

How to Spread Blended Fertiliser

– A Field Guide



Summary

How to Spread Blended Fertiliser – A Field Guide

provides practical, evidence-based guidance to help the New Zealand fertiliser industry achieve uniform application of blended fertilisers, drawing on field trials funded by the Ministry of Primary Industries. It emphasises the importance of precision nutrient placement using the globally recognised 4R principles – right product, rate, place and time – and highlights that uniform spreading depends on compatible fertiliser blends, suitable and well-tested spreading machinery, correct calibration, appropriate operating widths, and skilled operators.

The guide shows that when combined with a ‘flat’ spread pattern reduced spreading widths (around 14 m when untested), effective boundary control, and validated tramline widths significantly improve uniformity as measured by Coefficient of Variation, reducing crop striping, yield loss, nutrient waste and environmental risk. Overall, it reinforces the message that good fertiliser spreading is an investment that protects productivity, waterways and long-term farm performance, while poor spreading is a preventable cost.



Key points

- ▲ Fertiliser should be applied according to the globally recognised 4 Rs – the right product at the right rate, in the right place at the right time.
- ▲ The fertiliser spreader used should be suitable for the type of fertiliser to be spread (i.e. high analysis granule, manure, superphosphate, lime etc.).
- ▲ Machinery spreading fertiliser should undertake regular spread testing using the products to be applied.
- ▲ If spread testing has not been undertaken for the product to be applied, we cannot be sure we are achieving acceptable spread uniformity.
- ▲ Boundary control settings should be used on ground spreaders with ‘flat’ spread patterns.
- ▲ Tramline widths should only be used if spread testing confirms that the fertiliser can be applied accurately and uniformly at that width.
- ▲ The best way to achieve uniform spreading of different fertiliser components is to spread them separately.
- ▲ If different blend component particles differ in size, set the spread width to suit the hardest-to-spread component.
- ▲ In this work, we found that the simplest way to increase uniformity when using a spreader with a ‘flat’ spread pattern was to reduce pass-to-pass distance – 14 metres resulted in uniformity that meets the Spreadmark standard of a Coefficient of Variation (CV) < 15% for fertiliser containing nitrogen; and CV < 25% for fertilisers without nitrogen.

Background

This Field Guide has been produced to provide a simple guide for all parties in the fertiliser industry to help ensure uniform application of fertiliser blends. The New Zealand fertiliser industry comprises importers, manufacturers, wholesalers, spreaders, farmers, agronomists, regulators and consultants. Each sector depends on the others for the industry's overall success. New Zealand uses less than 1% of the world's fertiliser, and while we have purchase quality specifications, we have limited influence over the properties of imported products. Instead, we must measure the characteristics of the fertiliser we receive and manage how we spread it. Unlike imported fertiliser, locally manufactured products such as Superphosphate are made to specific NZ standards.

The NZ industry aims to undertake the precision placement of nutrients as outlined by the globally recognised 4 Rs. These are the placement of the right product at the right rate, in the right place at the right time (Fertmark, 2025b). Achieving this requires agronomic advice applied by trained operators with calibrated machinery. Accurate fertiliser placement improves pasture and crop performance, protects waterways, and reduces waste. Poor fertiliser application can lead to yield loss, environmental damage and crop striping as shown below.

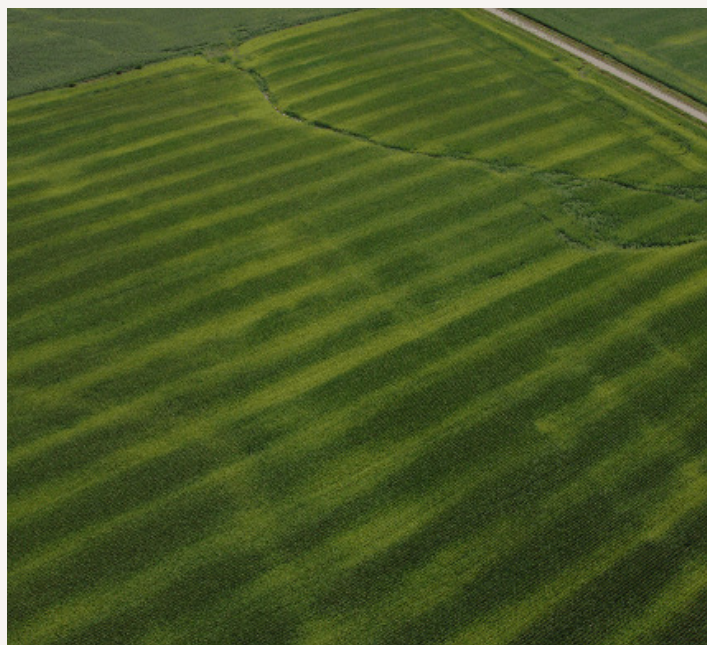


Figure 1: Crop striping as a result of poor fertiliser application can lead to yield loss and environmental damages.

