Good soil structure and a well-maintained drainage system are essential to avoid poorly-performing cropped areas for one Suffolk farmer and machinery designer.

Soil structure and drainage key to higher yields and quality

A section through the soil profile shows a mole drain about 60cm below the surface.

Creating the optimum soil profile into which plant roots can develop and thrive is essential to reap the full benefit from the time, effort and capital invested in growing crops. However, the importance of good drainage and soil structure in achieving this are often forgotten in the rush to establish crops.

That is the belief of Suffolk farmer Jeff Claydon, who is also a familiar face to many growers as the inventor of the Claydon strip tillage drills.

He says: "It is often a case of just pressing on to get the job done without really considering fully the impact on the soil, or whether the conditions required by the crop to survive and thrive are being provided, largely because traditional methods involve numerous passes and are so time consuming.

"Crops cannot prosper in cold, wet, slow-draining soils, which impair root development, so poor results are inevitable where crops are 'muddled in'. While it will not hurt the seed to be in wet soil for a short period, any longer than a few days and it will simply shut down, start to decay and ultimately fail to germinate.

"With margins in farming where they are currently that is too expensive to let happen, so we must avoid creating smeared, compacted soils. Instead, our priority must be to get water passing through the seedbed, which requires good drainage systems and good soil management techniques."

Top tips for free-draining soils

- Walk ditches regularly to check they are clear of obstructions and that outfalls are clear and free flowing
- Conduct a soil permeability test
- Poorly-timed cultivations can lead to compaction and surface ruts which trap water
- Mole drainage can be an economical approach but needs doing regularly

Source: Jeff Claydon

Poor maintenance

Much of the flooding now seen during the winter months is caused by poor maintenance of existing drainage systems and ditches, he adds.

"This reduces the capacity of soils to hold water and increases the speed at which it moves downstream. Crops grown in such conditions will develop shallow rooting structures which make them far more susceptible to drought when the land does dry out and any bare patches which are created will allow pernicious weeds, such black-grass, to fill the void."

So what can growers do? The starting point, says Mr Claydon, is to walk ditches regularly to check they are clear of obstructions and that outfalls are clear and free flowing.

"Poor drainage is easy to identify – if the land remains 'squelchy' 24-48 hours after heavy rain then almost certainly it needs draining.

"If the soils on your farm can support mole drains, this technique can be quite economical as it can reduce the number of underdrains required. However, it must be done regularly, every 10-15 years in our case, to a depth of 50cm to 60cm depending on where the clay is, and be carried out when it is in a plastic state so the moles hold their shape.

"We use a 300hp tractor to pull a single-leg mole drainer equipped with a 100mm expander at 2.7-metre intervals. Where conditions are unsuitable in autumn we often work through standing wheat in spring, because the growing crop will help to re-structure the soil and the mole to settle. You will know within six months whether you did the job right.

"On the Claydon farms we have a combination of tile and plastic drainage and in the last 15 years have spent about £40,000 renewing areas of the drainage system which had reached the end of their useful life.

"Fortunately, what we have spent on drainage has been offset many times over by the reduction in the cost of establishing crops using the Claydon system, which is typically one third of the £200/hectare it would be using conventional ploughing and min-till methods and saves us £120/ha. Some of that is invested in continually improving the field drainage system."

But while poorly-maintained drainage systems often get the blame for fields lying wet, another likely cause is

Jeff Claydon believes the importance of good drainage and soil structure is often forgotten in the rush to establish crops.

HOW TO TEST SOIL PERMEABILITY

THE ability of the soil to dissipate water quickly after harvest is paramount, says Jeff Claydon, who has developed what he says is a simple, quick, effective, low-cost way to check the condition and permeability of soils.

"The most common way to check for compaction is by digging down with a spade, but that will only tell you part of the story, which led me to develop another approach.

"I originally developed the test to assess and demonstrate the impact that even one pass of a track can have on the soil's permeability, but realised it had wider applications in assessing soil condition.

The test simulates 145mm of rain falling in a day.

"The test uses a 50cm by 35cm by 15cm frame made of 6mm steel with a strong metal mesh in the middle. This is pressed into the area being tested, deep enough so its edges will contain the water from a full 20-litre drum. Stand the drum on its head in the tray and

A good drainage system will begin flowing within 12 hours of rain.

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>
> JEFF CLAYDON

poorly-timed cultivations which caused compaction and surface ruts that trap water, adds Mr Claydon.

The difference in productivity between a well-managed soil and one with excessive wheelings or where ground pressure is not managed properly is typically about 20 per cent, he says.

"Reducing field traffic must therefore be a priority. With conventional plough-based cultivations that will be difficult, as 85-95 per cent of the land undergoes at least one wheeling during a typical growing season. Minimum tillage reduces this to about 65 per cent and direct drilling to 45 per cent.

Mask

"In the short-term, ploughing and subsoiling can mask poor drainage in the top soil layers simply by creating a greater volume of soil to soak up rainwater, and the problem will not show up until winter when it reaches capacity. But by then the land will be too wet to do anything to rectify the problem and a poor crop will inevitably result.

"Since we stopped ploughing in 2002 we have never seen water standing on the headland as it did before and the impact on soil structure, condition and permeability has been dramatic. Even on our heavy clay, the soil now acts like a big sponge, soaking up water and releasing it progressively."

Ditches should be inspected and cleared if necessary to ensure water draining off the fields is not restricted from flowing away.

time how long it takes for the contents to drain away into the soil profile. Then repeat the test in an adjacent un-compacted area to highlight the difference in permeability."

Importantly, the test should be done around the time of drilling, or in good crop growing conditions, and on moist soil. The reason for this is that if the soil is very dry much of the water will go down cracks in the surface, and if the soil is waterlogged it would be very slow to drain away.

In a test done in mid-September 2017, the 20 litres of water took 90 minutes to dissipate through the tracked area. In an adjacent area where the front tines of an Opti-Till drill had taken out any compaction in the top 150mm, it took just 90 seconds.

This test highlights how, even in areas where compaction occurs during harvest, soil can be returned to its optimum permeability before seed is sown, allowing it to grow away quickly, says Mr Claydon.