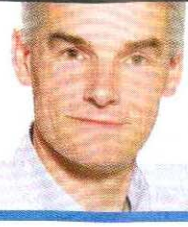


On the grid... six spreaders on test

Wondering how good your fertiliser spreader really is? **Emily Padfield** joined European colleagues in Denmark to test the accuracy of some of the most advanced spreaders on the market

Our last in-depth spreader test was nearly 15 years ago, when 24m working widths were becoming more commonplace. Now many spreaders cover a colossal 42m width and on-board weighing systems are becoming the norm. The weighing system constantly monitors the amount of fertiliser in the hopper and automatically adapts forward speed to the weight in the hopper.

It was clearly time to conduct a new test – one that looks at up-to-date spreaders equipped with weigh-cells and with a minimum working width of 36m. The norm in the UK may still be 24m, but it won't be long until these wider working widths creep in.

WHO TOOK PART?

The test involved four magazines – *Boerderij* in The Netherlands, *Top Agrar* in Germany, *La France Agricole* in France and *Farmers Weekly* in the UK. We asked all western European fertiliser manufacturers to participate. Amazone, Bogballe, Bredal, Rauch, Sulky and Vicon/Kverneland took the challenge. Tulip, who took over Lely spreader production in 2002, decided not to take part.

The spreaders were tested at Bygholm Research Centre, part of the University of Aarhus in northern Denmark. This is the only independent spreader test hall in Europe.

EVEN SPREAD PATTERN

To ensure the test was done properly, it was conducted to the official European EN13739 test protocol. So each spreader was tested four times to flatten out any anomalies in the spreading performance figures.

The test was also designed to be a practical one, so each machine was adjusted purely using the instruction manual and spreading tables, as any farmer in the field →p66

WITH THANKS TO...

* The Danish Research Centre, Bygholm, in Horsens – part of the University of Aarhus, Denmark
* Spreader accuracy professionals Krister Persson, Hans Skovsgaard and Kalle Antonsen, who operate the test hall and were involved in the design and implementation of the test
* Yara, who gave us 20t of high-quality CAN
* Michelin Denmark, who provided weighing pads so that the weight on the rear tyres could be measured
* Johannes Ballast, engineer and Dutch importer of Major Equipment, who assessed the spreaders' construction

would do.

Spreader adjustments were made by *Boerderij* staff, after which manufacturers monitored whether these adjustments were done correctly. However, manufacturers were not allowed to see any of the test results throughout the week.

FERTILISER

Supplied and produced by Yara from the Sluiskil plant in The Netherlands, the fertiliser was CAN – 27% N ±4% MgO. This is a standard Extran with a uniformly round shape, however transport and handling can cause some granules to be damaged. The fertiliser in the test was finer than usual.

Spreader manufacturers were not given a prior sample of the fertiliser used to avoid influencing the settings recommended in the spreading tables. Why? Because a farmer does not know the exact quality of the fertiliser he buys and uses only the spreading tables as a guide. Many manufacturers now offer websites with up-to-date spreader tables too.

COEFFICIENT OF VARIATION

After each test, the coefficient of variation (CV) was established. This is the key indicator of accuracy and measures the range of widths of granules and shows how much a spreader's average spread pattern differs from the ideal.

According to the EN protocol, a CV lower than 15% is acceptable and one below 10% is good. Anything between 15% and 30% is poor and although the farmer won't be able to see a visible difference in the crop, yields will be affected. A CV of over 30% will result in striping and even crop damage.

THE TEST ITSELF

One spreader was tested each day and the test consisted of five steps. The accuracy of the weighing system wasn't tested (see box: No weigh cell test).

1. Starting measurement

The spreader was adjusted according to the manual and manufacturer's spreading table. The distribution of granules when the spreaders was stationary was measured based on the spreading table settings. Although weigh-cell spreaders automatically adjust the shutter opening width based on driving speed, weight and rate/ha settings, manufacturers advise the operator to put specific

NO WEIGH CELL TEST

* This test took over a year to organise – mainly because of lengthy discussions between magazine editors and manufacturers over the test protocol. The manufacturers insisted that they would only take part if each spreader was tested according to the official EN13739 test protocol, so the test had to take place in an independent spreader test hall.

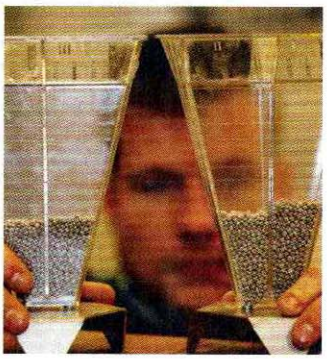
Farmers Weekly, *Boerderij*, *La France Agricole* and *Top Agrar* wanted to test the accuracy of weighing cells in a static load test. The plan was that two big bags of fertiliser would be lowered into each spreader, which would then be weighed. This reading would then be compared to the reading on the machine itself.

However, some manufacturers refused to take part in this part of the test. They said that a weigh cell test hadn't so far been included in the EN protocol and that our static method would not have been accurate enough. However, a test protocol is currently being developed.

