



## Controlling runoff with furrow diking

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Surface runoff can be a major issue for many vegetable growers. With it comes a higher risk of soil and nutrient losses, both of which complicate efforts to crop in an economically and environmentally sustainable manner. In the past, sediment traps have been used in some regions to contain runoff and prevent off-site impacts. To be effective, these traps require regular maintenance, and there is the added cost involved in spreading eroded soil back onto cropping paddocks. Also, these traps do not solve the issue of localised ponding and yield loss in the paddock, nor do they actually prevent surface runoff in the first instance.

A vital step to reduce surface runoff and ponding damage is to identify and then control water that enters the paddock from surrounding areas (e.g. small streams, other surface drains or runoff from nearby paddocks). In many cases this can be achieved with interception drains and banded headlands. The next step is to ensure the soil has good physical characteristics that allow rapid infiltration and drainage.



However, even with these practices there is still a risk of water movement within the paddock during rainfall or irrigation events. In these cases, some form of in-field control measure is beneficial to reduce runoff and limit soil erosion. One practice that has shown promise in reducing runoff is furrow diking, which involves creating small soil dikes or dams in the wheel tracks using equipment that is pulled behind a tractor. The dikes prevent water movement, thereby increasing infiltration into the soil.

Agronomist Antonia Glaria was interested in the approach when she first saw it discussed at a LandWISE conference. “Ponding was a major issue for us in Horowhenua, even in paddocks that appeared relatively flat to the eye. Our yields in these areas were much lower than those in unaffected spots, but both cost us the same to grow. We wanted options to reduce these crop losses. Also, the lower lying areas were wetter for longer. This made it more difficult to access the paddock for routine management without damaging soil structure in affected areas.”

Antonia set about testing diking equipment with the help of Paul Johnstone of Plant & Food Research. “One of our early trials really highlighted the potential of the diking approach”, Paul notes. “In winter we reduced surface runoff by about 90% compared with that in undiked rows, which got us thinking about the opportunities on a bigger scale. The technology has been used extensively overseas, but for a slightly different application – improving soil moisture uniformity following rainfall events.”



Antonia tested the equipment on a few blocks in the first winter and spring, some of which were comparatively flat and some that were more undulating. “We wanted to see how effective the equipment was going to be on our soils. We made observations during heavy rainfall events and saw that the dikes were very good at holding back the water. By comparison, in undiked

areas the water flowed down the wheel tracks and into low lying areas or surface drains. Where the water had ponded in the low lying areas of the paddock during the winter, our crops performed poorly. We were encouraged, so had a local engineering company build us our own equipment.”



A few design improvements were necessary for local conditions. A shallow ripper leg in front of the diking equipment was added to loosen the soil in the wheel tracks. Also, the paddle configuration was narrowed slightly and small shields were attached to prevent soil from spilling over onto the bed tops.

Paul notes that the frequency of diking will depend on the conditions in which it is used. In some cases one pass per season may be enough to minimise runoff, whereas in others several passes may be necessary between rainfall or irrigation events. The equipment should not be used when the soil is too wet, as the dikes will be poorly formed and soil structure may be damaged. Avoiding the spray rows is also advisable to prevent a bumpy ride during routine field activities.

Observations with the furrow diking equipment made in Levin are similar to those being made in other regions as well. Potato supply manager Simon Wilcox has been using a different but equally effective diking configuration in their cropping operation in Pukekohe. Maintaining sediment traps to limit erosion losses in this region can be costly, so combining management options to eliminate runoff before it becomes an issue is a priority.

“What we like is that diking equipment is comparatively cheap, and can be attached to our existing bed forming implements. This reduces the need for further passes through the paddock to establish the dikes. We’ve found that in our potato fields, the dikes really slow the movement of water across the soil surface, which allows for much better infiltration. We’re still playing with the equipment to get it set up right, but are excited about the opportunities with it – not just during the winter to control runoff from rainfall, but also during the summer to increase irrigation uniformity.”



Both Antonia and Simon agree that furrow diking is only one part of the story, and are contemplating how they can combine this with their other management decisions to reduce the risk of runoff-related issues in their system.



Support for this work was provided within the ‘Holding it Together’ project, which was funded by MAF Sustainable Farming Fund, Fresh Vegetable Product Group, Potatoes New Zealand, Ballance Agri-Nutrients, Hawke’s Bay Regional Council, Auckland Regional Council, Horizons Regional Council and Environment Waikato.

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