

Practical test: Amazone, Bogballe, Rauch, Sulky and Vicon spreaders

Dishing the 'fert'

The spreader topic is a big one. Which is why we split this test up into a two-parter: This month we look at how accurate the machines are at spreading various types of fertiliser; whereas next month we assess how convenient the models are to work with in the field.

Now for those introductions. When setting up the test, we asked the manufacturers to supply machines with 1,500-litre hoppers and capable of a 24m working width. And this is what arrived:

- Amazone ZA-M maxiS,
- Bogballe EX trend,
- Rauch Axera M,
- Sulky DPX expert,
- Vicon RS-XL.

Here we should point out that our spreader test was carried out on the Continent, so not all of the names will be familiar to UK farmers. The Bogballe EX trend, for example, is sold in the UK as a KRM, while the Rauch Axera M is badged and sold as a Kuhn. The other three are 'as is', the Amazone and Vicon coming in via their own

Fertiliser spreaders may not be the most expensive machines on the farm, but they handle product of many times their own capital value over a lifetime. That fact alone justifies the decision to turn our fertiliser spreader test into a monster two-parter

UK distribution companies and the Sulky through independent importer Huntingdon-based Reco.

Interestingly, even though all of the machines are capable of spreading to 24m as requested, individual max widths do differ – and substantially. Amazone and Bogballe/KRM claim a max work width of 36m for their machines, while the Rauch/Kuhn and Vicon machines are said to be capable of a 42m throw. The Sulky DPX, in contrast, is a more modest 28m machine. This all needs to be taken into account, because longer

throw designs are likely to be less 'stretched' down at the narrower 24m width; refer to 'Manufacturer comments' box.

Turning to the tests themselves, these were carried out in Horsens, Denmark, in full co-operation with the DLG (see 'How the tests were carried out' box). All machines had to spread the following fertilisers – sulphate of ammonia (26% N, 13% S), muriate of potash (60% K₂O) and urea (46% N) – at these application rates (200, 350 and 150kg/ha) and to identical widths (24m). The test data are shown in the graphs and tables over the following

Our comprehensive fertiliser spreader test assesses the performance of five disc-type machines with a number of fert products.

Photos: ST (1), HW



How the tests were carried out

The spreader tests were carried out by profi staff, with the DLG, at the 'Forskningscenter Bygholm' research centre, Danish Institute of Agricultural Sciences (DIAS). All measurements were taken in the research centre's 80m x 60m test hall, where the temperature is maintained at a constant 12°C and humidity at 50%.

As for the test kit, this comprises 448 floor-mounted funnels, 25cm



The machine passes over two rows of funnelled containers in the test hall. Weighing is carried out automatically.

wide and 50cm long, positioned in two rows. The funnels collect the fertiliser as the spreader passes over, and the gathered product is then weighed automatically. For our test, the results were then processed and set out graphically on a computer screen. The graph reflected the average result from four spreading passes. The travel speed during the test pass was 8.3km/hr, pto speed 540rpm. Referring to the table on the next page, each machine was initially set up according to its spreading chart. After these results had been recorded, testers then attempted to better them by using the various operator's manuals to adjust the machine settings.

Fertilisers used were a sulphate of ammonia (26% N and 13% S) from BASF, muriate of potash from K and S, and urea from Hydro Agri.

pages. As a reader reminder, the CoV (coefficient of variation) is a machine's deviation, expressed in percentage terms, from the perfect but not attainable spread pattern (CoV 0%). In reality, a stat below 10% CoV out in the field is a good return; when at 10-20%, the model

needs set-up attention, while a CoV above 20% results in crop striping. First up on the agenda was sulphate of ammonia at the 200kg/ha rate. After the spreaders had been set to their spread charts, the Amazone, Bogballe/KRM and the Rauch/Kuhn returned CoVs of less than 10%.

Manufacturer comments

Amazone: We have recently launched a new ZA-M range, which takes the maximum work width to 48m.

Bogballe: The main benefit of the spreading vanes on the EX trend is that they don't require time-consuming adjustment.

