Kondinin Group
Research Report
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FERTILISER SPREADERS

SORTING THE SPIN FROM THE SPREAD

Independent information for agriculture

Latest tests show spread of results

Kondinin Group's latest fertiliser spreader test puts eight machines from manufacturers Agrispread, Amazone, Bredal, Coolamon Steelworks, Gason, Kuhn and Landaco across the test track. After collecting and weighing over 2000 samples of urea and lime, the results are in. By **Josh Giumelli**, **Mark Saunders** and **Ben White**

Through the use of GPS and auto-steering systems, we've had the ability to precisely control the position of our machinery in paddocks for several years.

Reducing wasteful overlap, or under-application of products is now as simple as entering an accurate machine width into the terminal and establishing an A-B line.

But there is no point in the accurate placement of a product if we don't know how evenly it is being distributed. Fertiliser spreaders are a perfect case in point; they spread more product directly behind the machine, and less product further away from the machine. To even up this application, the outer edges of the spread pattern are overlapped by successive passes.

But how far apart can these successive passes be without adversely affecting the evenness of the application? Or put another way, can a particular machine spread product evenly when operated on the existing controlled traffic system in place on the farm?

HIGH PRICES PUSH ACCURACY CHECKS

Fertiliser represents a major input cost on farms, and prices continue to rise. Inaccurate fertiliser application wastes money, leaving areas of your paddock both under and over-fertilised, with resulting yield penalties.

Over-application wastes product, and causes significant environmental damage as nutrients are concentrated in waterways.

The use of GPS guidance and/or controlled traffic farming systems compounds the issues associated with inaccurate spreading, as areas of rich and poor nutrients are compounded over successive applications.

It is not simply enough to note a few granules landing near your boot when you are standing 20m away from a passing spreader to declare it "spreads to 40m". Spreading accuracy is far more complicated and involves the overlapping spread patterns from successive passes, and the cumulative distribution of product satisfying certain accuracy limits.

TESTING TIMES

Kondinin Group asked major manufacturers to be a part of our New South Wales based testing program, the first carried out since 2015's Western Australia tests (see *Farming Ahead*, June 2015).

Rising to the challenge were manufacturers Agrispread, Amazone, Bredal, Coolamon Steelworks, Gason, Kuhn and Landaco. Marshall were unable to supply a machine, but the spinner design would have been identical to the 912T tested in 2015.

Instead of testing with identical lime and urea products as used in the WA tests, it was decided to use locally available products. The main difference being the lime was much finer and harder to spread than the lime sand used in WA. Using local products means test results should be more relevant to the majority of Eastern states machines tested, and end users, but it does mean results are not directly comparable with the 2015 WA tests.

All machines were tested with urea at rates of 60 and 100kg per hectare, and lime at 2000kg per hectare, using the fertiliser distribution performance accreditation procedure, Accuspread, developed by AFSA.

Spread patterns were established by running machines over a row of 500mm square trays fitted with baffles to stop granulated products from bouncing out. Trays were set 500mm apart, with 24 stepped in either side of the tractor's wheeltrack and one in the centre.

Two passes were carried out for urea to improve sample accuracy, and one pass with lime due to the higher application rate. All

machines were set for maximum width for both lime and urea, and travel speed was set to 20km/h.

Each manufacturer was given an initial test and an opportunity to fine tune the spreader setup and calibration before the actual test took place for each product.

Samples were weighed individually, and the fertiliser distribution was plotted on graphs to display the actual deposits of fertiliser measured in each tray across the spread width.

Urea was supplied for the testing by Incitec Pivot through Delta Ag, Coolamon, and samples were taken from each spreader. Samples were tested for size in a shaker box and rejected if they did not satisfy a 70:30 size ratio (70% 2.00 – 3.35mm, 30% 3.35 – 4.75mm diameter).

Wind was monitored with crosswinds not exceeding 2.0m/s (most were zero), and where possible the trays were oriented so any breeze was in the travel direction of the machine. An observer in the tractor cab noted spinner speed, spreader settings, and ensured travel speed was set at 20km/h.

WHAT IS THE COEFFICIENT OF VARIANCE?

The best way to measure spreader accuracy is using the co-efficient of variance (CV). The CV is a measure of the evenness of the spreading application, with a lower CV indicating a greater spreading accuracy.

The industry standard used in Australia is a maximum CV of 15% for granular products and a maximum of 25% for lime and gypsum. These are also the CV values used in this test.

The CV value is a ratio of the standard deviation to the average value across the width of the bout, or the distance between passes. To understand CV, we need to start with standard deviation, which is a measure of how widely a set of values differ from the average of these values. A sample with a high standard deviation would have a wide spread of results, and one with a low SD would have a very narrow spread of results.

SD would be fine for comparing spreader performance from one machine to the other if they all had the same average result, but this isn't the case. For that reason, we use the CV, which is the ratio of the SD to the average for a particular set of results.

INTERPRETING THE GRAPHS

The results for each fertiliser spreader tested include fertiliser distribution graphs (see Figure 1) that display the actual deposits of fertiliser measured in each tray across the spread width.

The bout width selection graph (see Figure 2) is more complicated and is computer generated by overlapping the distribution curves successively as if the fertiliser spreader was driven at different pass widths. The CV is plotted on the graph as the width increases.

There are CV lines for both racetrack and back and forth driving patterns, as the product distribution across the paddock will be different. This difference is due to the spreader overlapping the opposite sides of the discharge when going round and round, or overlapping the same side when going up and back. If the spread pattern is not symmetrical (ie heavier on one side), back and forth travel can compound these errors. The different travel directions are represented by black lines for racetrack, and red lines for back and forth.

If a machine has a perfectly symmetrical spread pattern, these lines should be almost on top of each other.

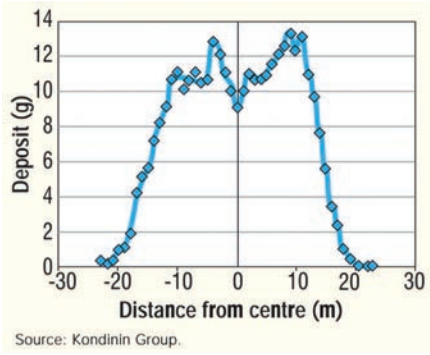
Machines tested were trying to achieve the highest bout width with a co-efficient of variance (CV) below the line at 15% CV (or 25% for lime). For example, Figure 2 has a maximum bout width at 32m (shown by the dashed vertical line) as this is where the actual CV line crosses the 15% CV limit.

The hump between 16m and 29m shows the machine was set for maximum spreading width (in this case 32m) and by using a lower bout width between these values, the CV limit cannot be maintained. This does not mean the machine cannot spread accurately below this width, just that it needs to be reset for spreading a narrower bout width.

The large hump above the target CV line is typical to most graphs, and is caused by the areas of high application at the sides of the spread pattern overlapping at narrower bout widths. Put another way, as the bout width is decreased, the sides of the distribution hump start to overlap each other, throwing the CV out of whack.

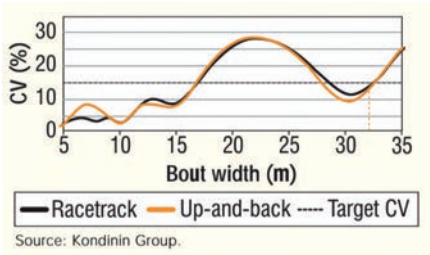
This is made worse by a distribution pattern with steep sides and horns or peaks, before dropping in the centre. In an ideal world, the CV line on the bout width selection graph would remain below the horizontal target CV line until the maximum bout width was reached, at which point it would cross over.

Figure 1. Example of a distribution graph



Source: Kondinin Group.

Figure 2. Example of a bout width selection graph



Source: Kondinin Group.

Trays all day: About 1500 fertiliser trays were individually emptied into sample cups and weighed, then entered into a computer program which calculated the distribution, and the coefficient of variance for various bout widths.

Acknowledgements
Incitec Pivot and Delta Ag, Coolamon for supplying the urea for testing; the Hutcheon family for the use of their facilities; Brian Pleming for the use of his property and tractor; Hutcheon and Pearce Wagga Wagga for the use of the John Deere tractor.

