

A GUIDE FOR FERTILISER SPREADING ON HUMPS & HOLLOW



Ministry for Primary Industries
Manatū Ahu Matua



Plant & Food
RESEARCH
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INTRODUCTION

This guide is designed to help improve fertiliser-spreading on a range of hump & hollow systems and increase pasture production per kilogram of fertiliser applied. Fertiliser spreaders are designed for flat ground. Spreading patterns on humps & hollows may differ greatly from those on the flat.

We recommend reading this guide in conjunction with the publication - Guidelines for improved fertiliser use and soil nutrient management¹, available on the Westland Milk Products website (www.westland.co.nz). That document provides more information on how pasture responses may vary across humps & hollows, how this may vary over time and the potential benefits of strategic fertiliser applications to slopes.

USING THE GUIDE

Ideally fertiliser is applied to positions across the paddock to maximise growth and minimise losses. Because of differences in nutrient cycling across hump & hollow systems this may not always be achieved through even application¹.

The following tables and figures show the results of spreader pattern tests for two types of spreaders: SAM (Coombridge & Alexander, Hamilton) (Tables 1, 3 and 5) and a Row Crop 770RC Transpread (Robertson® Manufacturing Farm Machinery, Hinds) (Tables 2, 4 and 6).

They show how driving the fertiliser spreaders at different positions across humps & hollows, using different products (urea and superphosphate) and different hump & hollow widths (30 m wide (Tables 1 and 2), 40 m wide (Tables 3 and 4) and 60 m wide (Tables 5 and 6)) affect the fertiliser distribution patterns. Spreader driving positions that result in the most uniform fertiliser distribution are highlighted green in Tables 1–6.

We recommend using the tables to understand how spreading patterns are likely to be affected by

- widths of humps & hollows,
- urea and superphosphate products and
- spreader type.

Use this information to help decide where to drive the spreader to get the best fertiliser distribution.

We recommend having your spreader tested to provide the best information for your spreader and paddock conditions.

FOLLOWING MANUFACTURERS' GUIDELINES







Use this guide in conjunction with the manufacturer's operating manual. Manufacturers have extensively tested their spreaders for a range of products and should specify expected performance. Each spreader should have optimum design bout widths reported for fertiliser particle size/density and size ranges.

¹Nutrient use efficiency on hump & hollow systems on the South Island's West Coast – Guidelines for improved fertiliser use and soil nutrient management, 2014.

Table 1. Summary table: spreader type = SAM; width of the humps = 30 m.

Product	Hump width (m)	Spreader position	Bout width (m)	CV (%)	Comment	Figure
Urea	30		15	17	Reasonably uniform. Less applied on the humps.	Figure 19
Urea	30		15	27	More applied to lower slopes than upper slopes.	Figure 20
Urea	30		30	29	Bout width too wide. More applied to the humps.	Figure 21
Superphosphate	30		15	26	More applied to the lower slopes than the humps.	Figure 22
Superphosphate	30		15	24	More applied to upper slope than lower slope.	Figure 23
Superphosphate	30		30	31	Poor uniformity. More applied to upper slope than lower slope.	Figure 24

Table 2. Summary table: spreader type = Transpand; width of the humps = 30 m.

Product	Hump width (m)	Spreader position	Bout width (m)	CV (%)	Comment	Figure
Urea	30		15	12	Very good uniformity. Slightly more applied to lower slope than upper slope. Bout widths closer than on the flat.	Figure 25
Urea	30		15	28	Good uniformity. More applied to lower slope than upper slope.	Figure 26
Urea	30		30	35	Poor uniformity. Most applied to upper slope; low rate applied to lower slope.	Figure 27
Superphosphate	30		15	20	Very good uniformity. More applied to lower slope than upper slope.	Figure 28
Superphosphate	30		30	20	Poor uniformity.	Figure 29
Superphosphate	30		15	46	Very poor uniformity. Much more applied to lower slope than upper slope.	Figure 30

CV = coefficient of variation. Provides a measure of uniformity (100% is uniform).

Figure numbers in Tables 1 to 6 correspond to figures in the publication "Nutrient use efficiency on hump & hollow systems on the South Island's West Coast – Guidelines for improved fertiliser use and soil nutrient management" (www.westland.co.nz).