“

Good fertiliser spreading is an investment; poor fertiliser spreading is a cost.

Jeremy Begg, Ballance Regional Distribution Manager
Upper South Island

The basics of spreading blended fertilisers

Understanding the basics of spreading blended fertilisers will help all parties in the NZ fertiliser industry ensure they order, supply, spread and use blended fertiliser that is stable and can be spread uniformly.

Compatibility

Achieving even distribution of blended fertilisers is challenging, as the components have different aerodynamic properties. Variations in particle size and density reduce spreading uniformity. Only fertilisers that are physically and chemically compatible should be blended (CFI, 2013).

Amount of product to be blended

The proportion of any individual compound in the blend should not be less than 1%. If any nutrient is required at a lower rate than this, it should be applied using spray equipment. This excludes the application of granular trace elements.

Spreader performance

None of the spreaders used in our spreading trials achieved a coefficient of variation (CV) below 15% when applying ammonium sulphate, diammonium phosphate and potassium chloride blends at their working widths of 24–28 metres. In one case, the CV reached as high as 37.5% for potassium chloride. Based on our findings, we found that when using a spreader with a ‘flat’ spread pattern reducing the spreading width to 14 metres allowed all spreaders to achieve CVs within the Spreadmark standard for every component of the blend, by all the spreaders. Spreaders from the same manufacturer can vary markedly in their ability to consistently achieve target CVs under field conditions.

“

Optimal fertiliser decisions start with optimal fertiliser placement.

Mike Manning, Ravensdown Innovation and Strategy

Spreading uniformity

Most fertiliser spreaders use two rotating discs to eject fertiliser to create a double overlap pattern, with the aim being an even, consistent application rate across the paddock. The figure below shows optimally spaced parallel tracks – if the spreader is correctly calibrated, this should result in the best possible fertiliser distribution for a given spreader. The dashed curves illustrate the application rate of each pass of the spreader corresponding to the spreader pass above. The full blue line shows the accumulated (total) application rate after multiple passes (Gyldengren et al., 2020).

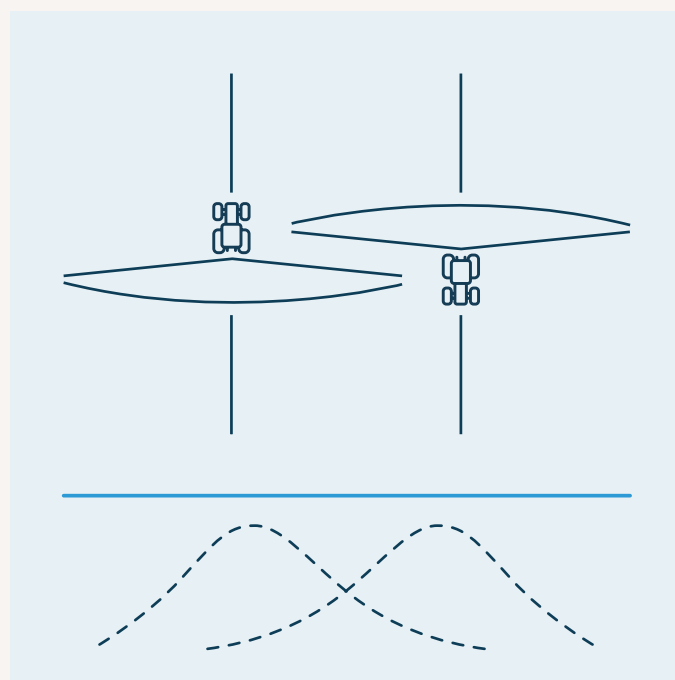


Figure 2: The application rate of each pass of the spreader corresponding to the spreader pass above (dashed curves). Accumulated (total) application rate after multiple passes (blue line).