Table 1. Fertiliser spreader specifications

Brand/Model	Bin capacity (l)	Fert cap (tonnes/kg urea)	Belt drive (pto/hyd/ground)	Spinner drive (pto/hyd)	Dry weight (kg)	Transport width(m) (tyres)	Belt type	Belt width (mm)	
AGRISPREAD									
AS55	5000 w	5	ground/hyd option	hyd	1800	2.55m	smooth rubber	Belt 830 Door 730	
AS100	9000 w	9	ground/hyd option	hyd	3500	2.65m or 3.65m on 3m cntr	smooth rubber	Belt 830 Door 730	
AS120	10600 w	10.6	ground/hyd option	hyd	3750	2.65m or 3.65m on 3m cntr	smooth rubber	Belt 830 Door 730	
AS130-T	11600 w	11.6	hyd	hyd	4250	2.6m or 3.6m on 3m cntr	smooth rubber	Belt 830 Door 730	
AS150-T	14600 w	14.6	hyd	hyd	4350	3.6m	smooth rubber	Belt 830 Door 730	
AMAZONE									
ZGTS10001 Profis Pro	10,000	8,000	hyd	hyd	4390	2.95 520/85R46	flat rubber	800	
BREDAL									
F2 Linkage ^	4000	3000	ground	hyd	800	3.0m	endless smooth	Twin 300	
k65 ^	8,400	6.5	ground	hyd	2,000	2.65m (650/65R30.5)	endless smooth	710	
k85 ^	10,000	8	ground	hyd	2,800	2.65m (650/65R30.5)	endless smooth	710	
k105 ^	13,400	9.5	ground	hyd	3,200	2.75m (750/60R30.5)	endless smooth	710	
k65 VRT #	8,400	6.5	hyd	hyd	2,000	2.65m (650/65R30.5)	endless smooth	710	
k85 VRT #	10,000	8	hyd	hyd	2,800	2.65m (650/65R30.5)	endless smooth	710	
k105 VRT #	13,400	9.5	hyd	hyd	3,200	2.75m (750/60R30.5)	endless smooth	710	
k105 VRT Bogie #	13,400	9.5	hyd	hyd	5,500	3.71m (710/45R26.5)	endless smooth	710	
k135 VRT #	21,000	17.5	hyd	hyd	6,500	3.75m (750/60R30.5)	endless smooth	710	
F4-Linkage *	4000–6000	3-4t	hyd	hyd	800	3.0m	endless smooth	Twin 300	
F8 *	10,000		hyd	hyd	2,800	3.48 (480/80R50)	endless smooth	Twin 410	
F10 *	13,400		hyd	hyd	3,200	3.48 (480/80R50)	endless smooth	Twin 410	
k105 VRT +	13,400	9.5	hyd	hyd	3,200	2.75m (750/60R30.5)	endless smooth	710	
k135 VRT +	21,000	17.5	hyd	hyd	6,500	3.75m (750/60R30.5)	endless smooth	710	
COOLAMON									
CS75	7,500	5700 @ 0.76 density	hyd	hyd	2900	2.48m (480/80R30)	rubber cleated	1000	
CS90	9000	6840	hyd	hyd	3200	2.65m (650/65-30.5)	rubber cleated	1000	
CS105	10,500	7980	hyd	hyd	3300	2.65m (650/65-30.5)	rubber cleated	1000	
CS120	12000	9120	hyd	hyd	3600	2.65m (650/65-30.5)	rubber cleated	1000	
CS145 @	14,500	11,020	hyd	hyd	4100	2.65m (650/65-30.5)	rubber cleated	1000	
GASON									
7390	7870	5900	hyd or grd	hyd	2800	2750 on 2m 650/65/30.5	chain & slat	730	
7312	10690	8010	hyd or grd	hyd	3000	2850 on 2m 750/60/30.5	chain & slat	730	
KUHN									
AXENT 100.1	9400	7300	hyd	hyd	4500	3.49m 3m axle/ 480 Tyres	rubber	800	
LANDACO									
TS10000	8000*	6	gnd or hyd or both	hyd	2700	2.75m/23.1 x 26	cleated or flat	800	
TS11000	9200*	6.9	gnd or hyd or both	hyd	2800	2.75m/620/75-26	cleated or flat	800	
TS12000	10000*	7.5	gnd or hyd or both	hyd	3000	2.75m/620/75-26	cleated or flat	800	
TS13000	11000*	8.2	gnd or hyd or both	hyd	3200	2.75m/620/75-26	cleated or flat	800	
TS14000	13000*	9.75	gnd or hyd or both	hyd	3500	2.75m/620/75-26	cleated or flat	800	
TS16000	14000*	10.5	gnd or hyd or both	hyd	6200	2.6m/600/55-22.5	cleated or flat	800	
TS20000	16600*	12.5	gnd or hyd or both	hyd	6800	2.75m/23.1 x 26	cleated or flat	800	
TS25000	20000	15	gnd or hyd or both	hyd	8500	2.75m/23.1 x 26	cleated or flat	800	
MARSHALL									
912T	10,600	8	ground	hyd	3500	2770	PVC endless belt	875	

^ = wheel drive # elec/hyd * = section control + = XE machines & = base model price w = at water level

	Bin load height (mm)	Axle width (m)	Roll tarp (Y/N)	Spinner diameter (mm)	Tacho (on spinners) Y/N	Rate controller	Variable rate ready	Cost of VR ready	Load cells and cost	$RRP incl GST
	2040	2m OPT 3m	std	675mm	y	Tacho std/ISOBUS option	ISOBUS Only	POA	POA	61,112
	2630	2m OPT 3m	std	675mm	y	Tacho std/ISOBUS option	ISOBUS Only	POA	POA	89,183
	2630	2m OPT 3m	std	675mm	y	Tacho std/ISOBUS option	ISOBUS Only	POA	POA	97,610
	2740	2m OPT 3m	std	675mm	y	ISOBUS std	yes	POA	POA	129,675
	2940	3m Std	std	675mm	y	ISOBUS std	yes	POA	POA	142,055
	2900	2	Y	1,000	Y	Amazone	Y	STD	STD	159,500
	N/A	N/A	Y	N/A	Y	opt	opt	POA	OPT	28,400
	2215–2815	1.8 to 4 Mtr	Y	N/A	Y	opt	opt	18500	inc in VRT	65,000
	2385–2885	1.8 to 4 Mtr	Y	N/A	Y	opt	opt	18500	inc in VRT	79,500
	2627–3447	1.8 to 4 Mtr	Y	N/A	Y	opt	opt	18500	inc in VRT	91,500
	2215–2815	1.8 to 4 Mtr	Y	N/A	Y	Teejet ISObus	Std	included	included	84,500
	2385–2885	1.8 to 4 Mtr	Y	N/A	Y	Teejet ISObus	Std	included	included	94,500
	2627–3447	1.8 to 4 Mtr	Y	N/A	Y	Teejet ISObus	Std	included	included	109,500
	2750–3136	3mtr Bogie	Y	N/A	Y	Teejet ISObus	Std	included	OPT	114,500
	2800–3000	3mtr Bogie	Y	N/A	Y	Teejet ISObus	Std	included	included	164,500
	N/A	N/A	Y	N/A	Y	Teejet ISObus	Std	included	included	48,400
	3029	1.8 to 4 Mtr	Y	N/A	Y on both	Teejet ISObus	Std	included	included	111,000
	3230	1.8 to 4 Mtr	Y	N/A	Y on both	Teejet ISObus	Std	included	included	126,000
	2627-3447	1.8 to 4 Mtr	Y	N/A	Y	Teejet ISObus	Std	included	included	136,500
	2800–3000	3mtr Bogie	Y	N/A	Y	Teejet ISObus	Std	included	OPT	191,500
	2695	2m & 3m	opt	600	Y	Athene	Y	$5,335	$9,075	78,705
	2765	2m & 3m	opt	600	Y	Athene	Y	$5,335	$9,075	85,910
	2765	2m & 3m	opt	600	Y	Athene	Y	$5,335	$9,075	92,400
	2765	2m & 3m	opt	600	Y	Athene	Y	$5,335	$9,075	105,820
	2850	2m & 3m	opt	600	Y	Athene	Y	$5,335	$9,075	130,350
	2480	2m–3m	opt	675	Y	Farmscan, Topcon ISOBUS or Jonn Deere RC	Y	$5250–$8950	$8,400	66,883
	2780	2m–3m	opt	675	Y	Farmscan, Topcon ISOBUS or Jonn Deere RC	Y	$5250–$8950	$8,400	72,609
	2900	3m	Y	500mm Granular	Y	KUHN	Y	standard	standard	242,385
	2670	1.8m–4m	Opt	800	Y	all brands	Y	$5,000–$9,000	$7,990	52,800
	2700	1.8m–4m	Opt	800	Y	all brands	Y	$5,000–$9,000	$7,990	58,300
	2760	1.8m–4m	Opt	800	Y	all brands	Y	$5,000–$9,000	$7,990	63,800
	2860	1.8m–4m	Opt	800	Y	all brands	Y	$5,000–$9,000	$7,990	67,100
	3060	1.8m–4m	Opt	800	Y	all brands	Y	$5,000–$9,000	$7,990	71,500
	3025	2–4m	Opt	800	Y	all brands	Y	$5,000–$9,000	$10,990	107,800
	3200	2–4m	Opt	800	Y	all brands	Y	$5,000–$9,000	$10,990	126,500
	3200	2–4m	Opt	800	Y	all brands	Y	$5,000–$9,000	$10,990	143,000
	2615	1.95	N	700	Y	MDC App, Greenstar, Trimble	Y	$6,000 to $12,000	Opt $10,000	$54,540 &

Agri-Spread AS-120

With new spinners, ISO readiness and a spring-assisted roll-tarp, the Agri-Spread AS120 has seen some improvements in its build since we last tested it in 2015.

The Agri-Spread still has an impressive list of standard features including four bin corner load-cells, hydraulic brakes, a sprung drawbar, mudguards, LED tail lights and mesh bin screens in 25mm or 75mm. The bottom third of the bin is fabricated using stainless steel as is the rear panel as are all nuts, bolts and hydraulic fittings. There is a single sight-glass window in the middle of the front bin panel. A sturdy ladder, lights and mud guards are also standard fitment.

An 830mm wide rubber belt sits on stainless steel shaft rollers with nylon bushes which feeds product through a 730mm wide door. Removal of a roller for repair, if required, is simple, by removing the nut from one end and sliding out. Belt tensioning is at the front and rear of the machine via nuts on stainless threaded rod to the belt-end bearing blocks.

There is no PTO requirement. The belt is driven from the rear with drive options including both ground and hydraulic. Spinners are driven hydraulically and if the belt drive is hydraulic, total oil flow requirement is 120 litres per minute.

Bin fill-height is 2800mm, making it amongst the lower of the spreaders tested.

Axles are 2m standard with a 3m option, but all 3m machines are hydraulic drive. Tyre options are typically 650/65-30.5 BKT flotation but 600, 520 or 480 wide options are also available. Tracks are also available on the Agri-Spread AS-150TX.

Maintenance is simple with clearly marked greasing points; 6 for the bearings on the belt, five on the adjustable height tow hitch and two on spinner tubes. Electrics are all well-guarded and sealed against the elements and a well-placed manual jack means the unit can be raised or lowered without a requirement to connect to hydraulics.

The Agri-Spread runs both granular and lime spinner discs. Changeover requires the removal of one 30mm nut underneath the spinner taking around ten minutes to change.

For lime spreading the spinner vanes are not adjustable and the product is run under heavy chains off the belt to help with distribution onto the spinners. Plastic wear plates to prolong lime spinner life are available. Fitting over the vanes, the wear plates are claimed to provide operational life of up to 20,000 tonnes of lime.

Granular discs have two adjustable vanes and flow rate is controlled via the rear

door which is set using an app. All other adjustments are in the cab through the universal terminal.

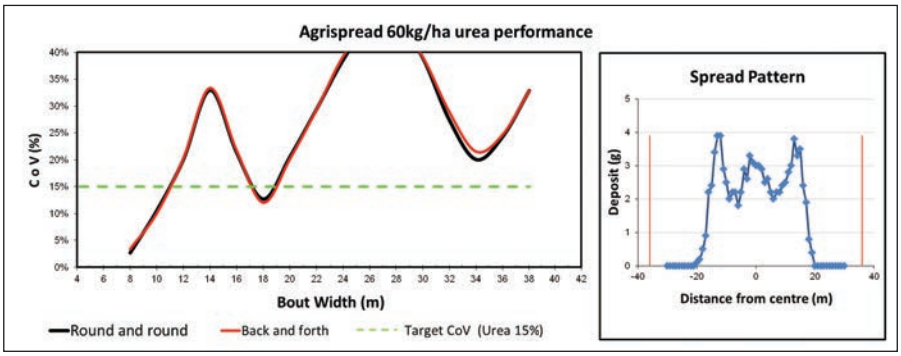
During the testing, the Agri-Spread team had to make changes to the vanes between the 60kg and 100kg rate settings for urea. While the adjustment seemed simple, this does raise some questions about the simplicity of distributing products with variable rate application.