Table 3. Summary Table: spreader type = SAM; width of the humps = 40 m.




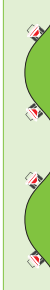


Product	Hump width (m)	Spreader position	Bout width (m)	Average bout width for calibration (m)	CV (%)	Comment	Figure
Urea	40		20	20	11	Very good uniformity.	Figure 31
Urea	40		10 & 20	13	35	Poor uniformity. Much more applied to lower slope than upper slope.	Figure 32
Urea	40		20	20	28	Good uniformity.	Figure 33
Superphosphate	40		20	20	26	Good uniformity. More applied to lower slope than upper slope.	Figure 34
Superphosphate	40		10 & 20	13	23	Good uniformity. Less applied to the lower slope.	Figure 35
Superphosphate	40		20	20	36	Poor uniformity.	Figure 36

Table 4. Summary table: spreader type = Transpread; width of the humps = 40 m.












Product	Hump width (m)	Spreader position	Bout width (m)	Average bout width for calibration (m)	CV (%)	Comment	Figure
Urea	40		20	20	14	Very good uniformity.	Figure 37
Urea	40		20	20	25	Good uniformity.	Figure 38
Urea	40		10 & 20	15	42	Poor uniformity. More applied to lower slope than upper slope.	Figure 39
Superphosphate	40		20	20	21	Very good uniformity.	Figure 40
Superphosphate	40		20	20	36	Poor uniformity. More applied to lower slope than upper slope.	Figure 41
Superphosphate	40		10 & 20	13	12	Very good uniformity, but narrow average bout width.	Figure 42

Table 5. Summary Table: spreader type = SAM; width of the humps = 60 m.

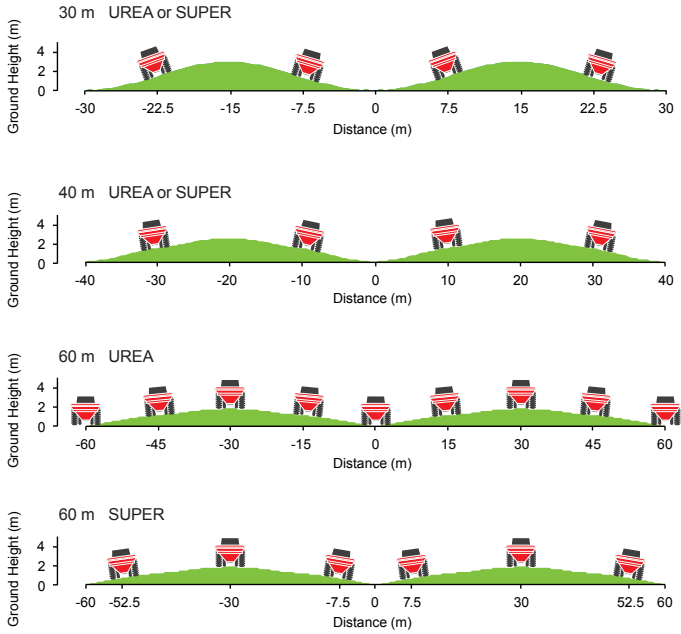
Product	Hump width (m)	Spreader position	Bout width (m)	Average bout width for calibration (m)	CV (%)	Comment	Figure
Urea	60		15	15	13	Very good uniformity.	Figure 43
Urea	60		10 & 20	15	23	Good uniformity.	Figure 44
Urea	60		10 & 20	15	40	Poor uniformity. More applied to lower slope than upper slope.	Figure 45
Urea	60		10	10	9	Very good uniformity, but narrow bout width.	Figure 46
Superphosphate	60		15	15	16	Very good uniformity.	Figure 47
Superphosphate	60		10 & 20	15	31	Poor uniformity.	Figure 48
Superphosphate	60		10	10	11	Very good uniformity, but narrow bout width.	Figure 49

Table 6. Summary table: spreader type = Transpread; width of the humps = 60 m.