Spreading uniformity – measured by Coefficient of Variation (CV)

Coefficient of Variation (CV) is a term used to measure the uniformity and evenness of fertiliser application across a paddock. A lower CV percentage indicates a more even spread, while a higher percentage indicates poor, uneven distribution that can lead to crop striping, yield loss, and environmental damage. The NZ Spreadmark standard requires a CV of less than 15% for fertiliser containing nitrogen, and less than 25% for other fertilisers.

Figure 3 shows spread patterns for two fertiliser spreaders achieving less than 15% CV, and therefore meeting the Spreadmark standard, when spreading at 22-metre pass-to-pass distances. The orange lines in Figure 3 represent the cumulative fertiliser application rate after multiple passes. The variability of the cumulative application rate at that bout width can be described by the CV of the spreading rate, with the CV in the figure above being 9%; and for the figure below the CV is 12%.

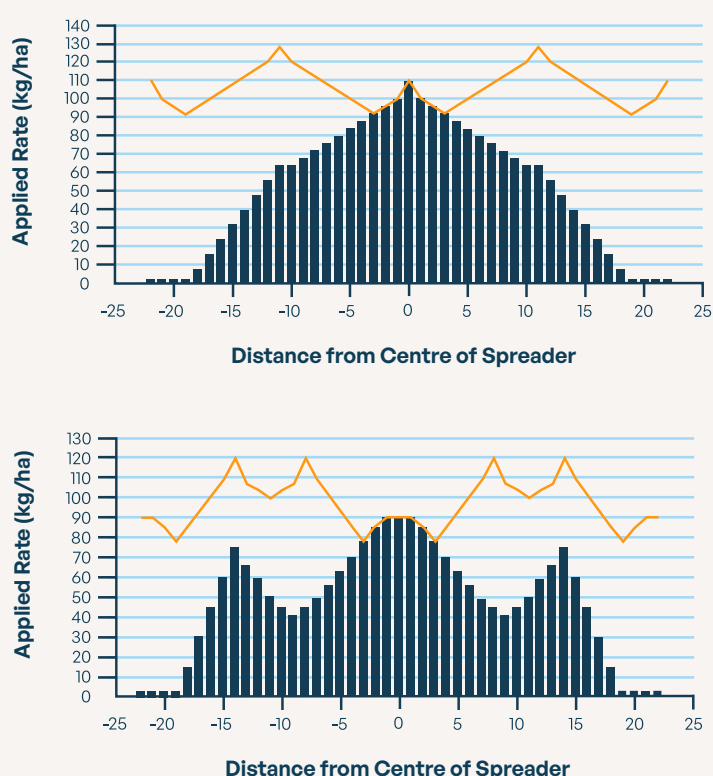


Figure 3: Spread patterns for two fertiliser spreaders achieving less than 15% CV when spreading nitrogen fertiliser.

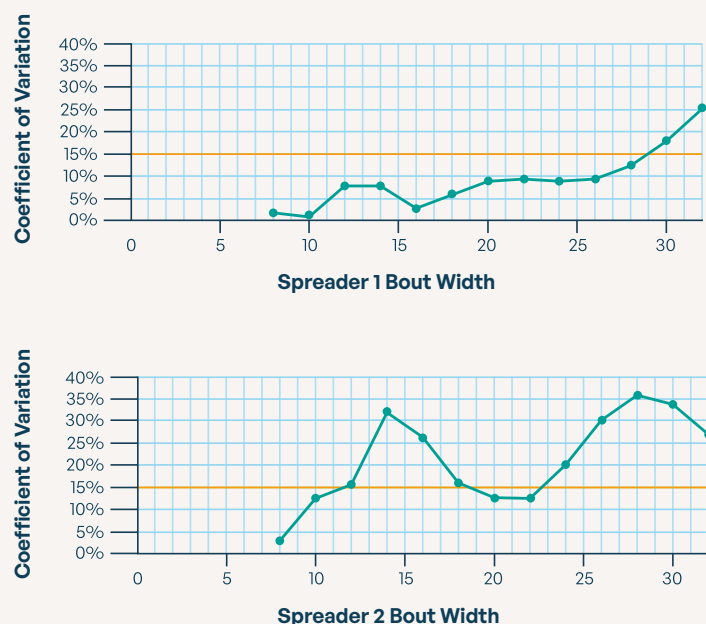


Figure 4: CV% value at different bout widths for the spread patterns shown in Figure 3 above. Orange line shows Spreadmark CV% threshold for spreading nitrogen fertiliser products.