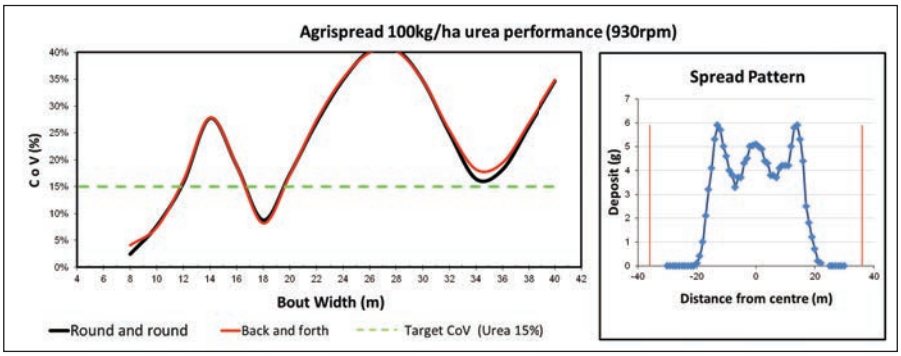
After the Kondinin Group testing in 2015, Agrispread were disappointed in the spreader performance results. Citing the impending arrival of new spinners and product drop point as a potential solution, we were expecting better performance in this latest round of testing.

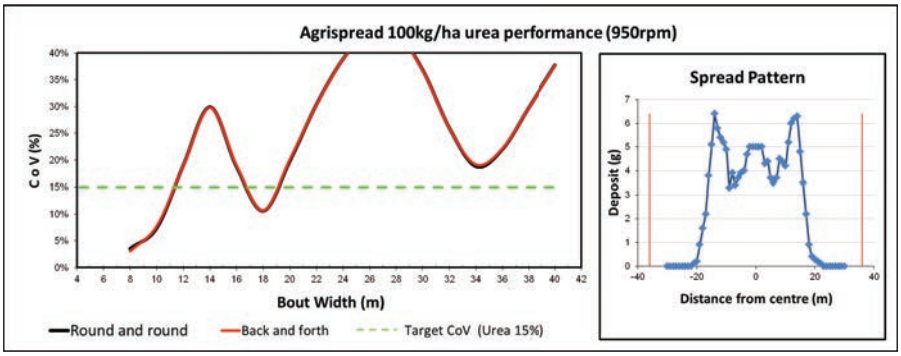
With near perfect testing weather conditions, consistent product and ample time for preparation including availability of product the day prior to testing in the same paddock, the Agri-Spread came close, but did not achieve sub 15% CV at 36m for granular product at 60kg or 100kg/ha. Lime performance was better with a very respectable 19m spread at a CV of 25%.

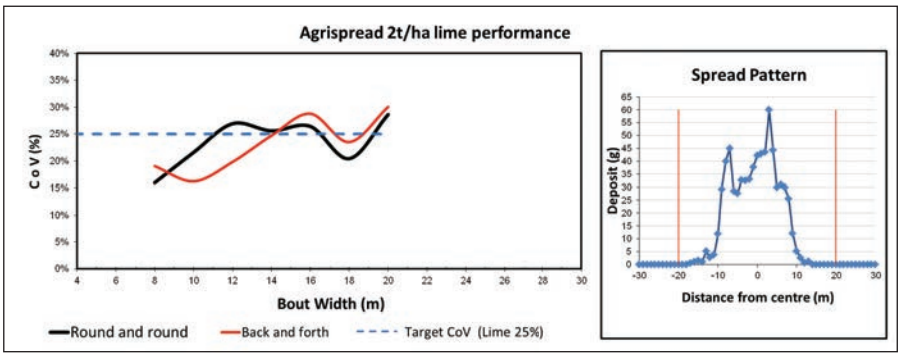
Agri-Spread claim a faulty spinner speed sensor setting is the culprit this time around. We understand mechanical and software issues can occasionally cause a problem when testing, and other machines fell victim to similar issues (see Amazone on p9), highlighting the need for thorough product knowledge and testing prior to bringing a machine to a publishable test.

We would like to think that owners of Agri-Spread units already in the field do not have the same spinner sensor input ▶









issue. Fortunately, a calibration and test kit is supplied with all Agri-Spread units, so owners can check the performance of the spreader on-farm.

According to Agri-Spread the problem sensor setting was reading spinner speed at 930rpm when it was actually doing 807rpm. But a second test of the Agri-Spread at the same 100kg rate with a higher indicated spinner speed of 950rpm actually resulted in a poorer outcome, exacerbating the "devil horns" on the spinner pattern.

Agri-Spread has shown us the results of an AS-120 accredited by ASFA to 36m with a granular product.

For an investment of around $120,000 including GST as tested, the Agri-spread is at the higher end of town for pricing. This includes a solid array of standard features, but exact pricing is a little ambiguous.

The Agri-spread is undoubtedly well-built and boasts an impressive list of standard features for this price. We are confident the required spreading accuracy at 36m can be achieved with a little perseverance and careful adjustment of settings.

WHAT WE LIKED

- ✓ Solid construction
- ✓ Roll-tarp good design and easy to use
- ✓ Supplied spread and product test kit
- ✓ Stainless steel lower bin section

WHAT COULD BE BETTER

- ✗ Front belt roller exposed
- ✗ Vane changes required between rates of 60 and 100kg per ha
- ✗ Unable to achieve previously accredited spreading accuracy at 36m

PRICE

Circa $121,000 including GST as tested

MANUFACTURER COMMENT

We found it difficult to believe our urea spreading results on the day since Agrispread has already achieved AFSA accreditation to 36m in both Australia and New Zealand.

Our customers repeatedly tell us the spreader performance exceeds their expectation and for that reason we encourage readers to talk to an Agrispread owner.

We did however discover a technical issue with the spinner speed after the completion of testing which would have been responsible to the less than adequate spread result on the day.

We provide a calibration kit with 13 test trays and tests tube with each Agrispread to help verify our spread width and pattern.

Agri-Spread's ability to spread a variety of different product at rates from 1kg/ha and up to 10,000kg/ha is renowned.

We're pleased with Agrispread's 19m lime spreading performance and the recognition for solid construction and an impressive list of standard features.

Amazone ZG-TS 10001 ProfisPro

Never one to rest on their laurels, Amazone has upped the tech with the release of the ZG-TS 10001 ProfisPro spreader, compared with the ZGB 8200 model tested in 2015.

Kondinin Group saw the ZG-TS ProfisPro spreader at Agritechnica last year, where it was equipped with the Argus rear-mounted, spread-pattern sensing radar and an anemometer for counteracting cross-winds. This model is still is to officially hit our shores, but the spreader tested last month is not short on tech.

The ProfisPro designation refers to the weighing system fitted to the hopper chassis corners, which isolates any influence from the pull of the tractor. This monitors product weight for on-the-go calibration, the fill level management system, and adjusts the braking force of the spreader axle to match. The axle is steerable as standard, and there is a choice between air or hydraulic braking systems.

The steerable axle is designed mainly to avoid crop damage, as the spreader wheel tracks should match the tractor towing it, assuming both are on the same track width. This is currently limited to 1.8 to 2.4m by changing the tyre offsets, but we are told a 3m axle option may be available in the future. The system, which is controlled through ISOBUS, can also counter-steer when working across sloping ground. Lugged tyres are set in the tractive direction to aid steering effectiveness, rather than the more familiar trailed direction.

The business end of the ZG-TS sees the spreading unit lifted from the ZA-TS linkage spreader and features on-the-go adjustable spread width, product drop point and part-width sectional control. Boundary spreading is made possible by a telescopic spinner vane, controlled by an actuator underneath the spinners, which alters the spread pattern on one side. This creates a steep-sided spread pattern on one side, allowing maximum product to be spread right up to the fence.

A sensor flap at the rear of the belt allows the machine to be primed, advancing the belt until product is ready to drop onto the spinners. From there it drops into a delivery hopper which splits the flow of product to the two spinners. An electric product agitator will automatically reverse if jamming occurs, and sounds a warning in the tractor cab. ▶

Unfortunately The ZG-TS will not spread lime, as it will bridge in the delivery hopper, although it may handle lime sand commonly used in Western Australia. Testing only urea, problems were immediately apparent, with a CV of 15% just achieved at a bout width of 36m at 60kg for the race-and-round direction, which fell to 20m for up-and back directions. This pattern was repeated for the 100kg tests, where it achieved a good bout width of 38m for round-and round, but a poor 22.5m for up-and-back.

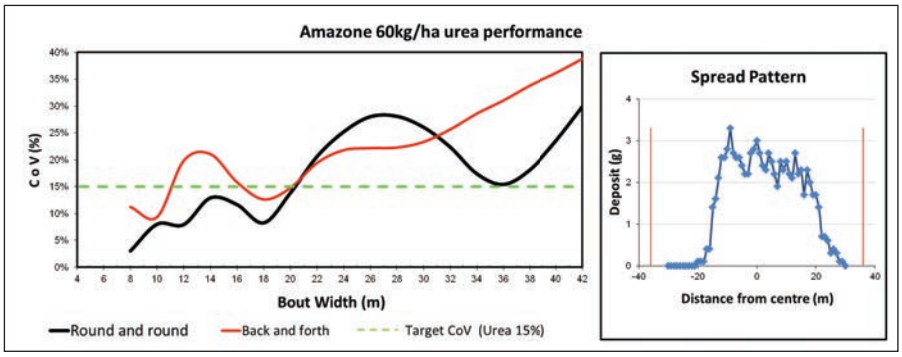
This problem was eventually traced after testing was completed to a loose bolt on the actuator which controls the spinner vane to enable boundary spreading. The lop-sided spread pattern was somewhat cancelled out in the round-and-round direction, but exacerbated in the up-and-back direction. The result is disappointing given the spreading accuracy we expect from Amazone products, and we look forward to testing a unit again in the near future.