Product	Hump width (m)	Spreader position	Bout width (m)	Average bout width for calibration (m)	CV (%)	Comment	Figure
Urea	60		15	15	19	Good uniformity.	Figure 50
Urea	60		20	20	20	Good uniformity.	Figure 51
Urea	60		20	20	22	Good uniformity.	Figure 52
Superphosphate	60		20	20	15	Very good uniformity.	Figure 53
Superphosphate	60		10 & 20	15	16	Very good uniformity.	Figure 54
Superphosphate	60		15	15	21	Very good uniformity. More applied to lower slope than upper slope.	Figure 55

UNIFORM SPREADER PATTERN

TRANSPREAD



SAM

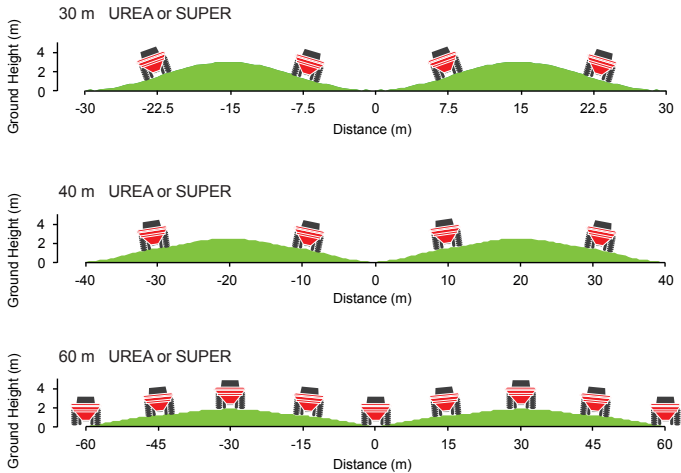


Figure 1. Fertiliser spreader driving positions that achieve the most uniform spread of urea and superphosphate for Transpread and SAM spreaders where humps are 30, 40 or 60 m apart.

SPREADER CHECKLIST

MAINTENANCE

- Keep the spreader well maintained following the manufacturer's guidelines. Before using the spreader, check that vanes/surfaces are clean and free of debris (Figure 2).



Figure 2. Build-up of fertiliser on vanes will affect the spreading pattern.

- Check and repair worn and damaged discs.
- Check your distribution patterns for your spreader on your humps & hollows. Ideally, the spreader pattern is tested and calibrated with the fertiliser products you use. Different products have different particle size characteristics and bulk densities. Even different lines or batches of the same product can vary in particle size and bulk density.

FERTILISER CHOICE, STORAGE AND HANDLING

- Store products in a dry place free from contamination by other fertiliser or foreign material.
- Store fertiliser on a damp-proof surface, including bagged fertiliser. If in doubt, add another layer between the floor and bags, and cover the bags. Moisture absorption shortens the acceptable storage period and changes handling, flow and spreading characteristics.
- If mixing products, check with the manufacturer that they can be mixed. For example, do not mix superphosphate and urea. Mixed chemicals may react and are generally more prone to moisture absorption. The Fertiliser Association of New Zealand provides a guide to chemical and physical compatibility (Fact Sheet 6, www.fertiliser.org.nz).
- Ensure particle sizes of blended fertilisers are similar; more than 10% difference in particle size can lead to separation during transport, handling and spreading.
- If possible, choose fertilisers with larger particle sizes, as ballistic properties are compromised if dry material is less than 1 mm in diameter.

SPREADING THE FERTILISER

- Make sure disc speed is correct. Connect a rev counter (tachometer), with the display visible to the driver or purchase a manual rev counter.
- Consider wind speed and direction. Moisture conditions are also important as some fertiliser materials are hygroscopic (attract and hold water molecules from the surrounding environment). Changing temperatures and humidity during the day can also affect their flow rate through machinery.
- Slippery ground conditions can interfere with accurate fertiliser placement.
- Ensure that the disc speed remains constant with changing engine revs.
- Ensure fertiliser does not build up on the centre divider and back plate (keep clean to allow for the free flow of fertiliser).

USING ACCREDITED OPERATORS

Experienced spreading operators should understand the spreading characteristics of the fertiliser and spreader performance. Spreadmark-accredited companies should ensure that fertiliser:

- Is spread at the desired rate and as evenly as possible over the target area.
- Does not directly enter surface water.
- Is not allowed to drift in wind, avoiding fertiliser indirectly entering or landing on surface water, or going outside the boundaries of the target zone.
- Is spread safely.

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