Field Drainage

Practical Guide

Scottish agricultural land has been drained using various methods since the 1700's, with major investment from the 1950's to 1980's encouraged by grant schemes. Currently, the majority of drainage schemes are between 20 and 50 years with some schemes up to 100 years old.

With climate change predictions signalling increasing and more intense rainfall events, effective drainage systems on the farm are going to become even more important.

Although difficult to quantify, farm drainage systems will have an impact on farm emissions; wetter soils are prone to greater Nitrous Oxide (N_2O) emissions compared to drier soils. N_2O is a key greenhouse gas implicated in driving climate change.

This Practical Guide looks at field drainage systems.

Benefiting the farm business

Good drainage through natural or manmade systems provides a number of benefits to both the farm business and the environment, for example:

- An accessible soil profile allowing a better root system and improved nutrient uptake, benefitting crop yields
- Crops are less prone to a range of common diseases
- Warmer and drier soils increase the length of growing or grazing season, improving the efficient use of your land
- Soils are more resistant to drought due to deeper root systems accessing more available water
- Less poaching of soil surface from machinery or livestock, reducing risk of soil structural damage; drier soils are more resistant to pressures acting on them
- Better animal health due to reduced risk of waterborne diseases and parasites
- Well drained soils are easier to work requiring fewer cultivations (reducing fuel use) to create a seedbed
- An increase in the number of available work days and soil recovers more quickly after heavy rain .

Farming for a Better Climate

There are five sets of Practical Guides covering :

Use energy and fuels efficiently

Develop renewable energy

Lock carbon into soils and vegetation

Optimise the application of fertilisers and manures

Optimise livestock management and the storage of manure and slurry

Find further information, including links to other Practical Guides and Case Studies, at

www.farmingforabetterclimate.org

Funded by the Scottish Government as part of their Climate Change Advisory Activity

Websites

www.farmingforabetterclimate.org

www.soilassociation.org

www.sruc.ac.uk/info/120062/crop_and_soils_systems/412/visual_evaluation_of_soil_structure

www.agrecalc.com

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Field Drainage

Drainage problems

Poor field drainage can be due to a number of problems both natural and manmade. In Scotland, these can be roughly split into 3 main problem areas:

- Surface water
- Ground water
- Springs and seepage lines

Drainage issue	% of problems (Scotland)
Water table	25
Impermeable subsoil	20
Springs	12
Failure of old drains	39
Other	4

As the table shows, during the late 1970's, drainage problems were mainly due to the failure of old drains, followed by water table and impermeable soil problems.

It is essential that before any drainage work is carried out, the cause of the drainage problem is identified. Different problems have different solutions and as drainage installations are expensive, it is imperative that the correct solution is installed.

Drainage installation

New drainage systems can be installed using a number of methods:

- Mechanical excavator - either wheeled or tracked plus a good operator. Suits small to moderate schemes.
- Trencher based system - professional drainage contractors can install 1,000 – 1,500 metres of drain per day. Not suited to soils with high stone or rock content.
- Trenchless based systems - up to 2,000 metres of drain installed per day. Suited to site with no existing drainage system (can be problems connecting existing drains if no plans are available).

Permeable backfill is an expensive element of the drainage scheme but is essential, especially on sites with impermeable subsoil. Depending on trench width and depth, the amount of gravel required per 20 metres of installed drain can vary from 1.5 tonnes using a trenchless system to 16 tonnes plus using a mechanical excavator.

What next if you identify a drainage problem on the farm?

Investigate any existing drainage systems to ensure that these are functioning properly. If no obvious faults are found, an experienced and competent drainage consultant should carry out further investigations. Test excavations and a level survey to determine the most appropriate system to alleviate drainage problems on your site should be undertaken. Your adviser should create a plan, including a bill of quantities which can be supplied to a contractor for pricing. A post construction plan of the system should be prepared to ensure that the drains can be located for future maintenance or repair.

Specialist drainage problems

Iron ochre, an orange slime, which coats the inside of drainage pipes is a problem for organic soils. It will block pipes if not controlled by regular jetting of the drainage system. Drainage schemes need to be designed to allow pipes to be easily rodded or jetted where iron ochre is present.

Running sand is another problem; ground water flows through a sandy soil turning the soil liquid. There are various methods to overcome this problem depending on the limitations of the site.

Managing floodplains

Flood plains are a major benefit to the whole community in that they store flood water and release it back to the river as levels recede, helping prevent flooding of towns and villages downstream.

Flood plains have some of the most productive farmland in Scotland and it is essential that they have good drainage to allow them to recover quickly after a flood event to maintain their productivity.