

Common rush produces 10,000 seeds/year which can be dormant for up to 40 years. Poaching or cultivation breaks the soil surface and allows seeds to germinate. Rushes also spread by growing new stems and they thrive in wet, low nutrient conditions in which productive grasses are unable to compete. Rush has a low D value, low palatability and does not ensile well. However it can be baled for bedding, offering a cheap alternative to straw. Rushes can quickly dominate in rough grazing and permanent pastures and when in excess of 70%, not only offer little grazing or silage value, but become too dense for bird, insect or wildflower habitats.

On productive land rush infestation can reduce output by £300/ha. Basic, good soil management and reseeding need to be part of any control strategy. Soil structure, pH, P and K levels should be corrected, land drains checked and poaching avoided.

GRAZING MANAGEMENT

To reduce rush cover, avoid over-grazing and poaching, but graze hard by cattle in late spring or early summer when conditions allow. Stock lightly in wet conditions to reduce pasture damage.

TOPPING AND CUTTING

Depending on the density of the rushes, use a flail or rotary topper or drum/disc mower before the rushes seed. Remove the swath as mulching restricts grass re-growth. Topping is cheaper (£38-50/ha) and effective in light infestations where it can reduce the mature rushes and give better chemical control.

CHEMICAL CONTROL

Rushes should be sprayed when they are actively growing but before flowering. Equipment should be maintained and calibrated and the operator must hold the correct NPTC certificate for the application.

Remember: Grandfather rights exemption ceased on 26/11/15.

There are 2 options:

- **Glyphosate –** a commonly used herbicide.
- **MCPA –** a selective herbicide widely used for controlling rushes.

Both should be applied according to the specific product datasheet. Advice and guidance on spraying chemicals and plant protection products is available in:

- Code of Good Agricultural Practice
- Code of Practice for using Plant Protection Products

Glyphosate – Glyphosate kills the plant roots and breaks down quickly in the environment. Mature and young rushes can be controlled using glyphosate in a weed wiper that should be adjusted to target the chemical to height of the rushes. A weed wiper uses less chemical than a boom sprayer, minimises the risk of wind drift and can leave grass and clover unaffected. Weed wipers are only licensed for use with glyphosate.

MCPA – Common rush is only moderately susceptible to MCPA, a selective herbicide which takes a long time to break down and is prone to leaching in clay soils. Although MCPA leaves grass undamaged, it can kill clover and other broad leaved species. MCPA should not be used near water courses (including ditches), on land that is wet or drained or mole ploughed, land sloping towards water courses or in sensitive catchments.

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