Drainage investment pays off

Bringing land back into productive cropping is the aim of a land drainage scheme recently completed on a south Wales farming estate. Peter Hill reports.

Waterlogged land has poor soil structure, delays field operations and prevents crops performing to their potential.

One look at an outfall into a ditch makes it clear why a 20ha (50-acre) block of land on the Penllyn Estate in South Wales was in dire need of a new drainage scheme.

Four weeks after being laid in early March, water is flowing out of the 80mm pipe at a fair rate of knots – and has been from within an hour of being put in the ground as part of a herringbone pattern scheme installed by contractor William Morfoot.

Damien Burnell, who looks after day-to-day management of the arable enterprise on the estate near Cowbridge in the Vale of Glamorgan, says the new drainage scheme will make a big difference to the workability and profit potential of the block.

"It gets terribly wet, causing poor crop establishment and making it difficult to get on the land when you need to," he says. "We have other land with acute drainage problems and the plan is to tackle another 40ha (100 acres) over the next two years."

Arable crops account for just over half of the 1000ha (2478 acres) of mostly in-hand land farmed on the estate, with wheat supplying two south Wales feed mills accounting for 50% of a rotation that also includes feed barley and some malting spring barley, which is partly grown for its strategic value in blackgrass control.

Spring beans and spring oats are also part of the mix, and with a climate that brings few flea beetle problems, winter oilseed rape remains a popular crop.

"In fact, it's our biggest earner," says fellow manager Andrew Shackell, whose main focus is the estate's numerous diversification enterprises. "We don't suffer from dryness down here, so as long as we keep on top of the slugs, we can grow good crops of oilseed rape."

Penllyn Estate managers Andrew Shackell (left) and Damien Burnell, with digital contour and drainage scheme layout maps.

1000mm annual rainfall

With a long-term average in excess of 1000mm a year, not suffering from dryness is something of an understatement. And on soils that are predominantly clay loams and silty loams, with the heavier ground lying over limestone, timely cultivations and drilling are essential.

"The larger arable block on the estate is free-draining but parts lying in a historic flood plain are not as naturally free-draining," notes Damien. "For the past three years we've been introducing

Soil pushed back over the trench will be levelled with a rotary tiller once settled.

Water has been gushing from the mains since an hour or so after they were laid.

Damien Burnell points out the barely visible trace of the tracked gravel cart.

Marker post highlights the location of an inspection chamber for jetting access.

cover crops such as deep-rooting radish to help improve the soils."

Min till establishment approach

At present, the farming operation is committed to a largely minimum tillage approach to crop establishment, using a 6m version of Vaderstad's Carrier disc cultivator. This has two rows of flexible tines up front to bash slugs when working on stubbles and the levelling board tines for ploughed ground.

A 7.5m Claydon stubble rake is also available to spread chaff and disrupt slugs, and the estate has toyed with direct drilling to the extent of calling in a local contractor's Mzuri Pro-Til tine drill to put spring beans into cover crops, accompanied by 100kg of TSP.

But for the most part, a 6m Rapid A-600S trailed disc seeder is the lead drill, while oilseed rape, and stubble turnips and forage rape for the sheep enterprise are sown in one pass from a BioDrill on the back of a 4m TopDown progressive depth tine cultivator.

In addition to surface cultivation, the TopDown's longest tines provide the subsoiling action required to break through compaction for drainage and to encourage the crop in its deep-rooting habit.

"Elsewhere in the rotation, subsoiling is carried out only if investigation with a spade shows that it's needed," says Damien. "We also use the spade before any cultivation because we don't like cultivating deeper than we need to."

Draining through the rape when it was much smaller in early March has cost little through losses compared with the benefits anticipated, says Damien Burnell.

Organic matter dilemma

At present, the majority of straw is chopped on the combine but in a dry season Andrew and Damien could be tempted to leave some in the swath for baling given keen demand for supplies from the stock farms on their doorstep.

"As ever, it's a question of balance," says Andrew. "The land is in good heart as far as organic matter is concerned because we have a 30,000 tonne garden waste composting operation on the estate and only recently packed in a 1200-head beef unit.

"We already see some herbicide lock-up because of the high organic content, so the soil wouldn't miss the straw," he adds. "But then we have to consider the impact of soil compaction from baling, collecting and hauling the straw off fields."

While that is a decision for a dry year, the current preoccupation is with getting land that lies wet into more serviceable condition.

Selling a block of land for development on the edge of the local town has provided the capital to invest in drainage in three tranches across 60ha (150 acres) of the estate so far identified as being in most need.

Fields deteriorated over time

Tim Sisson of drainage contractor William Morfoot takes up the story: "The estate had identified multiple fields experiencing acute drainage issues, with poor crop establishment and evidence of soils being at saturation point at ground level, resulting in fields being unable to achieve their yield potential and ultimately reducing the bottom line earning capacity of the ground."

Although there was little or no visual evidence of it, a linen map discovered in the estate office revealed an extensive complex of clay tile drains installed some 50 years ago when generous grants were available for such land improvement works.