TABLE HEAD

Model	Amazone ZA-M 3000 Ultra Profis	Bogballe Quadro M2W Plus	Bredal F2 3200	Rauch Axis 50.1W	Sulky X12-44 Vision WPB	Vicon RO-EDW
Dimensions						
Length (cm)	168	160 (18)	174	153	160	130
Width (cm)	300	300	300	300	298	298
Height to top of hopper	155	140	184	171	154	157
Height with closed cover (cm)	162	167	[1]	196	173	186
Width inside hopper (cm)	297	290	300	290	297	286
Length inside hopper (cm)	155	140	150	148	147	127
Height of hopper (top to bottom) (cm)	119	108	105	136	116	120
Distance from linkage to hopper (cm)	0	-3	-15	-2.5	6	0
RPM						
RPM pto/discs in field test	540/720	540/750	1000/1100	540/900	540/810	525/950
Weight						
Hopper (litres)	3,000	3,000	3,200	4,000	4,000	4,200
Weight hopper (kg)	802	673	954	808	710	820
Weight front axle empty (%)	21	17	23	23	19	20
Weight front axle loaded hopper (1200kg) (%)	54	51	57	56	52	50
Spreading measurements [2]						
CV field test	13.6	3.7	8.7	8.2	8.6	5.7
CV after correction	5.1	o.n.n. [4]	4.9	o.n.n. [4]	o.n.p. [5]	o.n.n. [4]
Best CV	5.1	3.7	4.9	8.2	8.6	5.7
Y Border spreading (% crossing boundary)	2.0	2.4	2.4	2.6	0.9	2.3
CT Border spreading (% spreading pattern from field to border)	22.4	16.6	17	18.7	22.2	19.6
Scores [3]						
Computer	●●●◐	●●●◐	●●●◐	●●●◐	●●●◐	●●●●●
Ease of use	●●●◐	●●●●	●●●●	●●●●	●●●●	●●●
Optimise spreading pattern	●●●●◐	●●●◐	●●●◐	●●●◐	●●◐	●●●◐
Construction	●●●◐	●●●●◐	●●◐	●●●●●	●●●◐	●●●●◐

(1) A cover can be delivered, but wasn't mounted on the testing machine (2) The lower the rating, the better the result
(3) 1 = bad, 5 = excellent (4) o.n.n = correction (5) o.n.p = correction not possible



Overall construction quality was assessed (left). Each manufacturer has a different method of measuring how accurate their spreaders are.

IN-SPINNING AND OUT-SPINNING

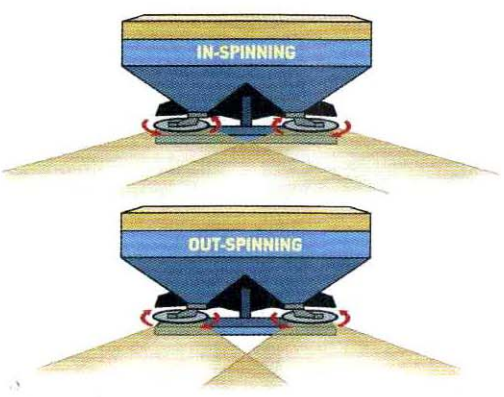
* Our line-up of spreaders used either in-spinning or out-spinning spreading methods. Bogballe and Bredal spreading discs turn from outside in – known sometimes as in-spinning. Amazone, Rauch, Sulky and Vicon discs turn the other way, from the inside out.

The advantage of the in-spinning method is that there is more overlap between the two discs, meaning the risk of deviations during full-width spreading is lower. However, this makes border spreading more difficult, as both discs are throwing fertiliser across the boundary instead of one.

Bogballe solves this by switching the disc rotation when border spreading. Bredal sticks to in-spinning, but reduces the speed of the outside disc and the rate.

As it is not possible to open and close the left and right side separately in the in-spinning system – due to the high degree of overlapping – it's also more difficult to decrease the spread on the headland.

With the out-spinning method it's possible to shut one disc off, so the degree of overlap needed is relatively small.



settings into the computer to take account of factors like flow characteristics.

At the same hopper setting, finer fertiliser granules flow faster than coarse ones. You need to compensate for this in the first few metres if the spreader is to achieve the correct application rate, as when spreading starts no weight measurement has been established. Adjusting the hopper according to the recommended settings means the rate/ha is accurate enough to commence spreading.

Because the Yara fertiliser was finer than usual, the actual amount spread was higher than the advised 260kg/ha for the Amazone, Rauch and Sulky spreaders at the start of the run. However this had no negative effect on the spread pattern.

2. Field measurement

In the field test, the spreader's own computer was left to adjust the hopper opening, resulting in an application rate approaching 260kg/ha at a forward speed of 8km/hour. The spreader computer does this automatically as soon as the operator starts spreading. Each field test involved four runs.

In an ideal world the spread pattern would be accurate enough without having to run a tray test. In practice, most growers don't perform one regularly due to the amount of work involved and complexity.

