

# Improving Soil Productivity through Drainage

The objective of a field drainage system is to remove excess water from the soil therefore improving the conditions for root development and grass growth. Improved drainage will also make field operations easier, including the harvesting of silage, earlier turnout of livestock and improved grass yields. Although an investment which will reap many benefits, budget carefully and avoid taking on too much expenditure during this difficult financial time.

## Maintenance of existing drainage system

Many of the drainage schemes carried out with grant aid in the 1970's and 1980's are at the stage where they need a lot of maintenance to be effective. If neglected the whole drainage system can break down in a very short time. In the current spell of dry weather and with silage in, now is an ideal time to carry out drainage works. It is financially better to maintain and repair than to start a new drainage system. First consider the following points:

- Maintenance of sheughs – inspect to ensure water is flowing freely, allowing a sufficient outfall from the drainage pipes and avoiding build-up of silt in the pipes.
- Note that infilling or laying drainage pipes in open sheughs are not permitted except by prior permission from DAERA.
- Only vegetation and silt should be cleared from the sheugh, avoid deepening or widening the sheugh. Try to leave the vegetation untouched along one side of the sheugh at cleaning.
- Fencing of sheughs – consider fencing off sheughs to prevent cattle from tramping banks and drainage outlets. Although take care to position fences to allow for regular cleaning out of sheughs.
- Inspection chambers – the use of occasional inspection chambers in suitable locations are beneficial to monitor water flow and clear obstructions in areas prone to silting.
- Inspect existing drains- open inspection holes and check if the old pipes are open and stones still clean.
- Plan repair work of existing drainage as necessary.

## Designing a new drainage system

The starting point on any field is to investigate the site to find the exact cause of the problem. Visible indications may be rising springs, soft ground conditions in dry weather and wet patches with rushes. Once these areas have been identified the type of drainage system will depend on the following three main categories:

- High water table – low lying, flat ground with little or no fall. Cleaning existing sheughs may help but a series of equally spaced parallel piped field drains will also be required.
- Impervious subsoil – common in many areas of Northern Ireland especially in Counties Tyrone and Fermanagh. Characterised by shallow topsoil overlying a poorly structured 'heavy' clay subsoil which

will not let water move freely through it. The design of this drainage system must allow for the use of either mole drains or gravel tunnels over a series of main piped collector drains.

- Springs or seepage lines – water moves through the free draining subsoil and runs along the top of the permeable layer bursting out on the side of the hill. Drains will have to be constructed deep enough to intercept the water in the soil layer in which it is moving and in some instances can be two metres deep.

## **Drain Depth and Spacing**

Within conventional drainage there are two options either:

- Wide spacing and deep – most cost effective, but depends on permeability of soil and amount of fall available. On free draining soils with a high water table, drains could be 12 – 15 metres apart and up to a metre deep (rarely beneficial to go below a metre deep).
- Narrow spacing and shallower – more suited to clay soils with drains spaced 6 to 7 metres apart and 900mm deep. If considering mole draining or gravel tunnelling, ensure collector drains are at the correct depth.

## **Cross Compliance**

When considering new drainage works, all farmers and landowners claiming under direct aid schemes, including Single Farm Payment, must meet the Cross-Compliance conditions. Prior permission from DAERA is required if you have land designated as permanent grassland on your farm. A further requirement of cross compliance is the Environmental Impact Assessment Regulation and this includes drainage on uncultivated land. However drainage of cultivated land is permitted without notification.

## **Drainage Layout**

- Aim for a minimum number of outfalls, whilst ensuring that there is sufficient fall.
- Due to the undulating and variable landscape in Northern Ireland, the herringbone design has been popular, with the side drain running across the slope at a gradient not exceeding 1 in 20.
- When working around existing drains try and connect them into the new layout as it will give better drainage and reduce the likelihood of 'boil ups' at a later date.
- Carefully connect pipe to pipe at the joins and ensure stones are manually placed on top of the joins to keep them stable while the rest of the stones are added.
- Stay with your drainage contractor to ensure the drains are positioned for best effect as only the farmer will be familiar with the field in a wet time.
- Choose to work in a dry time, working on damp ground will do more harm than good to soils.
- Consider the cost of stones, pipework and contractors charges and budget accordingly. Plan to do just as much as you can afford. These are difficult times and proceed with financial caution.

## **Drainage Stones**

- The stones should act as a filter to the drainage pipes as well as a connector if mole drains or gravel tunnels are used.
- Drains should be filled to plough depth as there is little benefit in filling them to the top unless it is to solve the problem of ponded water on the surface.
- Choice of stone will depend largely on what is available locally. It can be clean broken stone or gravel and range in size from 12 – 36mm.

## **Mole Drainage and Gravel Tunnelling**

In heavy clay soils with poor permeability, conventional drains may not be adequate to provide satisfactory drainage even at the closer spacing. In this case it is necessary to speed up water movement by both loosening the subsoil and providing closely spaced channels to carry the water to the drain. This can be done by either mole drainage or gravel tunnels.

Both provide comparable results in stable soils and the mole drainage would be preferable because it is much cheaper to install. However mole drainage is not permanent and will only last in the region of five years. They are not suited to steep slopes or unstable ground as channels will collapse, nor is it satisfactory in stoney subsoils.

The gravel tunnel whilst more expensive has a number of advantages over mole drains:

- It is a permanent system.
- Can cope with unstable soils – stone infill stops the collapse of the channel.
- Can cope with stones in the sub soil.
- Can work on steep slopes.
- Greater flexibility on soil moisture content at installation.

Both systems will require collector drains spaced every 20 – 30 m which they will run over the top of. Spacing between each will also be similar at approx 1.5 m apart and a depth of 450 – 500 mm.

## **Summary**

Maintaining and repairing existing drainage systems will help prolong their effectiveness because if neglected the whole system can break down in a very short time. If sheughs and outlets are not kept cleaned then no drainage system will work. Consider repair works where necessary first. The installation of a new drainage system whilst being costly can provide substantial benefits in terms of grass yield and timeliness of operations. It is important to take the time and make the effort to identify the problem and design a suitable drainage system. Budget carefully in this financially difficult time.

Discuss your drainage plans with your local CAFRE Development Adviser and for clarification regarding cross compliance rules relating to cleaning sheughs and new drainage on your farm, discuss with the local CAFRE Agri-Environment adviser. Call 0300 200 7843 and ask to be directed to a relevant local adviser.



*Conventional collector drain filled to the top with clean broken stone.*

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