Figure 4 shows the CV% results at different bout widths. For Spreader 1 (top), the flatter shaped curve when plotting the CV% at different bout widths means less change in variability occurs with small changes in bout width. For Spreader 2 (bottom), the CV% at different bout widths show an 'S' pattern which means a rapid change in variability resulting from relatively small changes in bout width. Hence, Spreader 1 (top), with a flat CV pattern can change their pass-to-pass distance anywhere up to 29 metres and still achieve a CV of less than 15%; while Spreader 2 (bottom) only achieves less than 15% CV at pass-to-pass distances of 19 - 22 metres, and 11 metres or less.

The spreader below must be driven at the correct pass-to-pass distances to achieve a CV of less than 15% and is likely to be more affected by variations in fertiliser properties, weather and terrain. At less than 15% CV both spread patterns meet Spreadmark certification at a bout width of 22 m, however, they each present very different risks of variability in spread uniformity with small changes in bout width.

Use boundary control

Boundary control settings allow fertiliser to be spread uniformly up to the edge of the paddock and limit the amount of fertiliser spread beyond it. Boundary control settings are effective and should always be used on ground spreaders. On average in this work, using boundary control reduced the amount of fertiliser spread beyond the boundary by 69%, while applying 63% of the target paddock rate within the five metres inside the boundary. This means that the pasture or crop within five metres of the boundary is only receiving less than two-thirds of the desired fertiliser rate, and this may have a major impact on crop performance. For a one-hectare paddock, these five metres could represent 20% of the paddock area or more.

When planning fertiliser applications adjacent to a boundary, consider what is on the other side of the boundary:

- If it is another paddock producing a similar pasture or crop, the operator may choose not to use boundary control and carry out the first pass in the adjacent paddock to achieve a double overlap spread pattern across the two paddocks.
- If beyond the boundary is a riparian planting with trees, shrubs and even long grass, this vegetation will capture much of the small amount of fertiliser spread beyond the boundary when using boundary control.
- If beyond the boundary is a waterway, wetland, or similar, this should be treated as a total exclusion zone with no tolerance for fertiliser being spread across it, and the spreading plan should account for this.

Check tramline width

Tramlines in crops are permanent or semi-permanent wheel tracks deliberately left unplanted in a crop so farm machinery can pass through the paddock without driving over the crop. Before implementing tramline widths, farmers should ensure that they can have the fertiliser they plan to use accurately and uniformly spread at that width. Although limited, our findings were that 32-metre tramlines result in unacceptably high CV, while spreading at 18m width with a conventional twin-disc spreader resulted in CVs within Spreadmark guidelines. It may be possible to achieve 32-metre tramline widths with some fertiliser lines and compound fertilisers, but this must be confirmed with spread testing prior to establishing the tramlines.

Most tractor-mounted fertiliser spreaders calculate their spread pattern based on the discs being 60 – 75 cm above the ground. However, when undertaking spreading on established crops, their height means that the fertiliser is intercepted before it reaches the ground, drastically altering the spread pattern. The discs should be kept at the recommended height above the crop, and if this is not possible, the width of spread will have to be adjusted.



Acknowledgments

This work was undertaken thanks to funding obtained from the Sustainable Food and Fibre Futures fund from the Ministry of Primary Industries for project S3F-21125 “Reducing off-target fertiliser application”.

We acknowledge the cash and in-kind co-funding of the other project partners the Fertiliser Quality Council (FQC); Groundspread NZ (New Zealand Groundspread Fertilisers Association,

NZGFA); Federated Farmers and Environment Canterbury (ECan).

Thanks also to the owners and operators of the fertiliser spreaders; the project steering group for guidance and critique; Travis and Julie Churchill of Spread Test NZ for undertaking the spread tests; and David Baird of VSN NZ for designing trials and undertaking statistical analysis.

References

Canadian Fertilizer Institute (CFI). 2013. Bulk Blend Quality Control Manual.

Fertiliser Quality Council of New Zealand (FQC). 2025a. Code of Practice for the Sale of Fertiliser in New Zealand - The Fertmark Code of Practice.

Fertiliser Quality Council of New Zealand (FQC). 2025b. Spreadmark Code of Practice: For the Application of Nutrients in New Zealand.

Gyldengren, J.; Greve, M.; Skou-Nielsen, N.; Olesen, J. & Gislum, R. 2020. Field scale agronomic and environmental consequences of overlapping N fertilizer application by disc spreaders. *Field Crops Research*, 255.