



Resilient Cropping

Quick, Cost Effective Drain Laying

About this fact sheet

This fact sheet describes the use of high accuracy GPS systems to automate tile drainage surveying, planning and installation. The equipment in use in Hawke's Bay, greatly reducing the effort and cost of providing enhanced drainage for cropping.

The system

A fast and highly accurate drain laying solution developed by Keith Nicoll and Hugh Ritchie combines numerous operations for great efficiency.

In two passes, the ground is surveyed and drainage pipe installed complete with a gravel envelope. A key to this efficiency is the use of precision technologies including high accuracy RTK-GPS and in-tractor computing.



Figure 1 Precision drain layer in action (D. Dixon image)

The tractor-drawn drain-layer is able to lay 110mm plastic drainage pipe 1.2m deep. Its wheels are hydraulically driven to provide extra traction.

High accuracy GPS maps farm terrain in 3-D, special software determines optimum drain gradients on the fly, and guidance ensures pipe is laid to exact depth. And for future reference there is a record of exactly where pipe is laid.

Drainage survey and planning



Figure 2 In-tractor computer console that calculates drain depth and controls laying operation

The system surveys the paddock as the tractor drives along the planned line for the next drain, the GPS measuring surface elevation to within 5cm.

Trimble *Field Level*TM software calculates the optimum design to fit the desired slope from the top end of the drain to the outlet.

A change in grade can be specified and applied where necessary, and no extra set-up is needed. This is very valuable when the surface grade is variable because it allows more consistent depth of pipe-laying across a paddock to give more effective drainage.



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Drain pipe installation

In practice, drain pipe is laid alongside the planned drain and fed into the pipe-laying shank on the machine. The depth of the shank is automatically controlled according to the design saved in the on-board computer. Pitch control allows the mole-plough tine to be angled, reducing stress on the machine.

The system developed lays pipe at about 1km per hour, limited by the ability to keep shingle supplied. The drain-layer has its own hopper holding enough shingle to back-fill an envelope on 200m of pipe. A towed hopper would supply shingle faster, increasing the work rate.



Figure 3 Drain pipe and gravel being fed into the machine - leg depth controlled by tractor GPS

Early success

The machine was used to lay new drain pipe in one of Hugh's wetter paddocks. Hugh was delighted. Water flowed strongly from the pipes, with some pipes flowing for a week after installation. "I now have a quick and cost effective solution to drainage and I know the pipe has been precisely laid to the correct depth and grade," says Hugh. "From now on, planting won't be delayed or crops affected by big puddles in those lower areas. We expect fewer stuck tractors, even crops, and more yield."

Further information

See the LandWISE website for updates: www.landwise.org.nz