Andrew Shackell remembers vegetable crops being grown on the site in the 1970s and harvesting fodder beet being manageable in the 1980s.

"But since then, conditions have deteriorated as drains failed and the ground became waterlogged and pretty much died," he says.

Investigations on the ground had shown that many of the pipes were failing and there had been no gravel backfill used on

An aerial view of the first 20ha (50 acre) block to be drained; fields at the far end and bottom right are also due to be drained during the next three years.

the older pipes, despite being laid in heavy subsoils.

Drainage issues investigated

William Morfoot was engaged to further investigate the issues and undertake a detailed survey early this year. The firm's quad bike GPS survey provided a digital topographical map while studying old paper farm maps revealed how water flows were managed around former field boundaries – the first block of 20ha (50 acres), for example, was once eight individual paddocks.

"We also identified the need for some improvements to ditch systems and, in particular, for a new ditch to manage water flowing into the area from surrounding higher ground," notes Tim Sisson.

The ditch will be dug using the estate's own Takeuchi 360-degree excavator as an interceptor for water coming off the narrow field to the west of the recently drained site and the wooded area beyond, taking care to avoid a pipe running to the farm buildings from a nearby borehole.

Andrew recalls his concern that this had been breached when the main drains were installed: "I was convinced they'd cut into the pipe when the mains started running with a large volume of water – but it was simply coming out of the ground."

Scheme gets in place

The natural contours of the land and overall shape of the fields called for a herringbone layout, using 80mm and 100mm perforated plastic pipe for the laterals at 20m spacing feeding into a pair of 160mm main drains running down the slope to an existing ditch.

Gravel backfill was added to an average depth of 450mm as it is considered a key factor in assisting rapid infiltration of surface water into the piped network.

"Gravel speeds the rate at which excess water is able to drain away, which allows the field to recover more quickly after heavy or prolonged rainfall," says Tim Sisson. "Mole drainage was considered at the survey stage but we felt that the subsoils present were not conducive to holding mole channels open effectively in the long term."

There is also the added dynamic of the significant annual rainfall – more than 1000mm a year, remember – which limits the window for carrying out mole drainage operations.

With everything agreed, no time was lost in getting the scheme underway, with Morfoot's Mastenbroek tracked trencher guided by GPS steering and gradient control working its way through oilseed rape in the western side of the site and poorly established winter wheat on the eastern portion.

As Damien Burnell points out, only a third of the intended winter wheat area was sown in the field last autumn because of the ground conditions.

"We knew what the crops we did get in wouldn't perform particularly well so there was no point waiting until harvest to have the work done," he says. "By pressing on, we thought we'd

Contractor William Morfoot's trencher and backfill wagon work in tandem.

Getting excess water away will help timeliness of operations such as drilling and spraying

The contractor

Drainage contractor William Morfoot Ltd is based near Thetford, Norfolk but operates nationally, having drained land throughout Britain for almost half a century.

"There are few costs associated with farming that produce a comparable and consistent level of return to that of investing in field drainage," says Tim Sisson. "A professionally designed and installed land drainage system will last for 20 years or more on stronger soil types, and that's what we aim to provide with our latest-technology surveying and mapping systems, and drainage installation equipment."

In addition to land drainage, the firm works in the environmental sector creating wetland habitats and creates and refurbishes wetland scrapes as well as lakes, ponds and reservoirs. It also handles the installation of water management, utility and renewables infrastructure, and constructs sports fields and horse arenas.

The company is accredited by the Land Drainage Contractors Association (LDCA) and is Achilles UVDB verified and approved for utility works.

Tim Sisson, managing director at drainage contractor William Morfoot.

probably get more benefit from the drainage than any losses caused by draining through the standing crop."

To start putting that right, a motley hedge running from one end of the site to the other was cleared with half an eye to combining the land on either side into one field. As it is, conservation scheme rules require that it be re-instated, which is why pre-cast concrete inspection chambers set into the two mains to facilitate flushing if needed in future coincide with its location.

In the meantime, the old hedge line and tramlines provided a useful access route for the self-propelled gravel cart, which despite a fully laden all-up weight of 33 tonnes left barely visible track marks where it had to cross virgin ground.

"We were hugely impressed with the way Morfoots went about the job, from the site inspection and surveying to the work on-site," says Andrew Shackell. "The operators were very conscious about minimising the amount of travel off previously tracked ground and they even managed to get the mains into the ditch without disturbing the stock fence – perfect!

"Over the seven or eight days the crew was here, they always cleaned the yard and any machines of ours they used, such as our small excavator, and they've been in constant communication, ensuring we knew what to expect and with good follow-up."

In addition to a drainage scheme that should work wonders for future cropping on that block of land, the estate now has a detailed map of the scheme available digitally as well as on paper.

And also a low-tech, high-tech combination of marker posts and GPS co-ordinates now entered into the estate's Gatekeeper farm records as a permanent record of the location of the new outfalls, which continue to run as a huge volume of water shifts out of the soil.