3. Getting the best spread pattern

Manufacturer's manuals give operators the chance to adjust the spread pattern based on the results of the tray test. This involves putting between four and 14 trays (depending on the make) in the field to collect the granules. Once the tray contents have been weighed, the instruction manual consulted and, possibly, the dealer rung up, the operator can check whether the spread pattern is good enough and if not, how to improve it.

According to the EN standard used in our test, each manufacturer had two attempts to correct the spreader pattern, using the instructions in the manual.

4. Border spreading

We also adjusted the spreader for border spreading using the instruction manual. We worked to the EU regulations on this; they stipulate that only 0.3% of fertiliser can cross the boundary. In addition, the spreading value (CT) needed to be below 25%.

5. Optimising border spreading

In their manuals, Amazone, Bogballe, Bredal, Sulky and Vicon indicate how to adjust the spreader both for full-width spreading and border spreading. Rauch doesn't have a protocol in its manual for adjusting border spreading.

SPREADERS *CAN* BE MORE ACCURATE

* This test was designed to be a practical test, which replicated what the farmer can achieve in the field. However, the CV achieved wasn't the best that each machine is capable of. Take Rauch. In the field test, the Rauch spreader achieved a CV of 8.2%. After the official test, and as the spreader still had a couple of hundred kg of fertilser left, the manufacturers had the opportunity to conduct an unofficial retest. By looking at the graphs (which was forbidden during the official test) they achieved a CV of 6.8% and, if there had been more time, might have got that down even lower.

The same applies to other manufacturers. However a farmer wouldn't have the facilities to conduct a test like this, merely a few trays and a manual.

RESULTS

All spreaders achieved a CV below 15%. In the field, the difference between the measured CVs seemed big, but in practice it was slim. However, the machines' performances fell into the acceptable, good and very good categories, and all spreaders tested provided a good spread pattern.

After spreading, we used the instruction manual to work out whether a better spreading pattern was possible. For Bogballe, Vicon and Rauch the initial tray test meant there was no need to adjust the spreader, as the deviation was already within the guidelines.

For Amazone, Sulky and Bredal the test showed there was little improvement after adjustment. Readjusting the Sulky spreader didn't result in a better spread pattern and after two attempts the spreader was set to the original settings. The instructions in the manual turned out to be wrong and the manufacturer has now changed this.

Eventually, all spreaders scored a CV of below 10%, which is very good. Border spreading wasn't a problem for any manufacturer. No spreader broke the 0.3% rule and all have a border spreading value (CT) of under 25%.

Conclusion? There is no real winner in this test as the differences were too small, particularly if the grower takes time to perform a tray test regularly.

Amazone ZA-M 3000 Ultra Profis

AMAZONE

- **Model:** ZA-M 3000 Ultra Profis
- **Working width:** 15-52m
- **Hopper:** standard 3,000 litres (with hopper extensions: 4,200 litres)
- **Price tested:** £16,395
- **Contact:** 01302 751 200, www.amazone.co.uk

Above: Amazone's ZA-M Ultra is the only one to alter the width by changing the position of the vanes.

Right: Lots of corners to clean

* The ZA-M Ultra was introduced in 2002. Amazone offers both mechanically and hydraulically driven spreaders, and the German manufacturer pays a lot of attention to operator safety.

Spread pattern:
CV field test: 13.6%;
CV after adjustment: 5.1%
After calibrating the flow of fertiliser and spread pattern using the tray test, Amazone scored a CV of 5.1%, which is good. Before adjustment, the spreader had a CV of 13.5% which, although well within the limit, is erring on the high side. This can be explained as the Amazone spreading table is based on a rougher Yara CAN than used in the test.

Border spreading:
Y: 0.2% CT: 22.4%
Only 0.2% of fertiliser went beyond the boundary, which is good. The distribution of fertiliser along the side is good, indicated by the CT of 22.4%. The border spreading device is on the left, and by using the computer this can be folded down hydraulically with the application rate reduced automatically.

Computer:
●●●◐
Amazone uses the Amatron+ computer for spreaders, sprayers and drills. Although it has large, clear buttons, there is no colour screen. And, because there are a lot of symbols and values the display looks busy. On the back, there's a shift button which doubles the function of the buttons on the front. The spreader is available with ISObus, which then allows it to be compatible with colour and touch displays like the CCI 200-terminal.

Ease of setting:
●●●◐
Setting is pretty simple. Find the name of the fertiliser in the supplied spreading table (or on the internet) then enter the calibration factor and application rate into the terminal (0.98 for Yara CAN). Adjust the vanes on the spreading disc – the small vane goes in position 19 and the large one in position 44 – using the wing nuts. This is harder than using a lever or having a computer to set it electronically. The spreader always spreads at 540rpm with a disc speed of 720rpm.

Correcting your spreading pattern:
●●●●
The Amazone spreader is the most accurate and user-friendly when it comes to operators adjusting the spreading pattern to get the best accuracy. You use four trays; three on the right-hand side (at 6m, 12m and 18m distance) and one in the middle. Then you repeat that to make sure the spreading pattern is symmetrical.