Rauch: Our top test results show why we conduct 3,000 tests every year to update our spreading charts. These are available on our website.

Sulky: We have just launched a new DPX expert model that spreads up to 36m rather than the tested unit's 28m. Importer comment: Reco has worked independently with Sulky to come up with a UK-specific list of setting charts. These charts were not supplied with the continental-spec test machine.

Vicon: Our machine was tested by DLG back in 1999, when it gave top results (CoVs of 2.8% to 11.2%) and the correct charts were available. A programme of testing is now underway to extend the range of fertiliser products covered in the charts.

Assessments in comparison

How profi rated the spreading accuracy of five broadcasters



| Manufacturer Model | Amazone ZA-M maxiS | Bogballe/KRM EX trend | Rauch/Kuhn Axera M | Sulky DPX expert | Vicon RS-XL |
|---------------------------------------|--------------------|-----------------------|--------------------|------------------|------------------|
| Sulphate of ammonia (200kg/ha) | | | | | |
| ...to chart setting | + | + | + | - ¹⁾ | - ¹⁾ |
| ...after adjustment ²⁾ | + | + | + | + | 0 |
| Late-crop spreading (200kg/ha) | | | | | |
| ...to chart setting | 0 | + | + | - ¹⁾ | -- ¹⁾ |
| ...after adjustment ²⁾ | 0 | ++ | + | + | - |
| Muriate of potash (350kg/ha) | | | | | |
| ...to chart setting | 0 | + | + | 0 | - |
| ...after adjustment ²⁾ | + | + | + | + | + |
| Urea (150kg/ha) | | | | | |
| ...to chart setting | 0 | + | + | -- ¹⁾ | 0 |
| ...after adjustment ²⁾ | + | ++ | + | + | + |

Grading system: ++ = very good; + = good; 0 = satisfactory; - = needs improvement; -- = needs significant improvement

¹⁾ Because the test fertiliser was not listed in the spreading chart, the testers took the nearest equivalent setting; Vicon's fertiliser grading box was used to set the RS-XL. ²⁾ After spreading one pass according to chart settings, each machine was then adjusted a maximum of two times.

The remaining two units, Sulky and Vicon, returned CoV figures of 17% and 20%, which clearly do not hit the 15% European standard (EN 13739). This can probably be put down to the fact that our particular fertiliser did not match anything on the Sulky or Vicon spreading chart, so we had to rely on a comparable product setting. Vicon, to its credit, does provide a grading box to match fertiliser products, but clearly the result achieved from this box failed to give the correct setting. After this first pass, we adjusted the spreaders' settings using collector trays – supplied as standard spec



Amazone ZA-M maxiS: When using its chart settings, the ZA-M put in average to good performances on our profi test.

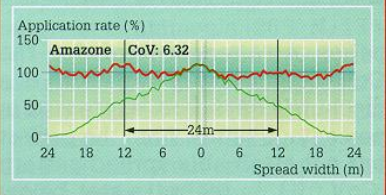
by Sulky. This resulted in dramatic improvements, especially from the Vicon and Sulky models, on which we changed the point where the fertiliser dropped on to the pair of discs. We also upped the Amazone and Bogballe/KRM results, on the green machine by altering the vane position (CoV from 9% to 6%) and on the blue Bogballe by tilting the machine forward by 2° (CoV from 8% to 5%). The Rauch/Kuhn Axera M was the only machine to notch its best CoV by just following its chart settings.

Next up, we looked at the late-crop application job. With the spreading discs set to work down at 20-40cm above the floor – this simulates a smaller distance between the disc and the crop top – we asked all of the machines to put on the same fertiliser product as before. Or in other words, the BASF sulphate of ammonia at a rate of 200kg/ha.

