

Reducing surface runoff from grazed winter forage crop paddocks by strategic grazing management

Key messages

- Research has shown that grazed winter forage crops contribute significantly to the risk of phosphorus (P), sediment and faecal losses to water. Critical source areas (CSAs) such as gullies and swales are a particularly important part of the landscape involved in the transport of these contaminants to water.
- Strategic grazing and careful management of CSAs can reduce losses of sediment and phosphorus (P) by 80-90%.
- The reduction is achieved by minimising stock movements and thus soil treading damage in the CSA. This means any rainfall and runoff that occurs is more likely to infiltrate the soil, minimising the amount of runoff and losses of sediment and P.
- Strategic grazing will not greatly reduce nitrogen (N) losses observed from grazed winter forage crops, which are largely due to the urine patches left behind following crop grazing.

What is a critical source area?

Critical source areas are those parts of the landscape, such as swales and gullies, where overland flow and seepage converges to form small channels of running water, which may then flow to streams and rivers. (Figure 1).

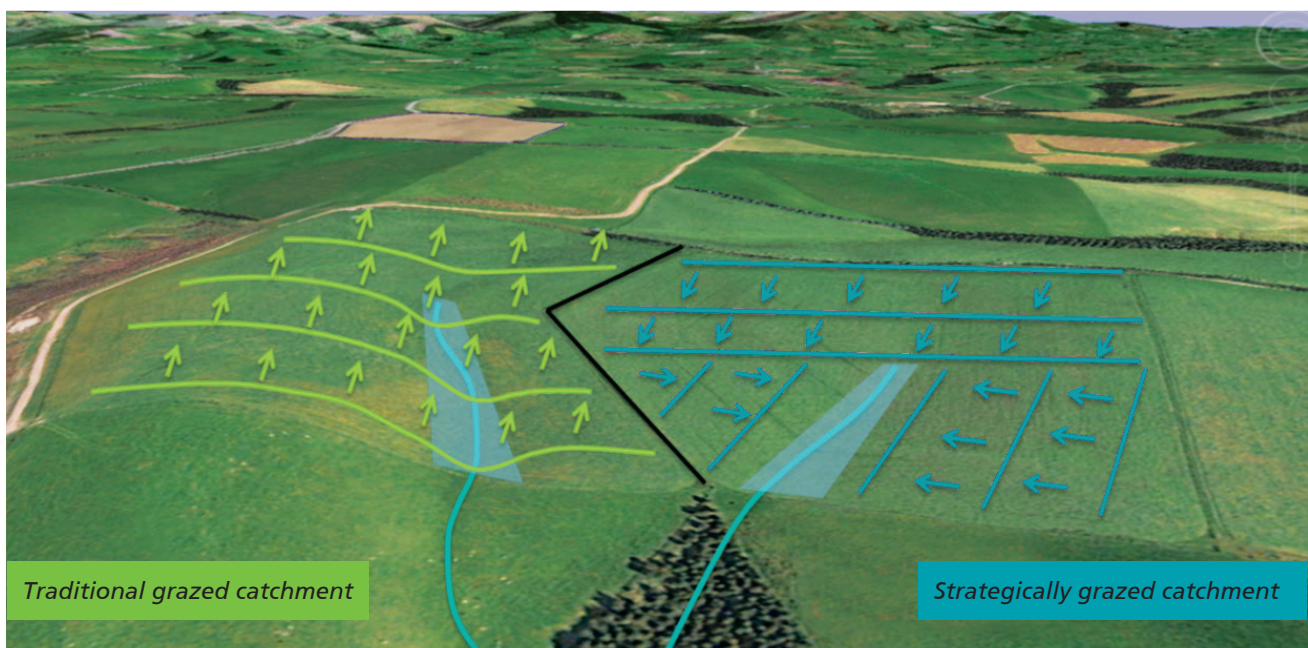
Figure 1. Examples of critical source areas



Management tips to reduce surface run off in a CSA

- When selecting future winter forage crop paddocks, if possible, avoid paddocks with large CSAs that will be difficult to manage
- Work out a grazing strategy before putting up fences, thinking about the location of stock water sources. i.e. do you need portable water troughs?
- Use a winter crop calculator to work out feed requirements to achieve BCS targets at calving
- Set up baleage in paddocks ahead of winter
- Leaving CSAs uncultivated and not planted in crop will make it easier to fence off and reduce the amount of soil treading damage by stock. The pasture will also provide an additional filter for any runoff that occurs
- Fence off CSAs to provide as much of a buffer area as possible. This type of buffer strip should be at least 10 m wide and as long as possible (will depend on landscape)
- Ensure cows begin grazing the least risky parts of the paddock first to minimise the period of runoff risk. This usually means that cows should enter at the top of paddock catchments/gullies, and graze their way downhill (Figure 2).
- Back-fence as much as possible – this will help minimise soil pugging and compaction damage, and thus reduce the volumes of surface runoff generated.
- The CSA should be the last break grazed in the paddock (if it needs to be grazed at all). Changing the break layouts to graze into the CSA from each side will allow this to happen (Figure 3)
- On-off graze any crop left in the CSA, ideally at a time when soil moisture content is not too high.