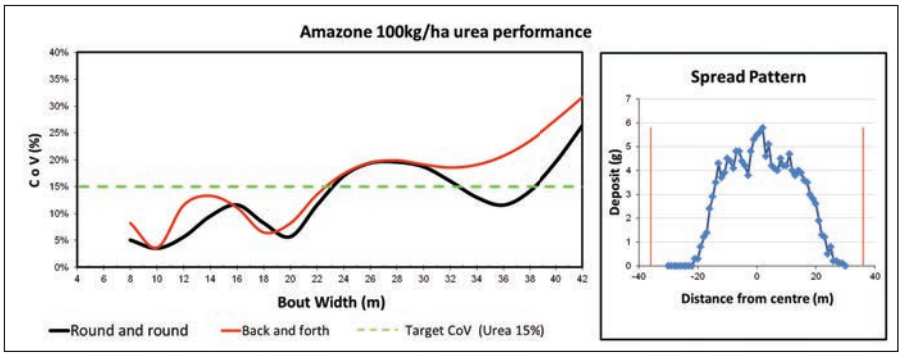
Both spinners are independently hydraulically driven, and each is fitted with a speed sensor, with a speed range of 720 – 1000rpm. The load-sensing hydraulic system also controls the floor belt and steering axle and needs 130L/m, but an optional hybrid system is available for tractors which may not have sufficient hydraulic capacity.

This utilises a PTO-driven hydraulic pump mounted on the spreader generating about a third of capacity, in conjunction with the tractor's hydraulic system for the remaining two thirds.

The 800mm flat belt angles upwards to the rear of the machine, creating space under the unit for the steering axle. While the drawbar is fitted with rubber block suspension, it does not have an adjustable height option; the machine simply sits on a different angle to match the tractor's drawbar height.

The 10,000L bin is fitted with sieves and





has some plates at the rear to keep weight off the belt. The platform, handrails and ladder at the front of the machine permit easy bin access. The jackstand is unusual in that it folds out hydraulically from under the drawbar. While it is difficult to see in the down position, an indicator is visible from the cab. A crank-handle is used to manually apply a park brake. The only grease points on the machine are the drawbar pivots, load bar points and steering axle.

The Amazone ISOBUS controller (rebadged Topcon X30) is great to use with typical uncluttered, intuitive menus common to Amazone products. The spreader will work with Greenstar, Topcon or Trimble systems, and can be operated with its own GPS receiver if desired.

WHAT WE LIKED

- ✓ Sectional control and boundary spreading functions
- ✓ Excellent sealed storage boxes on both sides
- ✓ Air/hydraulic braking and steering axle
- ✓ Construction quality and multilayer paint finish
- ✓ Hydraulic bin tarp

WHAT COULD BE BETTER

- ✗ Can't spread fine lime products (may be ok for WA lime sand)
- ✗ No current 3m axle width option
- ✗ Expensive (high spec is standard)

PRICE

$159,500 (inc GST)

MANUFACTURER COMMENT

CLAAS Harvest Centre Product Manager, Craig Hopkins, says that "while the disc bolt failing on this machine is unfortunate, the Amazone's TS spreading system is acknowledged as one of the most accurate and reliable systems available," he says. "More than 5000 Amazone spreaders are in use throughout Australia and are fully supported by full warranty and full parts and service backup by the CLAAS Harvest Centre network."

The Bredal K85.

Bredal K85

Bredal brought two versions of the K85 along to the testing with substantially differing specifications. One was a standard ground-drive model while the other, a hydraulic belt drive was fitted with extended spinner discs.

Known as the XE variant, the 6m wide spinner position is a unique offering amongst fertiliser spreaders. While the XE tested was a non-production K85 with the XE spinners, the XE is typically optionally available on the larger K105 and K135. All XE models are exclusively hydraulically driven. The option costs around $30,000 more, including GST, than a conventional spinner Bredal K-series spreader.

Delivery mechanism for the XE attachment takes product from the back of the bin, onto a divider, splitting it onto two flat rubber conveyor belts around 400mm wide. This in turn feeds the product to the spinners which are each 3m from the bin centre.

The XE arms fold up for transport. As tested, sitting on 3.4m wheel centres, tyres are the widest dimension of the spreader. Axles can be specified as 2.2m, 3m or customised to requirement.

Minimum hydraulic oil flow from tractor is 135 litres per minute and in a small change from previous models tested, hydraulic drives employ piston motors now, doing away with the previously used hydraulic gear motors. Hydraulic drives offer variable rate application via a TeeJet ISOBUS controller and all hydraulic drive machines come with load cells as standard. The price variance between a hydraulic drive Bredal K-series and a ground drive is $18,500.

Overall, little has changed on the Bredal K85 since our 2015 testing, if anything, improving on previous performance to manage around 38m at a CV under the 15% standard when spreading urea at both 60kg/ha and 100kg/ha. Performance with lime was 19m under the 25% CV.

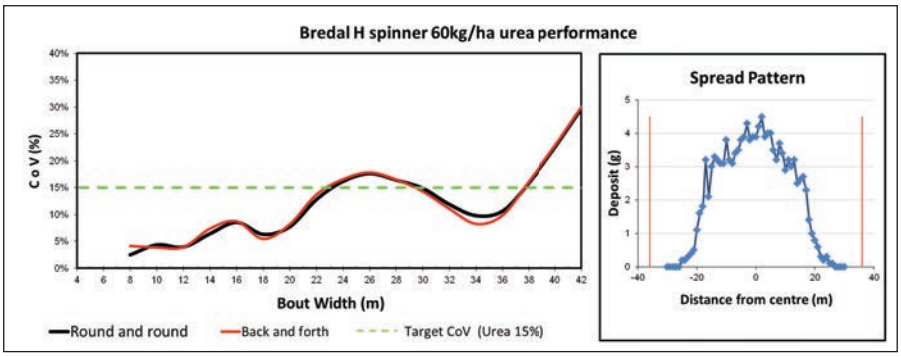
But the XE machine did not perform well in our testing with an evident product leakage issue over the centre tray blowing the CV out to over 15% at just 15m at 60kg/ha urea and 24m at 100kg/ha. Lime was also disappointing at 15m before the CV exceeded the 25% standard.

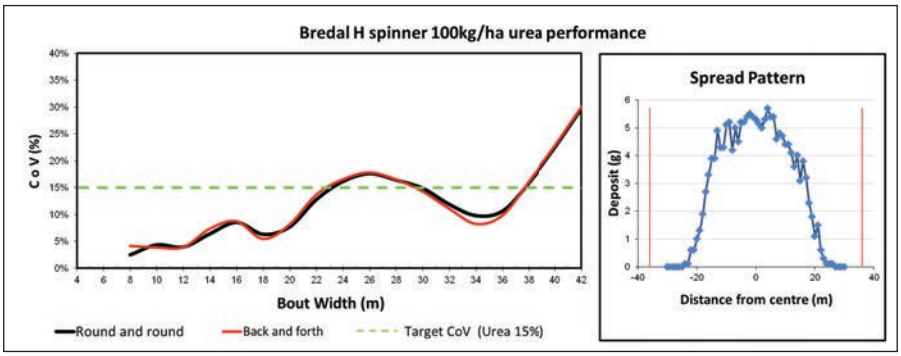
The K85 runs an 800mm vulcanized smooth-join belt and belt-wear.

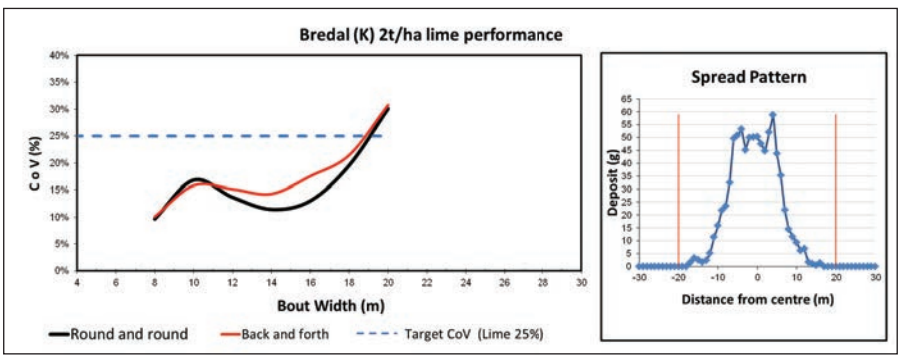
The unit weighs in at 3200kg empty according to the compliance plate and a hydraulic jack is standard. A storage rack for hydraulics and electrics is fabricated from stainless steel.

The Bredal K-series XE.

Bredal K-85





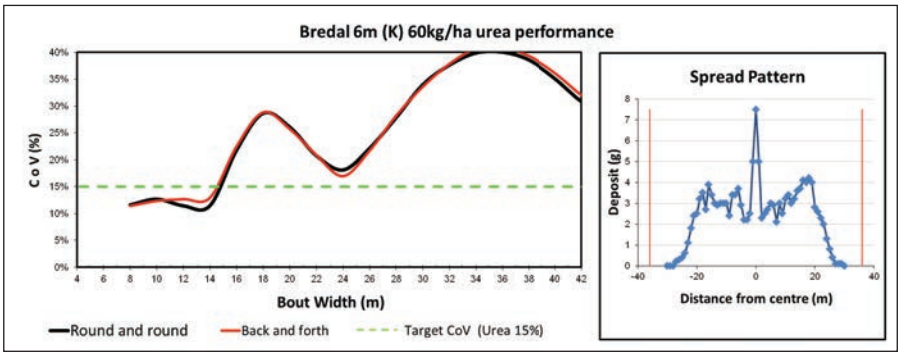


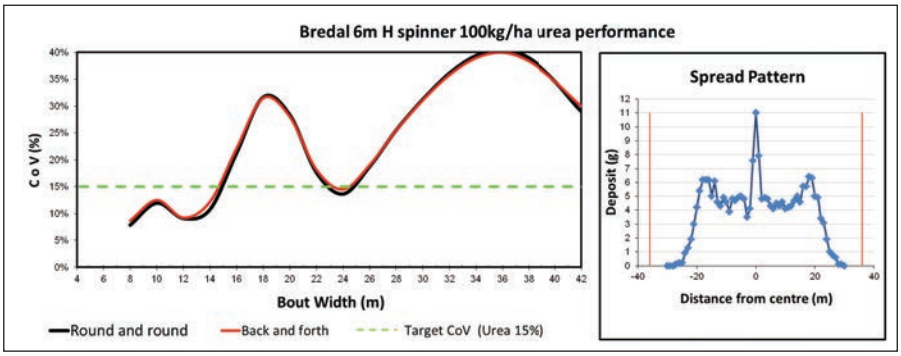
With a 10m³ capacity, the fill height of the K85 was measured at 2560mm sitting on 650/65-30.5 Trelleborg tyres. The XE model fill height was 2850mm on 520/85R42 Michellin Cerexrib tyres. Hungry boards are standard fitment on all K-Series machines.