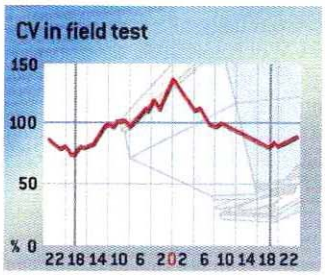
After the spreader has passed over the trays, fertiliser is collected in four plastic containers each with a scale, with each value entered into the computer. This calculates to what extent the operator needs to adjust the vanes. If the distribution is good, there's no need to adjust them. This system works well and is much better than using comparison charts in the manual to fine-tune spreading, as other manufacturers do.

Construction:
●●●◐
The spreader looks quite complicated, partly due to the limiter. There are steep ladders on both left and right sides of the hopper and four viewing windows. All parts that come into regular contact with fertiliser such as vanes and limiter as made of stainless steel. However, there are lots of corners in which fertiliser residue can gather, which makes it harder to clean.

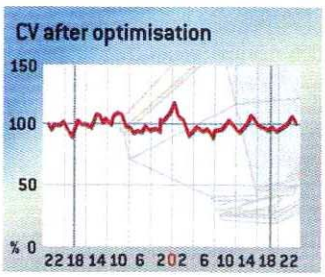
Paint quality is good, although there are a few areas where it seems thinner and around the lighting panel it's possible to see spots of rust. Amazone says this was a problem with the light housing and is solved on new models.

Amazone is the only brand that alters the spreading width by changing the position of the vanes on the discs. All other makes change the position of the discharge point above the disc. This adjustment is done with wing-nuts, so no need for tools.

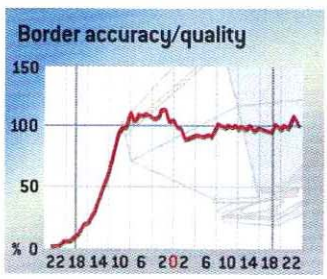
The ZA-M's weigh frame uses a rear-mounted weigh cell positioned in the middle of the frame.



The Amazone's field test CV of 13.6% erred on the high side...



...but dropped to just 5.1% after adjusting the pattern.



The Amazone scored well on both accuracy and quality.

Bogballe Quadro M2W Plus

Left: Spreaders were tested for stability qualities, too. The computer system (above) had input from audio experts at Bang & Olufsen.

BOGBALLE

- **Model:** Quadro M2W Plus
- **Working width:** 12-42m
- **Hopper:** Standard from 1800-litre to 3000-litre
- **Price:** £13,495
- **Contact:** 01423 324 221, www.krm-ltd.co.uk

* The Quadro M2 Plus was introduced in 2005. Danish company Bogballe uses the in-spinning way of spreading, ie the discs rotate from the outside in. According to Bogballe, this is the way our great-grandfathers used to spread, swinging their arms from the outside in for the best distribution and overlap. This apparently gives more overlapping between the two discs and less chance of a bad spread pattern. Interesting fact: the spreading computer was partly designed by top-end audio company Bang & Olufsen.

Spread pattern:
CV field test: 3.7%
CV after correction: correction not necessary

After setting the spreader according to the manual, the Bogballe had a CV of 3.7% – the lowest of all machines in the test without correction.

Border spreading:
Y: 0.24% CT: 16.6%
This is located on the right-hand side, with disc rotation reversed to give out-spinning spreading and the fertiliser exiting through a hole in the vanes. The results were good, with only 0.24% of the fertiliser falling beyond the boundary. Although the CT-score was good at 16.6%, there was a clear peak in terms of quantity applied on the right-hand side, while the left-hand side of the spreading pattern fell short. The CT-value doesn't reflect this.

Computer:
●●●◐
Bogballe's Calibrator Zurf computer was introduced last year. Although it lacks a colour screen, the console itself is easy to use and clear. On screen, there's a lot of information, such as how many metres you have left before the hopper is empty (a little bit like the range function on your car) and area covered. It's equipped with a USB port and spreading chart data can be read automatically and transferred between tractor and office.

Ease of setting:
●●●●
The Quadro is very easy to set. Find the name of the fertiliser either in the manufacturer-supplied tables or on the internet. Then enter the application rate, flow factor and working width. You can also opt to analyse the spreading characteristics of the fertiliser yourself (like Vicon) and determine what setting is most appropriate by using the website. The tilt of the spreader should be set at 4°, which you do by adjusting the top linkage. An arrow indicates the gradient.

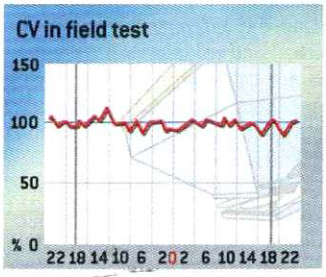
Correcting the spreader pattern:
●●●◐
The Quadro M2W requires the operator to use seven trays for the field tray test; three positioned to the left, three to the right and one in the middle. The collected fertiliser is then compared with the bar graphs shown in the manual. Equal distribution indicates the spread pattern is good, however if the outer trays contain fewer granules than the inner, the discharge point above the disc has to be adjusted so that the working width increases. If the outer trays have more, simply reduce this as the spread is too wide.