Perhaps not surprisingly, when set according to the spreading charts,

Graphs explained

The green curve reflects the application rate expressed as a percentage of the target rate (100%) in one spreader pass. More importantly, the red curve represents total fertiliser that would be applied when the next passes have been made. Quoted throughout this article as CoV, coefficient of variation measures average deviation from the target rate: Smaller the CoV, better the accuracy. In relation to the graphs opposite, we took a machine's best-pass result to produce the curve/line. We rate a CoV of less than 5% as 'very good', less than 10% as 'good', and one that is less than 15% as 'satisfactory'. A CoV of more than 15% means that the machine has not met the full standard of accuracy required.



Spread pattern results of five twin-disc machines

Coefficient of variation as tested by DLG and DIAS

| | Fertiliser type and application rate | | | |
|----------------------------------|--|----------------------|-------------------------------|----------------------|
| | Sulphate of ammonia (200kg/ha) Normal | Late-crop | Muriate of potash 350kg/ha | Urea 150kg/ha |
| Amazone ZA-M maxiS | | | | |
| ... to chart setting | 9.23% | 12.93% | 10.77% | 12.40% |
| ... 1st adjustment ¹⁾ | 6.32% | 16.39% | 9.89% | 11.39% |
| ... 2nd adjustment ¹⁾ | 6.79% | 13.62% | 8.53% | 9.12% |
| Bogballe/KRM EX trend | | | | |
| ... to chart setting | 8.05% | 6.20% | 8.64% | 9.26% |
| ... 1st adjustment ¹⁾ | 5.57% | 4.47% | 5.83% | 6.39% |
| ... 2nd adjustment ¹⁾ | – | – | – | 4.59% |
| Rauch/Kuhn Axera M | | | | |
| ... to chart setting | 6.89% | 7.74% | 8.66% | 8.15% |
| ... 1st adjustment ¹⁾ | 8.87% | 5.71% | – | 5.86% |
| ... 2nd adjustment ¹⁾ | – | – | – | – |
| Sulky DPX expert | | | | |
| ... to chart setting | 17.12% ²⁾ | 16.33% ²⁾ | 11.63% | 26.54% ²⁾ |
| ... 1st adjustment ¹⁾ | 9.05% | 9.49% | – | 20.00% |
| ... 2nd adjustment ¹⁾ | – | 8.83% | – | 9.71% |
| Vicon RS-XL | | | | |
| ... to chart setting | 20.61% ²⁾ | 30.36% ²⁾ | 22.83% | 14.13% |
| ... 1st adjustment ¹⁾ | 15.58% | 23.13% | 13.64% | 8.45% |
| ... 2nd adjustment ¹⁾ | 11.60% | 16.91% | 6.32% | – |

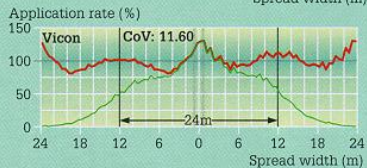
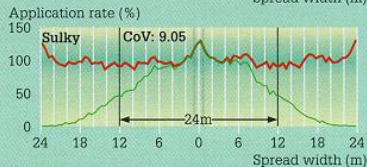
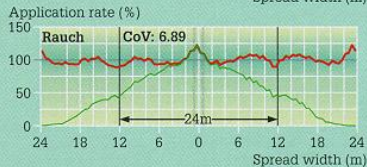
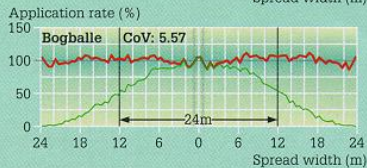
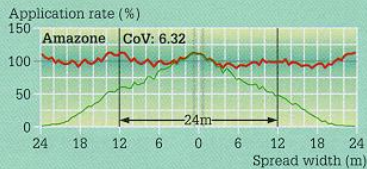
¹⁾ After spreading one pass according to the manufacturer's chart settings, each machine was then adjusted a maximum of two times (operator's manual suggestions). ²⁾ Because the test fertiliser was not listed in the manufacturer's spreading chart, the machine testers took the nearest equivalent setting; Vicon's fertiliser grading box was used to set the RS-XL model.

results were similar to those of the first test. Topping the heap were Bogballe and Kuhn models, which returned CoVs of 6% and just under 8%. After a further adjustment we were then able to bring these test figures down even more, to CoVs of 4.5% and slightly under 6%. The Amazone ZA-M model's 13% stat was fine, but we were not able to drop it down any further.

