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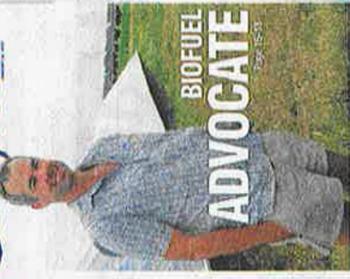
GUARDIAN
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TUESDAY, JANUARY 28, 2020

THE MVP RIDING HIGH

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Dairy Focus



A simple nitrogen reduction tool



Mary Ralston **FOREST AND BIRD**

Woodchip bioreactors are one of the many simple on-farm nitrogen reduction tools that farmers can use to capture soil nitrate before it reaches a waterway. Used in conjunction with other techniques, they can make a difference to the nutrient load entering a stream or drain.

They are based on a simple principle most farmers are familiar with – a high carbon environment uses up nitrogen.

Basically, woodchip bioreactors are pits full of woodchips that intercept soil water. The woodchips in a low-oxygen pit create an ideal environment for microbes to convert nitrate from the soil water to harmless nitrogen gas. The microbes release the gas into the air to join the 78 per cent of the atmosphere which is also nitrogen. (Nitrogen is not a greenhouse gas.)

Trial woodchip bioreactors were built on several farms in the Hinds area in 2015 where the soils are predominantly heavy and naturally poorly drained. Many farmers in the area use tile drains to reduce waterlogging and it is where the drains meet waterways that woodchip bioreactors can be built to intercept soil nitrate before it enters the stream or drain.

“Woodchip bioreactors can definitely be a useful tool for reducing the amount of nitrogen entering a waterway,” said Brandon Goeller, who developed the trials into bioreactors as part of his PhD research at the University of Canterbury.

“They are an edge-of-field nitrate reduction tool that can intercept soil water high in nitrates.

“A single tile drain bioreactor can remove around 10 per cent of the mean daily tile drain nitrate load, but some are much more efficient, removing up to 99 per cent.

“Other tools, such as constructed wetlands and riparian planting, are also useful for reducing nitrogen and also intercept phosphorus and sediment.

“There’s a huge range of performance with all these methods – how much



The building of a 30m³ woodchip bioreactor constructed to intercept and treat high nitrate water coming from a tile drain.

PHOTO BRANDON GOELLER

nitrogen is captured depends on soil type, rainfall, slope and fertiliser application.”

Warren Harris has three woodchip bioreactors on his Hinds farm. “They’ve been a great success,” Harris said. “Once established, the cows graze over the top. They’re a cheap, easy thing for anyone to have on their farm.”

The woodchips are a practical, cheap and long-lasting source of carbon. The pits constructed at Hinds were 30 cubic metres, containing chips about 2cm big. The chips will last 10 to 15 years before they need to be replaced.

When planning a woodchip bioreactor, farmers should consider several factors

such as size, slope, soil type, drainage pattern, type of drain being treated (tile drain or open drain), and how long the water will be in contact with the bioreactor.

Lining the bioreactor pit and covering the woodchips with geotextile fabric may be necessary, depending on soil conditions and whether grazing will continue over the top of the bioreactor.

Goeller cautioned that although these tools had been shown to be useful for removing soil nitrates, they cannot replace catchment-scale nutrient reduction plans to address losses from land and historic nitrogen pollution.

The bioreactor trial was part of the CAREX (Canterbury Waterway Rehabilitation Experiment, see <http://carex.org.nz/>) project run by the University of Canterbury. The project focused on finding tools and solutions to improve agricultural waterway health. Brandon Goeller now works for NIWA as a riparian and wetland scientist, designing and testing tools to reduce nutrient, sediment and faecal microbial pollution on farms.

Farmers interested in building a woodchip bioreactor on their farm can seek advice from a land management officer at Environment Canterbury.

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