Construction:
●●●●◐
Very tidy throughout and design quality is good. At 673kg, it's a light machine. There are no sharp edges and it's well-painted. Disc drives are sealed and maintenance-free and there are very few corners where dirt can linger, while mudguards protect any mud from being flung up.

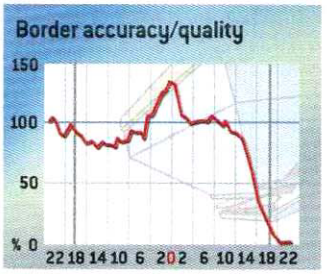
All elements of the machine that have contact with fertiliser are made from stainless steel, apart from the vanes themselves, which are made from hardened steel instead. Steps on the outside of the hopper and a set inside make it easy for the operator to gain access.

The spreader itself is mounted on a parallel subframe, on which there is one weighing cell and a reference sensor which accounts for the machine's gradient and any shocks when operating. The agitator is mounted so that it can both rotate and move both back and forth.

Below: Tidy throughout and design quality is good.



Bogballe's CV of 3.7% was the lowest uncorrected figure in the test.



The Quadro also turned in a good result for border spreading.

Bredal F2 3200

Bredal spreader was unusual in using a belt to feed fertiliser to the discs.

BREDAL

- **Model**: F2 3200
- **Working width**: 12-36m
- **Hopper**: 1,500-litres (with extensions, 3,200-litres)
- **Price**: £12,145
- **Contact**: 01423 324 221, www.krm-ltd.co.uk

* Bredal mainly builds trailed spreaders for fertiliser, sand, salt and lime but also offers mounted models. The larger trailed machines feed fertiliser to the discs with a mechanically or hydraulically driven belt, a system also used on the mounted spreaders. This is a significantly different method from the competitors. In fact, the belts look similar to those used in a potato planter, and Bredal supplies these belts to Miedema for this very purpose. The F2 3200 is the flagship machine and was introduced in the late 1990s.

Spread pattern:

CV: 8.7%; CV after correction: 4.9%

Despite the unusual spreading setup, the Bredal performed well. After adjusting the machine according to the spreader table, the 3200 scored a CV of 8.7%. However, according to the manual, this spread pattern could be better. Having done the tray test, the bar graph looks like a "smiley" – too little fertiliser in the middle and too much to the outer edges - indicating the spreading width is set a little wide. After adjustment, the Bredal scored 4.9%, which is good.

Border Spreading:

Y: 0.24%; CT: 17%

Border spreading is located on the left-hand side. Application is reduced by 10%, pto speed is lowered by a further 20% and a hidden door in the left hand chute has to be opened manually. The electro-hydraulically driven gearbox then reduces the speed of the left disc by 33%. The results of this seemingly complex arrangement are excellent – 0.24% of fertiliser was found beyond the boundary and the CT is just 17%.

Computer:

●●●◐

The TeeJet 500, Bredal's spreading computer, stands out for its easy-to-use simplicity. Although it lacks a colour screen and ISObus compatibility, all functions can be found quickly. Application rates can't be adjusted separately as the Bredal spreads using the in-spinning method.

Ease of setting:

●●●●

Setup is simple. The density of the fertiliser can be found in the spreading table or alternatively the operator can determine the actual density by using the supplied bucket. After this, the application rate, density and working width are entered into the computer. Everything is adjusted electronically and the operator doesn't even have to adjust the levers on the spreader. Spreading beyond 28m needs 1000rpm pto speed.

Correcting the spread pattern:

●●●◐

Seven trays are needed for the field test; three to the left, three to the right and one in the middle. The collected fertiliser is compared to the bar graphs in the manual; equal distribution indicating that the spreader is set correctly, more or fewer granules in the outer trays suggesting the chute needs to be adjusted.

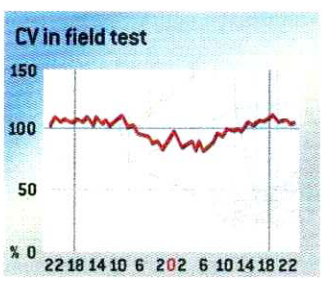
Construction:

●●◐

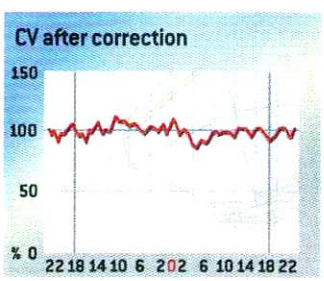
Because of the multiple driveshafts, extra gearboxes, hydraulic motors and transport belts, the construction of the F2 3200 looks overly complicated. It also requires double the space of competitors' machines under the hopper itself, making it higher and heavier than others on test.