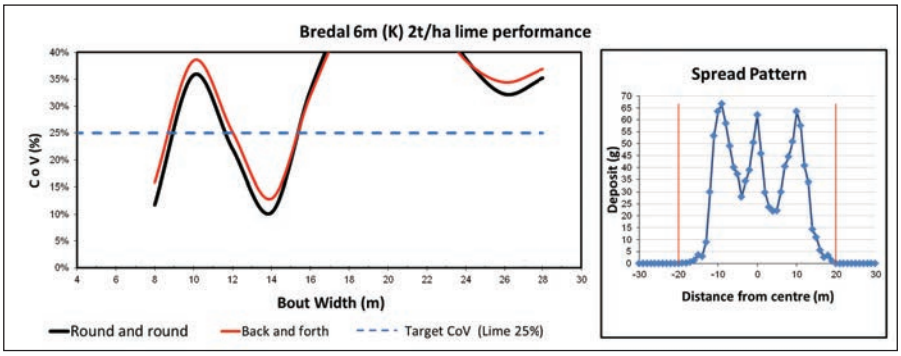
Bin access is via a sturdy ladder and internal step and roll-tarp retraction is simple after removing the handle from its locked position. Rubber straps keep the roll-tarp in place. The bin has two sight-windows located on the front panel.

Hitch options include ring or ball, the latter becoming increasingly popular ▶

Bredal 6m H spinner 60kg/ha urea performance







according to Bredal, particularly for 6m machines. A hinged, cushioned drawbar is an option.

Under-belt rollers have a sealed bush at each end and in terms of servicing, there are only four non-sealed bearings on the machine requiring greasing at 200hr intervals to maintain the grease seal.

Calibration using the supplied kit and machine-mounted charts is simple with the included product density scales.

On ground-drive machines, setting the selection of one of three belt speed shaft settings, deck and gate positioning is simple and settings are well marked. Variable rate applications machines utilise dynamic weighing so product density for calibration is not required.

Two sets of spinners are supplied for the K-series, one (H-type) for granular product and another (K-type) for lime. Changing the spinners over is simple requiring one bolt removal and takes around 10-15 minutes.

We chipped Bredal over the sharp edges on some laser-cut stainless components in 2015 and little has changed. For wearing components, these edges are likely to be smoothed after a couple of days work, but a pickle finish could easily smooth these out for other components left with a sharp finish.

Use of the spreader for rates down to 1kg for example, for mouse baits, requires an optional bait kit to restrict the opening of the rear door.

WHAT WE LIKED

- ✓ Well labelled, easy to adjust
- ✓ 38m granular spread for K85, 41m from XE machine with Danmas spinners
- ✓ Good track record and resale value
- ✓ Variable rate option and ISO connectivity

WHAT COULD BE BETTER

- ✗ 6m machine tested did not perform well
- ✗ Still some sharp laser-cut edges
- ✗ Higher cost machine

PRICE

K85 ground drive unit: $90,750
XE hydraulic drive machine: $138,600
(all inc. GST)

MANUFACTURER COMMENT

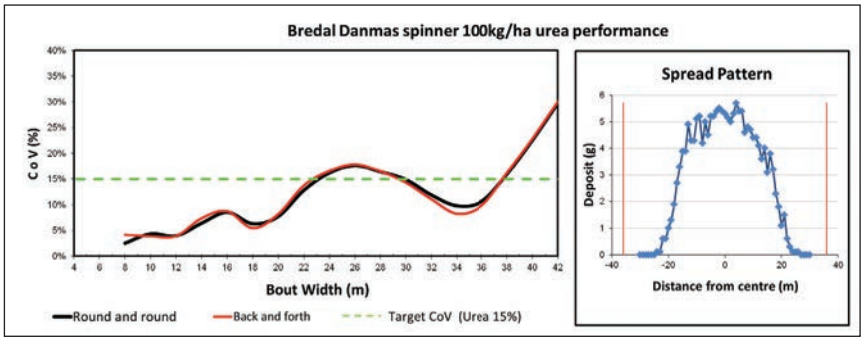
At Bredal Australia we believe our product to be simple, precise and reliable. Our distribution system provides consistent results in conventional, CTF or VR application systems across Australia.

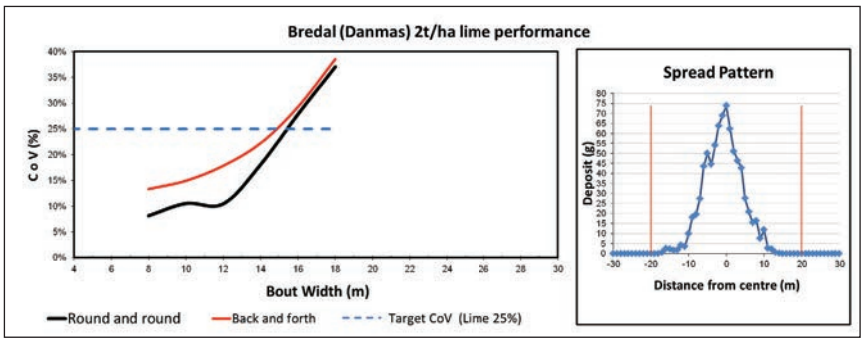
CTF systems require the application of multiple products consistently at pre-defined widths in order to maintain reliable results. For two decades Bredal has proven to consistently achieve the defined widths across all growing regions in the country with a variety of products.

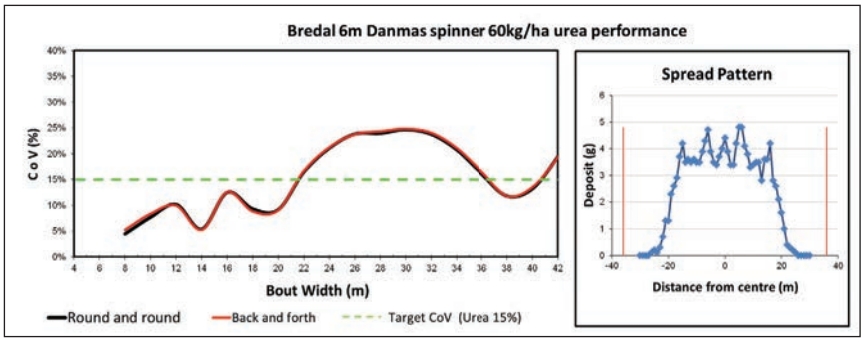
VR applications require the spread pattern to be consistent over multiple rates, as seen in Accuspread test results, our pattern remains precise and reliable between 60kgs and 100kgs without adjustments to the distribution system.

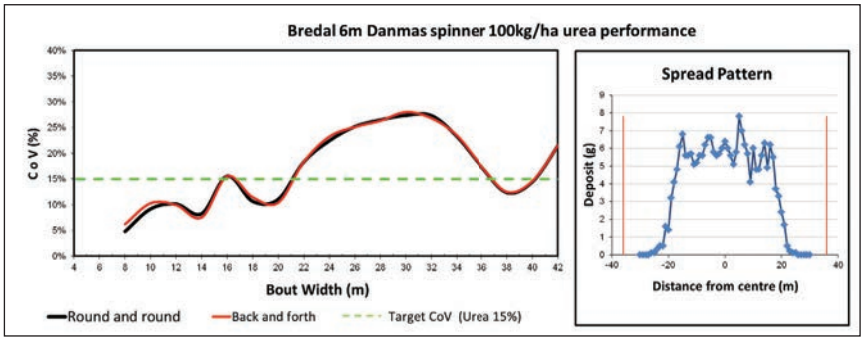
While the XE attachment did not perform well in lime for this test, this system can provide the extra width or consistent width in adverse wind conditions that 40mtr plus CTF systems require.

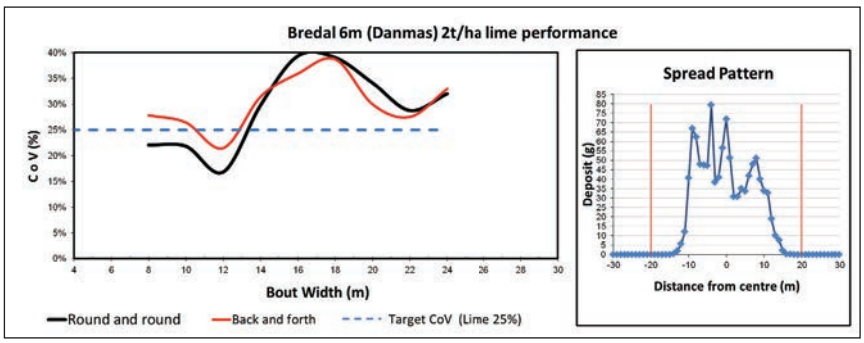
Danmas spinners

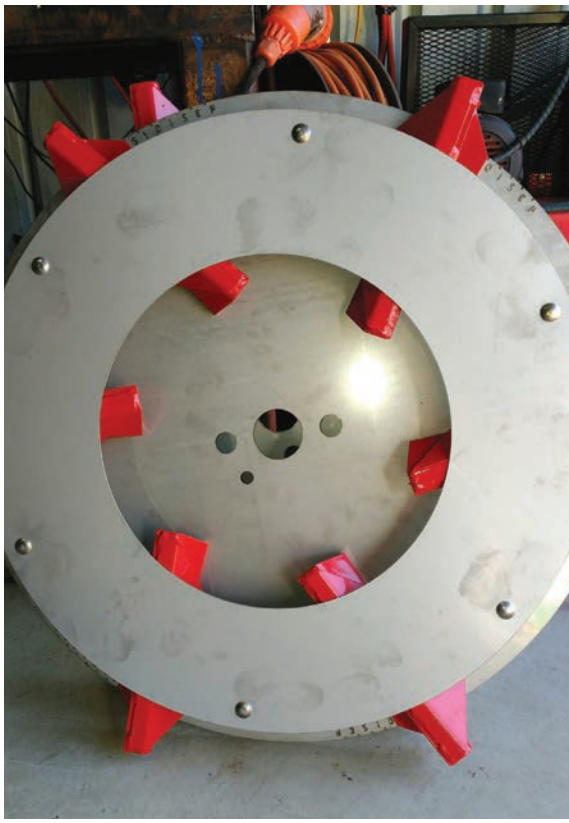












Separate to the testing of the Bredal K85 and K-Series XE, Kondinin Group researchers also tested some recently released Danmas spinners as designed to fit Bredal spreaders by former Bredal importer, Jorn Ib.