Figure 2. Strategic grazing of critical source areas.



< **Figure 3.** Last break critical source areas.

The potential for surface runoff to occur

Risk = Soil + Slope + Moisture + Stock Disturbance

- **Soil:** Poorly-drained and/or weakly structured soils are at greater risk of compaction and pugging during grazing in wet conditions. This treading damage seals the soil surface, resulting in more water moving across the soil (runoff), hence increasing the loss of sediment and nutrients.
- **Slope:** The greater the slope in a paddock, the greater the risk of surface runoff.
- **Moisture:** The greater the moisture content of the soil, the greater the risk of compaction and pugging.
- **Stock disturbance:** The greater the number of animals on wet soils, the higher the risk of soil treading damage leading to compaction and pugging.

The research trial

The paired catchment trial at Telford Dairy Farm used two grazing methods to demonstrate the benefits of strategic grazing of winter forage crops:

Control/traditional grazing: cows entered at the lower end of the paddock; strip grazed, moving in an uphill direction; no protection of the CSA; no back-fencing.

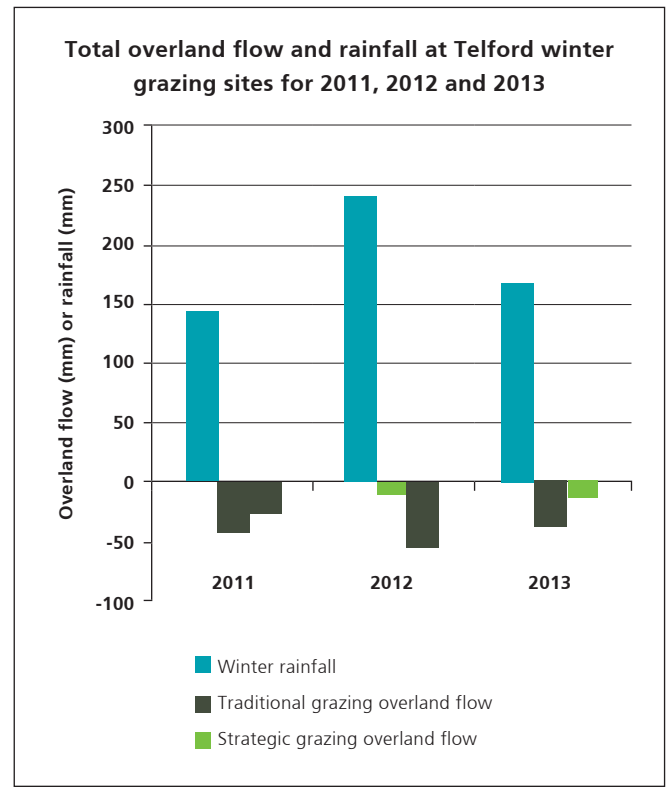
Strategic grazing: cows entered at the top end of the paddock; strip grazed moving in a downhill direction; protection of the CSA; back-fencing every 4-5 days; final time-restricted grazing of the CSA when soil conditions were suitable.

Research results

This trial ran over three years. In 2011, each catchment was grazed as per the control method. In 2012 the strategic grazing approach was implemented in one of the catchments and compared against the other (Control) catchment. These treatments were then reversed in 2013.

The results show that through the use of strategic grazing, the volume of overland flow can be significantly reduced when compared to traditional grazing (Figure 4).

Figure 4. Total overland flow and winter rainfall



The results also show that strategic grazing of the crop paddocks over a two year period reduced sediment and P losses by approximately 80-90%. (Table 1).

Table 1. Losses of sediment and P in surface runoff

	Sediment loss kg/ha	Total P loss kg/ha
Control grazing	6635	6.9
Strategic grazing	656	1.2
Reduction	90%	83%

Available resources

Go to dairynz.co.nz for:

DairyNZ fact sheets:

- Crop Paddock Selection
- Southland Stock Movement Fact Sheet
- Guidelines for Southland farmers moving stock to and from winter grazing
- Transitioning Cows onto Crops Fact Sheet
- Drying-off Cow Management Fact Sheet

DairyNZ Farmfacts:

- DairyNZ Farmfact: Fodder beet - feeding to dairy cows (1-73)
- DairyNZ Farmfact: Kale - growing a high yielding crop (1-74)
- DairyNZ Farmfact: Winter Crops - Feeding to Dairy Cows (1-75)
- DairyNZ Farmfact: Swedes - growing a high yielding crop (1-76)
- DairyNZ Farmfact: Fodder beet - growing a high yielding crop (1-77)

Calculators:

- Winter Crop Allocation Calculator

References

Orchiston, T.S., Monaghan, R.M., Laurenson, S. 2013. Reducing overland flow and sediment losses from winter forage crop paddocks grazed by dairy cows. In Accurate and efficient use of nutrients on farms (Eds L.D. Currie and C.L. Christensen). <http://flrc.massey.ac.nz/publications.html>. Occasional Report No. 26. Fertilizer and Lime Research Centre, Massey University, Palmerston North, New Zealand. 7 pages.

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