The spreading discs are powered by a V-belt drive with variable speed. There is only one small sight glass to allow users to see in. The weighing unit is located between the linkage and the spreader and if there is a difference between the actual and recorded weight, a flow factor calibration can be carried out when the machine is static, however this can't be adjusted via the computer.

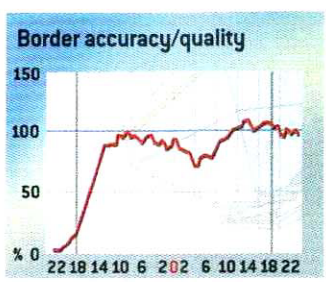
Spreading discs are made of steel and vanes are stainless steel, however overall welding quality could be better. The open design is prone to collecting dirt, but is also easy to clean.



Bredal performed well, despite its unusual spreading set-up.



The CV went from 8.7% before correction to 4.9% after it.



Though mechanically complex, border spreading is excellent.

Rauch/Kuhn Axis 50.1W

KUHN/RAUCHE

- **Model:** Axis 50.1W
- **Working width:** 18-50m
- **Hopper:** 2,000-litres (with extensions, 4,000-litres)
- **Standard price:** £20,141
- **Contact:** 01952 239 300, www.kuhn.co.uk,

* German manufacturer Rauch builds fertiliser spreaders, grit spreaders and pneumatic seed drills, and the Axis 50.1 was introduced in 2007. Rauch is sold in the UK, France and Italy under the Kuhn banner. As well as mechanically driven spreaders, the company also offers hydraulic spreaders too.

Above and left: Rauch's Axis 50.1W is a well-built machine that is sold in the UK under the Kuhn banner.

Below: Quantron E computer isn't a touchscreen unit.

Spread pattern:

CV field test: 8.2%; CV correction not necessary

The spreader was set according to the manual and delivered a CV of 8.3%, which is a good result. No further adjustments were needed, however, in the manual if any tray contains more than 15% above the average, it's recommended that the settings are adjusted. On test, the highest was 13.5%, so that was good enough without adjusting the spread pattern.

Border spreading:

Y: 0.26%; CT: 18.7%

Push a button to activate the border spreading setting and the application rate is automatically dropped by 20% and the limiter is electrically lowered on the right-hand side of the machine. This directs the fertiliser flow backwards. The result? Only 0.26% of the fertiliser fell beyond the boundary and there were no peaks in the spread pattern. Distribution on the headlands was 18.7%, another good figure.

Computer:

●●●◐

The spreader is supplied with the Quantron E computer. Although it has a colour screen, the display is still in black and white and it's not a touchscreen. It's a clear and intuitive system, though, thanks to logical symbols and buttons. As well as being ISObus compliant, it's equipped with a USB for data transfer. For those wanting more sophistication, a touchscreen is available.

Ease of setting:

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To set the machine, you first need to find the name of the fertiliser by using the supplied spreading tables, the internet or the CD supplied. Because of the multitude of spreading tables and the fact that these can alter so regularly, Rauch doesn't offer a book. However if you use the CD-ROM, the computer will automatically check for updates. The next step is to enter the flow factor in the spreader computer, the application rate and the outflow position. Everything is done electronically and the operator doesn't have any levers to alter.

Correcting the spreading pattern:

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The manual suggests you put four trays at 4.5m, 9m, 13.5m and 18m on both sides of the spreader when dealing with a large working width. With a tray in the middle, a total of nine trays are needed and the operator needs to cross these trays three times. If the results deviate less than a given amount, the spread pattern is fine.

The manual shows seven examples of incorrect spreader patterns and what to do if these occur. The side-spreading function can be adjusted, although Rauch doesn't illustrate a tray test procedure for this, instead offering a brief explanation of how it can be adjusted if the operator thinks too much fertiliser is ending up in the ditch.

Construction:

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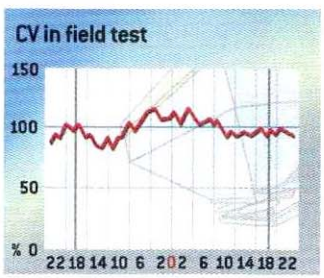
The quality of construction on the Rauch was the highest of those on test. It's a sleek and good-looking machine with a durable finish. There are four viewing windows at the front, two at the rear and two in the hopper cover. The front of the spreader is protected by a robust plastic sheeting material to avoid mud damage from the tractor tyres.

The disc drive is oil-immersed and maintenance free and only the pto has greasing points. All corners and parts are easily accessible with a pressure washer. The agitator rotates at only 18rpm, meaning the fertiliser has less chance of getting crushed. The weigh frame has two cells but no reference sensor.

All parts that come into direct contact with fertiliser are made from stainless steel.



The Rauch's CV was 8.2% so no further correction was needed.

Only 0.26% of the fertiliser fell beyond the boundary.

Sulky X12-44 Vision WPB

The Sulky X12-44 was easy to set up, but the border vane complicated things somewhat (bottom right).