The Danmas spinners delivered granular product under the 15% CV limit to 38m on the K85 at 100kg rates matching the stock Bredal "H" series.

But on the 6m XE Bredal, the Danmas spinners were able to achieve 41m for granular product at under the 15% CV.

The Danmas spinners were not as well suited to lime, making just 15m on the K85 and around 13m for the XE.

PRICE

Granular spinners @$2360 plus GST
Lime spinners

Coolamon Steelworks CS75

Already well-known for their range of chaser bins, Coolamon Steelworks recently teamed up with Richard Hazelton of Haze Ag to produce a range of trailing fertiliser spreaders. Previously a spreader manufacturer in his own right, the partnership now sees Richard's patented spinner design fitted to the Coolamon spreaders, which are available in 7500, 9000, 10500, 12000 and 14500 litre product capacities.

Performance when spreading lime was a standout, recording a maximum bout width of 18m for both racetrack and up-and-back directions. The 100kg urea test was reasonable, recording 31m (racetrack) and 30m (up-and-back), but fell away at the 60kg rate, registering a bout width of only 16m for both travel directions. But a quick look at the 60kg graph will show a CV of 17-18% was obtained at 31m, so a little more tweaking should bring that back down to a 15% CV.

The most noticeable feature of the business end of the spreader is unique spinner setup. A series of cone-shaped collars sit stacked over the spinner shafts in the centre of the spinner discs, effectively controlling the position at which product sits on the disks before entering the vanes. To adjust, one or more of the cones can be slid up the shaft and secured out of the way.

The vanes are short, with an aerodynamic cross-section, and are made of polyurethane. This design is claimed to draw product to the disc centre by creating a zone of negative pressure, but it is likely this occurs to a degree with standard spinner designs in any case. The flexible nature of the vanes should help reduce product damage, and vane life is claimed to be good. The same vanes are used for granular and lime products, but there is a steel vane option if required.

The spinner shafts are driven by dual bent-axis hydraulic piston motors from the top, and shafts are retained by a bearing underneath each spinner. Typical spinner speed is 1300rpm for urea, and hydraulic requirements from the tractor are about 120L/m.

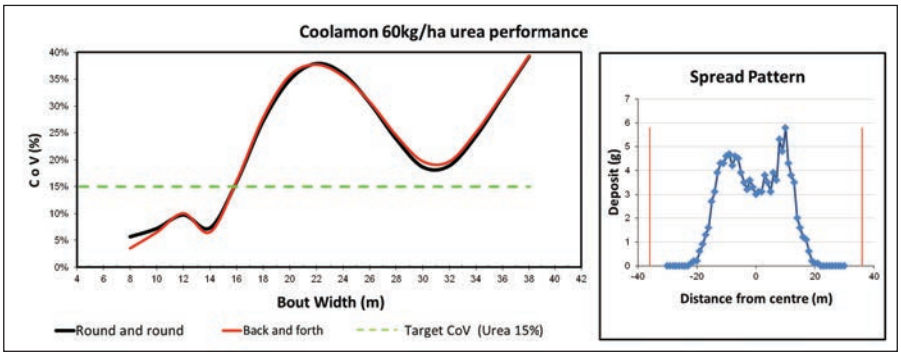
Drop point to each spinner is adjusted through the use of three rubber flaps attached to steel backers, which are secured using bolts and sliding brackets. While this provides an infinite range of adjustments, it may become a little confusing to get the drop point setup initially are there are so many possible adjustments.

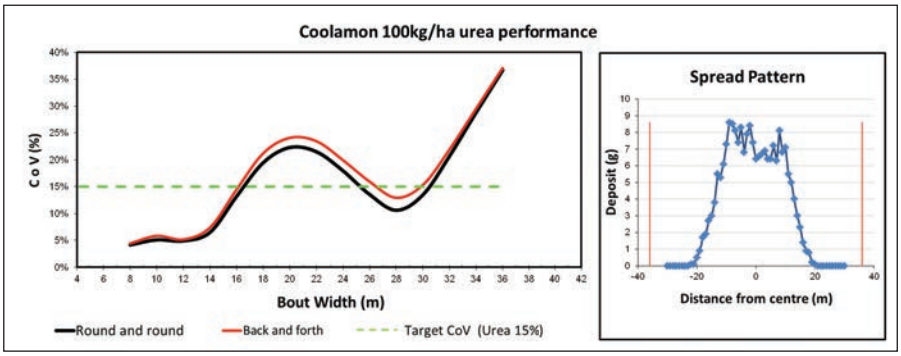
The 1000mm cleated belt is hydraulically driven at the rear through a 20:1 Sumitomo gearbox, and there is no ground drive

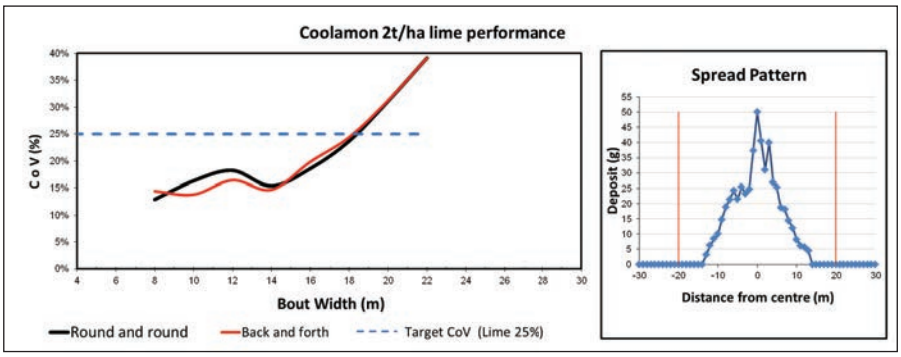
option available. The head and tail pulleys are rubber-faced and large in diameter, and slightly crowned to aid belt tracking. On the CS120 and CS145 models the belt is driven by both head and tail pulleys.

Support rollers are oil filled and packed with grease on the ends, and are virtually maintenance free. Bearings sit on a 25mm stainless steel shaft, and the entire assembly is clad in PVC. The only grease nipples to worry about are for the head and tail pulleys, spinner shafts and axles.

Much of the chaser bin design philosophy carries over to the spreader range, and the machines are simple, robust and well put ▶







WHAT WE LIKED

- ✓ Excellent build quality – similar to Coolamon chaser bins
- ✓ Good lime spreading performance
- ✓ Bin can be filled from both sides
- ✓ Low bin fill height of 2.6m
- ✓ Three bin sight windows

WHAT COULD BE BETTER

- ✗ Performance when spreading urea
- ✗ No decals or labels (are told they will be fitted in future)
- ✗ No bin access ladder fitted
- ✗ Large array of adjustments for drop point onto spinners

PRICE

$82,500 (inc GST)
About $88,000 for ISO-ready machine

MANUFACTURER COMMENT

We as a company pride ourselves on our even spread patterns and believe that this is the most important aspect to any spreader on the market today. On the day of testing, the results make out that our machine lacked width with urea however we still had a 25% CV at 36m with a very even spread pattern.

We have taken onboard Kondinin's feedback and have already addressed the limited labelling on the rear adjustments. In respect to the ladder, our self-cleaning hopper and our low maintenance design means there is no need to climb into the hopper.

Our dual-purpose machine is the only machine on the market with a 1m wide cleated belt which allows us to spread everything from feedlot waste to very wet chicken manure, wet or dry lime and gypsum right through to urea.

together. Bin sides are curved to increase stiffness and bin ends are made from 6mm plate. The bin is symmetrical and can be filled from both sides, and is covered with an optional manual roll tarp. Internal corners are bevelled to improve product cleanout, but no access ladder is fitted.

Track width options are fixed 2m or 3m axles, with 480 tyres fitted to the test spreader. Larger machines use 650 rubber, with twin axles on the CS145. Other tyre options are available.

Gason series 7312

In the 12 years since Kondinin Group last tested a Gason spreader there have been many changes made in the new 7390 (nine tonne) and 7312 (12 tonnes, as tested).

Both models are available with ground-drive feed chain, or hydraulic drive for full variable rate control, and can be fitted with multi-purpose or widespread spinner sets.

Gason advertising claims the new machines will spread granular product to 36m, and that is exactly what they did at a CV of 15% when set to maximum width on both the 60kg and 100kg urea tests. Lime tests at 2t/ha were a little heavy in the centre, recording a tad over 14m before the CV rose above 25%.

The most notable difference between the Gason and other spreaders tested is the use of a 730mm wide slatted chain, rather than a belt on the bin floor. There is no doubt slats aid feeding irregular or clumpy products such as manure or gypsum, so it was good to see the accurate results achieved with granular products as well.

The chain in question is custom made by Gason by welding steel slats to roller chain, which travels around profile-cut sprockets at the front and rear of the bin. Chain tension is maintained by spring pressure and is not set overly high. Any bending of slats is easily fixed by straightening with a hammer as they are mild steel. Bars can be fitted in the bin over the slats to take some of the weight off the chain when spreading heavy pelletised products at low rates.

The chain is driven through the rear sprockets by a hydraulic motor and reduction gearbox on VRT machines. Ground drive machines use a jockey wheel taking drive from the tyre through a three-speed metering gearbox. The VRT option costs an additional $8000.

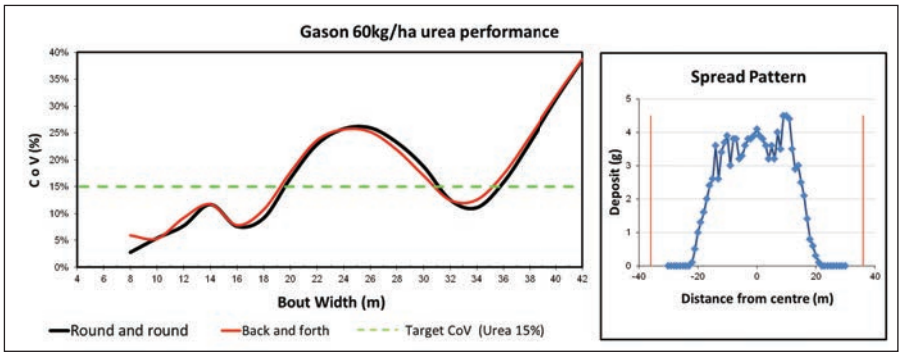
Spinner drive is hydraulic, with a minimum requirement of 100L/m from the tractor. Hydraulics are routed to a Gason-designed control block on the side of the machine which features a manual override or limp system to get work completed should an electrical fault occur.

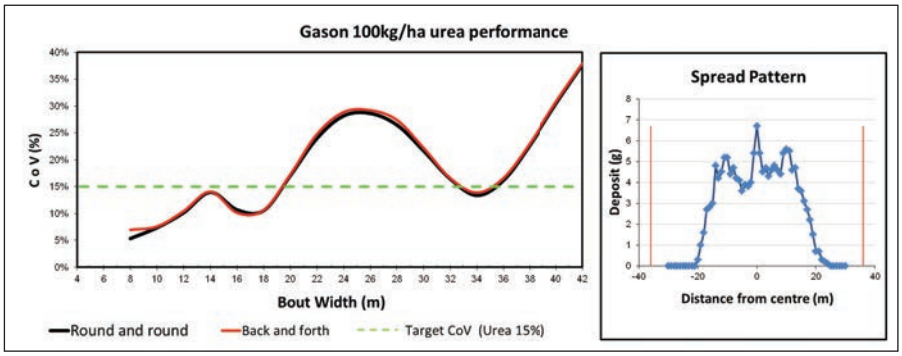
While the general purpose spinners can be used for all products, the widespread spinners need to be fitted to achieve 36m with granular products. This is easily accomplished by removing a 36mm nut and dropping the spinners down, all while sitting on the convenient fold-down steps either side of the spinners. ▶

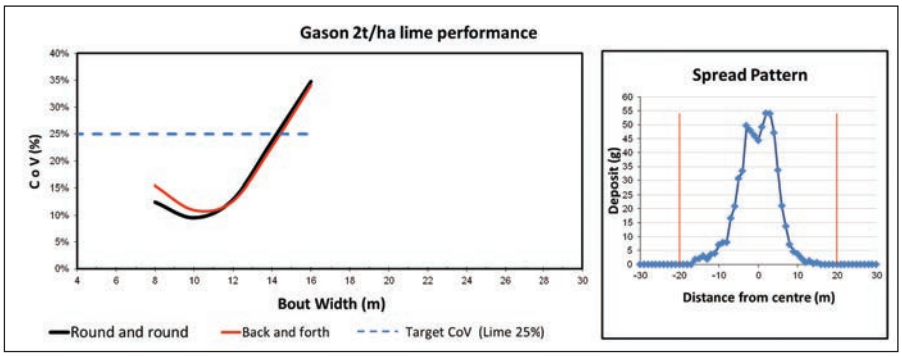
A central Vee-shaped divider is removed when changing from urea to lime, which can also be moved in or out to alter the drop point. The entire deck, complete with spinners, can also be moved forward or backwards for drop-point adjustment. Spinner vanes are of differing length and are adjustable, and the rear gate is manually operated and adjusted.

Buyers can choose between three different VRT control monitors; a Farmscan 7300 base unit, or John Deere dry rate controller or Topcon unit. The latter can be set with an Atlas module to give dynamic calibration on-the-go.

A front-mounted platform and ladder provides good bin access, and is handy for standing on if washing down with a







pressure hose. Two bin windows are fitted. The chassis is single-piece rails with no cushioning, and the drawbar height is adjustable, but correct operating trim sees the bin slightly sloping down towards the tractor. A twin-speed manual jack is fitted.

Axle widths can be varied from 2m to 3m and several tyre options are available. If load cells are fitted ($8400 option), they are sandwiched in between the axle and chassis rails.

A bin roll-tarp, light kit, braked axle and a hydraulic handbrake are optional equipment.

WHAT WE LIKED

- ✓ Platform and bin access
- ✓ Spreading performance on granular products
- ✓ Well-made spinner deck componentry – well marked and labelled for adjustment
- ✓ Low bin fill height (2.67m)

WHAT COULD BE BETTER

- ✗ Possible increased maintenance and cleaning with chain floor
- ✗ Some exposed electricals

PRICE

Base model ground drive: $66,883 (inc. GST)
VRT model as tested – check with manufacturer

MANUFACTURER COMMENT

We would like to thank Kondinin for inviting us to be involved. With the new 9 & 12T WideSpread Spreader, our goal has always been to have the ability to spread urea to 36 metres, and then with minimal changes, to spread lime and compost type materials evenly and at heavy rates. This makes the Gason spreader a true Multi Spreader.

Simple to operate, simple to set, easy to maintain, robust design. We regularly hear from current uses of the 12T model spreader carrying 15 tonne loads of lime and gypsum, and with the heavy duty axles and wheels, travelling over paddocks with ease. Designed and built in Australia for Australian farmers.

Kuhn

The Kuhn Axent 100.1 was a relative unknown coming into the spreader testing.

But with an asking of price of $200,000 plus GST, there was plenty of expectation about the European-made spreader's performance.

The 10,000 litre capacity bin, made of mild steel, with an 800mm wide belt is the basis of the design. Changing between lime and granulated or fertiliser "cartridges", involves changing the whole rear spinner platform.

The platform sits on two quick attach hooks and changing takes about eight minutes, including removing the bin's internal grating. This also requires the use of a forklift or tractor with set of forks to lift and move the cartridges, which weigh about 300kg each.

With a dry weight of close to five tonnes, the Axent is a serious bit of kit but there is also has plenty of refinement and features as standard, which you would expect for an asking price of $200,000 plus.

A power take off shaft drives a self-contained hydraulic system which runs the belt and spinners. The over engineered hydraulic jack, auto folding tarp and self-levelling system suspension which uses accumulators, rely on the towing tractor's hydraulics (using only about 40 litres/min flow).

Hydraulic flow rate for the belt and spinners is 160 litres but for spreading lime or gypsum, the oil pressure requirement is

280bar and hence the non-reliance on the tractor hydraulics.

The drawbar can be fitted as a ball hitch or ring style and can be adjusted to a high-hitch position by turning the adaptor plate upside down.

There are no sight windows however load cells are standard so in theory, the operator should not need to see into the bin.

Access to the bin is easy with a sturdy ladder and small platform located at the front of the bin, just below the hydraulic oil tank which has a site glass. A temperature sensor on the oil cooler starts the cooling fan if the oil temperature runs over 65 degrees Celsius.

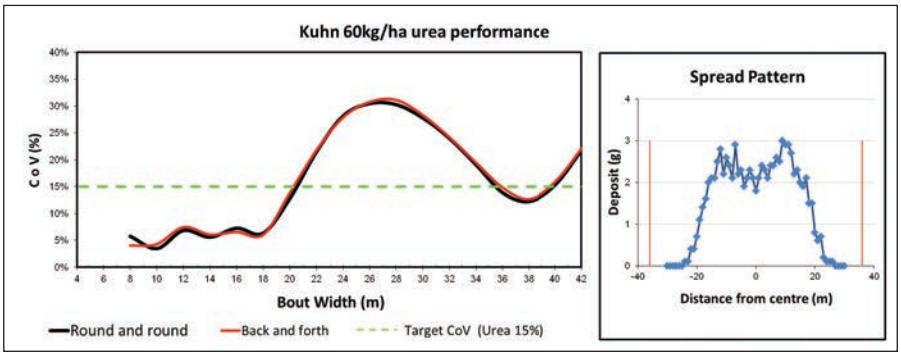
There are several axle widths available, including 2m, 2.25m and 3m as well as a steering axle option. The Axent tested was shod with 480/80/R50 rubber and had a transport width of 3.45m. The BPW axles are rated to 13.5 tonnes with the machine load spread between axle and drawbar.

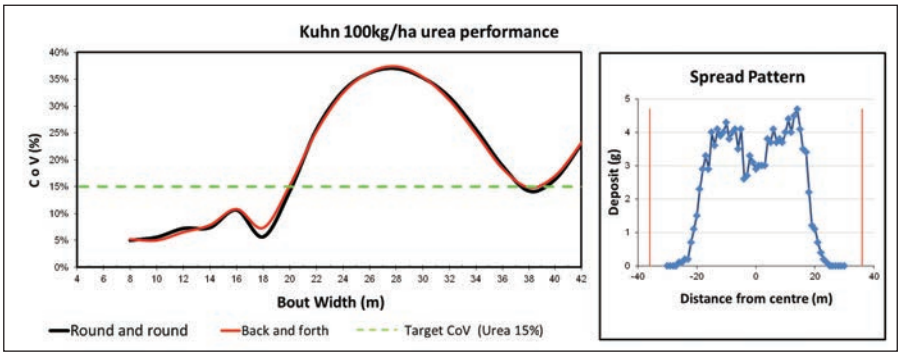
An emergency break is standard, so if the connection between the tractor and spreader is broken, the spreader's brakes will be activated.

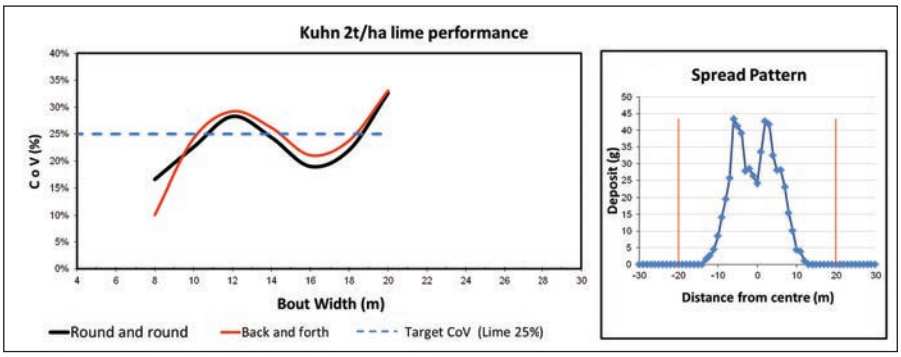
Side panels which can be removed in seconds provide plenty of access to the rollers underneath the bin and each roller can be removed by slacking off the belt and lifting them out of a slot cut into the metal frame.