SULKY

- **Model:** X12-44 Vision WPB
- **Working width:** 12-44m
- **Hopper:** 2,400-litres (with extensions 4,000-litres)
- **Price:** £13,525
- **Contact:** 01480 455 155 www.reco.co.uk,

* French manufacturer Sulky builds drills and tillage kit as well as fertiliser spreaders. Imported into the UK by Cambridgeshire firm RECO, the X44 was introduced in 2007 and heads Sulky's range of spreaders.

Spread pattern:
CV field test 8.6%; VC after correction: Correction failed
After setting the spreader according to the table, the Sulky spreader achieved a CV of 8.6% in the field test, which is good. However, the spread pattern wasn't completely symmetrical. Sulky uses a curved third vane on the right-hand disc for border spreading.

When application rates are below 200kg/ha this doesn't affect the spreading pattern, but at higher rates this vane catches some of the granules destined for the longer vane and spreads them closer to the spreader. This means land adjacent to the spreader receives too much fertiliser and land further towards the spreading width edge doesn't get enough.

When we tried to improve the spreading pattern, we failed (see Correcting the spread pattern, top right).

Border spreading:
Y: 0.9%, CT: 22.2%
When in border spreading mode, the disc rpm is reduced by 10% to 480rpm. The discharge outlet electronically shifts several centimetres to the right, so that the border spreading vane takes over the flow of fertiliser from the longer primary vane. Only 0.9% of the fertiliser spread ends up beyond the boundary (the best on test) and the spreading pattern from field to boundary (or CT) is below 25%, which is ideal.

Computer:
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The Sulky display lacks a colour screen or touchscreen functionality. However, the menu structure is clear and straightforward to use. There is an SD card for data storage and transfer.

Ease of setting:
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Set-up is simple – find the name of the fertiliser in the supplied spreading table or on the internet and put the calibration figure into the computer. The application rate and the flow position is then configured taking into account the working width. Everything is done electrically, and the operator doesn't have to adjust any levers. Calibration can be done on the move by pushing a clearly marked button on the console.

Correcting the spread pattern:
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Sulky is the only manufacturer that routinely supplies four trays and a granulometer (a box that separates granules into different compartments indicating spreading characteristics). When it comes to adjustment, the manual says to put four trays to the right of the spreader.

However, once the spreader has passed over the trays, the Sulky system requires some complicated calculations to determine the spreader settings. This tray test also only takes into account the right-hand side of the spreader, which is also home to the border spreading vane.

After adjusting the settings on the spreader, the CV actually deteriorated from 8.6% to 14.3%. Why was that? Because some of the fertiliser gets diverted to the border vane the spread pattern is not symmetric. And although we repeated the process several times, we couldn't correct the setting, leaving us to reset the original settings.

After the official tray test, the test teams decided to reposition the trays to the left of the spreader. The CV turned out to be slightly better, at 8.4%.

From this, we concluded that the instruction booklet was, in fact, wrong. Sulky has now changed this and recommends that operators use a left-hand side tray test instead. Because of this, Sulky scored 2.5 in this part of the test – if we had used the correct method, the spreader would have scored 3.5.

Construction:
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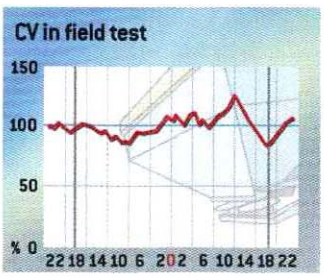
The X12-44 follows standard design practice, with the weigh cell located between the linkage and the spreader itself, not integrated into a separate frame. One further weigh cell is positioned in the middle of the machine. Unfortunately, mud can accumulate in the system.

Electric motors are connected to a spindle, so if they break the operator can adjust the machine manually. The rear bumper doubles as a ladder and lighting is nicely integrated. Paintwork is good and welding is high quality. A nice feature is that the agitator stops when the hopper opening is closed, so fertiliser granules don't get ground unnecessarily.



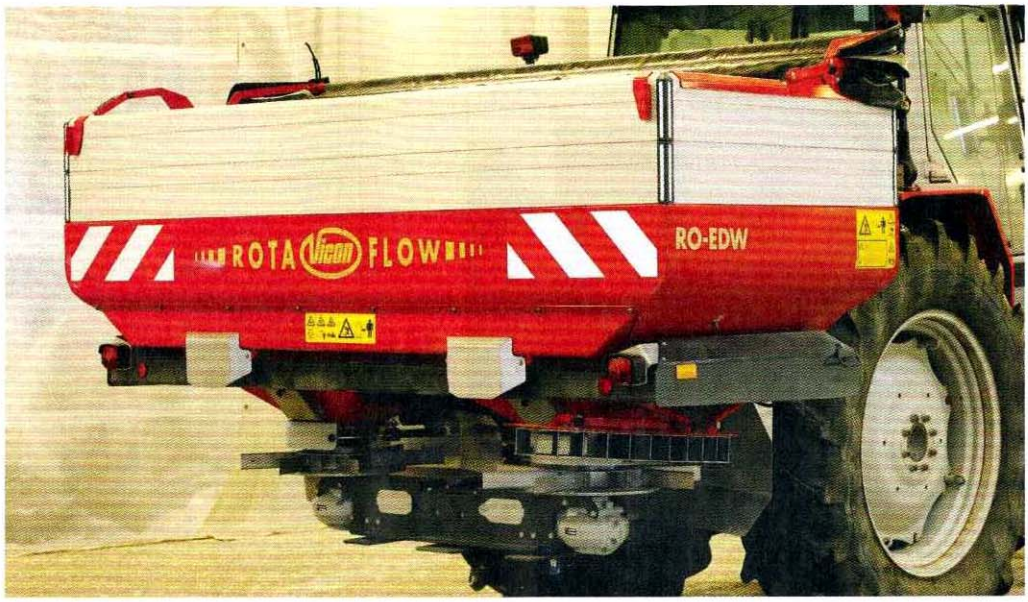
A CV of 8.6% in the field test was good. Spread pattern not symmetrical.