Grease points for the drawbar, suspension and belt pulleys require daily lubing and each nipple is well labelled.

A large fiberglass cover sits above the rear end of the bin providing protection for the area where material is dropped onto the spinners. The cover is quite heavy and once raised, is a little awkward to pull back down via the cloth tether. ▶







WHAT WE LIKED

- ✓ Spreading performance on lime and urea
- ✓ Many features as standard, eg camera
- ✓ Finish and function
- ✓ Hydraulic fold tarp
- ✓ Monitor and in cab control

WHAT COULD BE BETTER

- ✗ The price
- ✗ Rear cover quite heavy and awkward to close
- ✗ Cartridges are tricky to support on loader forks when changing

PRICE

$242,385 (inc. GST)

MANUFACTURER COMMENT

The Kuhn Axent 100.1's ease of operation and highly accurate regulation system, combined with automatic variable working widths means that you can maximize your time and efficiency in field and is well worth the investment.

Adjustment is all done from the cabin of the tractor, in the test Kuhn's case via the John Deere terminal thanks to the Kuhn's ISOBUS capabilities. The terminal display was large and easy to read.

Key to the in-cab control is the product application rate being governed by torque sensors on each spinner which work independently of each other. The Kuhn runs a program known as EMC which continually self-calibrates the torque sensors.

If there is a need to remove a spinner, a small 'L' shaped tool allows a threaded cap to be removed from the top of the disc. Spinners are labelled 'left' and 'right' and the vanes are attached via holes of different sizes and offsets, so it should be backpacker proof.

Each Axent also comes with a vibration system to help keep the bin contents flowing. Fitted into the bin wall structure, the vibration is from a small, off-balance electric motor which can be set to run at intervals. A roller beater also helps feed coarser material, located at the rear of the bin and a rear camera and LED lighting are also standard.

So the $200,000 question was "how did it spread?" The answer was "impressively".

At 60kg/ha of urea, the Kuhn managed a 40m bout width at 15% CV while at 100kg/ha of urea it was almost the same at 39m. Both travel directions recorded identical results. The lime result was similarly impressive, making almost 19m width at the 25% CV.

Landaco

Made in Wagga Wagga, NSW, the Landaco spreader range covers a variety of sizes which can be used for a wide range of products.

Missing from our last round of trailed spreader testing in 2015 in Western Australia, we were keen to see how the Landaco would perform a little closer to home with the test paddocks located at Coolamon, about 30km from Wagga Wagga.

The Landaco tested and inspected was a TS12000 model, with a 10,000 litre capacity bin, V cleated rubber belt (800mm wide), towed by a JCB 8250.

In terms of performance, the Landaco performed very well on lime and urea. Urea at 60kg/ha was spread to 39m before the CV rose above the 15% for round-and-round travel, but the CV blew out slightly in the up-and back direction, just missing 15% at this point. For the 100kg urea test, both travel directions made 38m at a CV of 15%. Lime at 2t/ha made it to 23m before going over the 25% CV, which was the best of any spreaders tested.

The spreader tested was supplied "variable rate ready", able to be connected to a range of commonly used controllers including John Deere, Topcon, Trimble and Dickey John.

Being variable rate ready, the Landaco requires 160 litres a minute oil flow from the tractor to run the two circuits which supply belt drive and spinner control.

Load cells can be retrofitted to any of the trailed spreaders in the Landaco range. ▶

Axle widths can be tailored to suit 1.8m to 3.5m and there are dual and steerable axle options. The TS12000 inspected was shod with 480/80/R42 Titan lugged tyres.

Overall build quality looked good with steep sides of the bin and a relatively uncluttered internal area to help with product flow to the cleated belt. Belt options include smooth rubber and chain and slat versions.

The bin has 5mm thick front and rear walls and 3mm thick side walls with the side walls aided structurally by external struts. The research team noted the external struts were not full-seam welded which may allow the ingress of moisture. Internal cross members can be supplied for larger bin sizes and these were fitted on the Landaco inspected.

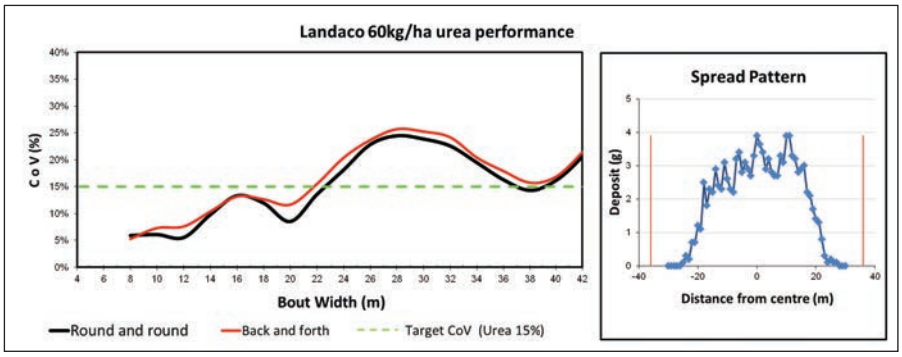
Overall, the Landaco is well finished with two-pack paint which is applied after sand blasting and an etching primer. Individual components are painted prior to assembly.

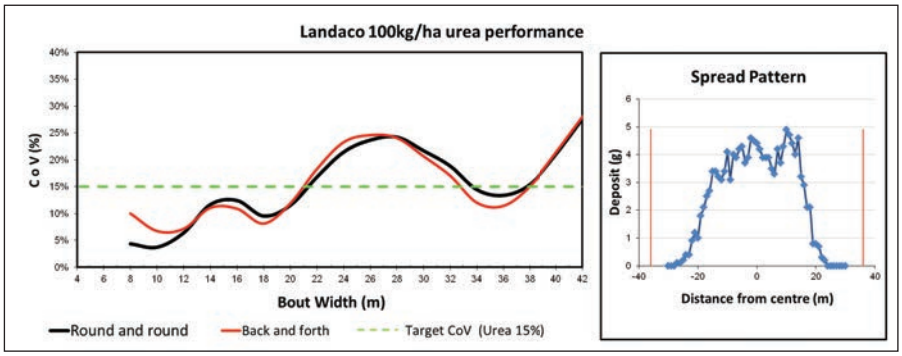
Stainless steel is used extensively throughout the spreader, for example for all bolts contacting spreading product, the ladder, the spinners and a rear protection bumper.

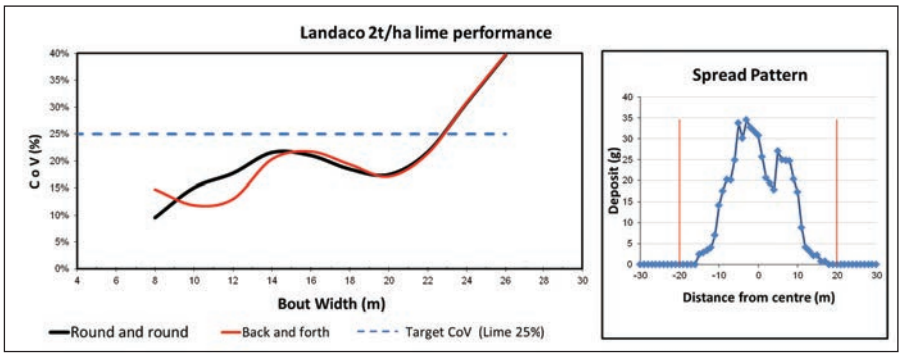
There are several hitch options but the unit inspected was fitted with a HD60 swivel ball and safety chains. A manually-operated, two-speed jack is located within the confines of the drawbar frame and we recommend care when turning the crank handle to avoid skun knuckles.

A roll tarp was provided with the test spreader and the bins come "hungry board ready" with 300mm and 500mm extensions available.

The rear of the spreader is well labelled for adjustment which covers the spinner deck moving forward and backwards, the







WHAT WE LIKED

- ✓ Excellent value
- ✓ Good spread performance
- ✓ Easy to adjust and well labelled
- ✓ One tool for most adjustments
- ✓ Aussie product matching imported performance

WHAT COULD BE BETTER

- ✗ Position of jack in drawbar
- ✗ Some wiring could be better protected

PRICE

$71,500 (inc. GST)

MANUFACTURER COMMENT

The simplicity of the Landaco spreader was a major benefit which resulted in excellent test results on the first pass. Apart from changing the rate from 60kg to 100kg/ha on the electronic controller, no adjustments were needed to the L36G urea deck settings. This is a key consideration when selecting a spreader for variable rate application. For the Lime test, a simple five minute conversion of the disc and deck adjustment was all that was required to switch to the 4B8 spinner system. Simple and effective!

With new models just released in the 12 to 30 tonne range, Landaco are able to meet the capacity and accuracy demands of its many larger scale farming customers.

With 30 years' experience, we are proud to be providing a quality Australian manufactured product supplied direct to farmers and contractors. We focus solely on spreading equipment with commitment to continual product improvement.

bin gate opening and the drop point to the spreader (using V-shaped plates).

A different spinner is required for granulated fertiliser than that used for lime and changing the spinner only takes a few minutes. The spinner deck can be wound right out (backwards) and then there is a centre spinner cap to remove, which exposes the single nut to remove the spinner. A handy touch is the spanner/tool which can be used to remove the spinners and V-plates and adjust the belt tension via external rods, easily accessed above the drawbar at the front of the bin. Spinner vanes can also be adjusted for pitch and length.

A rear facing camera is standard, which is a great idea to allow vision of the belt feeding the spinners.

Hydraulic remote control of the rear bin gate is also an option, using a camera so the operator can see the gate opening measurement and this allows crude variable adjustment for high application rate products such as manure.

Maintenance is covered by six grease nipples – two for each end of the belt rollers and one on the hitch and jack.

The rollers under the belt use sealed labyrinth bearings and a crowned rear drum roller and front tracking rollers help keep the belt centred.

Not every grains farmer sees precision ag the same way.

When you're looking to take your farm's productivity to the next level, we know there is one thing everyone wants. Answers. It's different for everyone, so to answer a few of those questions we got a group of Aussie grains farmers together to try our latest PA technology for themselves.

Watch their story at JohnDeere.com.au/PrecisionPays

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