Only 0.9% of the fertiliser spread ended up beyond the boundary.

Vicon RO-EDW/Kverneland Exacta-TL

VICON

- **Model:** RO-EDW
- **Working width:** 12-45m
- **Hopper:** 1,875-litres (with extensions, 4200-litres)
- **Price:** £14,510
- **Contact:** 01744 853 200, www.kvernelandgroup.co.uk



Above: Vicon RO-EDW spreader can come with a very high-tech terminal.

Left: Close coupling to the tractor made up for its weight.

* Vicon spreaders are built in The Netherlands and the RO-EDW is the only spreader that meets ISObus as standard. It's available with either the Tellus terminal or a more simple Focus-2 controller or it can be connected to the tractor terminal if it's ISObus compliant. The Vicon RO-EDW is also sold as the Kverneland Exacta-TL.

Spread pattern:
CV field test: 5.7%
CV correction not necessary
After following the instructions in the manual, the Vicon had a CV of 5.7%, a result that didn't need correcting.

Border spreading:
Y: 0.23%; CT: 19.6%
Vicon uses a deflector positioned on the right-hand side of the machine that, in effect, 'bends' the flow of fertiliser, like Amazone and Rauch. Results are good: only 0.23% of fertiliser crossed the boundary and the distribution between the field and the boundary is 19.6%. The system doesn't lower the application rate when border spreading, so quite a lot of fertiliser ends up on the 18m wide headland.

Computer:
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The new IsoMatch Tellus terminal, compared to other spreader computers, stands out for its level of sophistication. However, it is an expensive option, coming in at over £2,000 more expensive than the standard black-and-white Focus II computer. The Tellus has two screens that are clearly visible and everything is clearly laid out, and can be used for all isobus-equipped machines.

Ease of setting:
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The first step is to determine the fractioning of the fertiliser by using Vicon's sorting box. Then, it's a case of checking the spreading sheets on the internet or in a large tome of tables to see which matches the fractioning of the fertiliser tested.

This method, although fiddly, is extremely accurate as often the name of a fertiliser doesn't always indicate its properties. Then the application rate, spreading width and type of fertiliser needs to be entered into the computer.

The given pto speed changes with the type and spreading width of the fertiliser. The tilt angle of the spreader should be 8° (not always in the case of 36m). Because there are so many things to adjust, there is scope for error. However, the advantage is that this system can establish a good spreading pattern with any fertiliser, which is helpful when working with imported blends.

Correcting the spread pattern:
A tray set is optional when you buy a spreader. For the tray test, a total of 13 trays need to be positioned on the right-hand side of the tractor including one in the middle. The maximum distance between each is 4m, however using 13 trays to measure 36m spreading width, this shrinks to 3m.

After driving over the trays, the tubes should be filled with a similar amount of fertiliser (less than 15%) to indicate a good spread pattern. The manual lists four examples of incorrect spread patterns and what to do to correct them. Simple in theory, but the graphs aren't ideal for fine-tuning. There is a computer program to help growers, however not many farmers have a laptop to hand in the field.

Construction:
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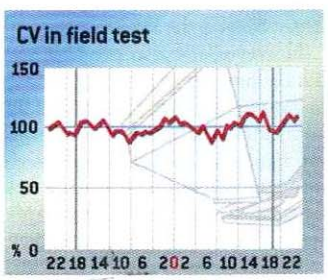
The RO-EDW is built logically and all sections are well-integrated. Overall construction is open, but enclosed at the front to stop mud gaining entry from the back of the tractor. At 820kg, it's a heavy machine but because it's close-coupled and the hopper is close to the tractor the weight on the front axle isn't too bad.

There are two outlets for removing fertiliser and an optional ladder. The lights look cheap, but the hopper cover is robust and painting and welding quality is very good.

Additional extensions are made of aluminium and servicing is pretty straightforward, particularly as there are only a few greasing points. The weighing system is the only one to have four sensors to take into account both slopes and gravity forces. Weighing is probably very accurate because of this, but we couldn't test it.



A CV of 5.7% meant there wasn't any need for correction.

Only 0.23% of fertiliser crossed the boundary.