Again, it was the Sulky and Vicon that struggled with our fertiliser, recording CoVs of 16% and more than 30% respectively when set to their charts. Clearly, with a return of 30%, the charts' settings must have been wrong for the fertiliser, and this highlights the big problem when a particular fertiliser doesn't match what's shown in 'the book'. After adjusting both the machines a couple of times, we got the Sulky down to a good sub-9%, but didn't manage the same reduction on the Vicon (16.9%).

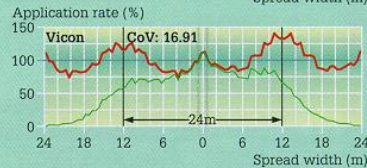
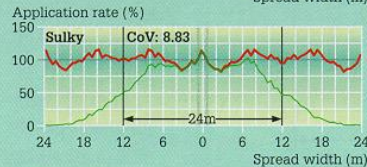
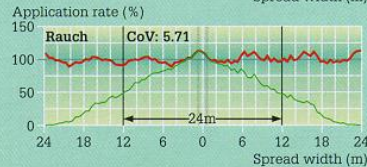
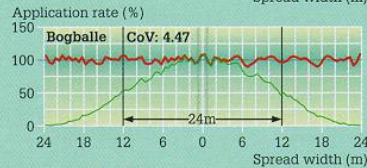
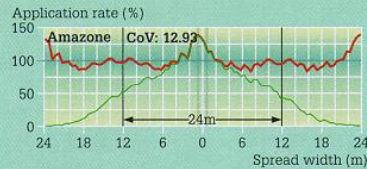
Next task on the profi test list was to apply the muriate of potash at 350kg/ha. Best results here came

Spread pattern – 200kg/ha of sulphate of ammonia



Using the machine chart settings, the Amazone, Bogballe and Rauch/Kuhn machines achieved CoVs of less than 10% straightaway, the Rauch getting as low as 7%. Altering the main settings of the Amazone and Bogballe brought them down from 9% to 7% and down from 8% to 5%, respectively. In contrast, the Sulky and Vicon machines produced 17% and 20% CoVs when operated according to chart settings. After adjustments were made, these figures dropped dramatically – to 9% and 11%, respectively.

Spread pattern – 200kg/ha, late-crop, sulph. of ammonia



On 'late' work, only the Bogballe and the Rauch spreaders came in under the 10% CoV benchmark. Tweaking their settings took them to an excellent 5% and 6% level. The Amazone produced an acceptable 13% from its chart. Sulky, again, managed a big improvement in CoV – from 15% to 9% – after the fertiliser/disc drop-point had been altered. Vicon was the only machine not to sneak in beneath the 15% threshold, although the RS-XL unit did succeed in bringing its initial high 30% test figure down to about 17%.



Bogballe/KRM EX trend: The test results speak for themselves. The EX trend's CoV figure never topped the 10% benchmark.

from Bogballe/KRM and the Rauch/Kuhn, both managing CoVs of 8.6%. Adjusting the Bogballe dropped its result to an impressive 6%. Chart settings brought acceptable stats (10% and 11%) from Amazone and Sulky, whereas the Vicon only notched 22% when set according to its potash 60 chart. But then here's the rub. After altering the fertiliser-on-disc drop point, the Vicon took its result from a disappointing 22% to an excellent 6.3%, which worked out as the second best muriate test.

Rauch/Kuhn Axera: Along with the EX trend, the Axera M model was the most consistent performer of the five machines on trial in this test.



Final product to be put through our five machines was urea, a tough challenge for any wide-spreading broadcaster. With a target rate of 150kg/ha, again it was Bogballe/KRM and Rauch/Kuhn that gave the lowest CoVs (9% and 8%). Further tweaks – tilting the EX trend and

altering the drop-on point on the Axera – brought reductions, down to a very good 4.6% and less than 6% respectively.

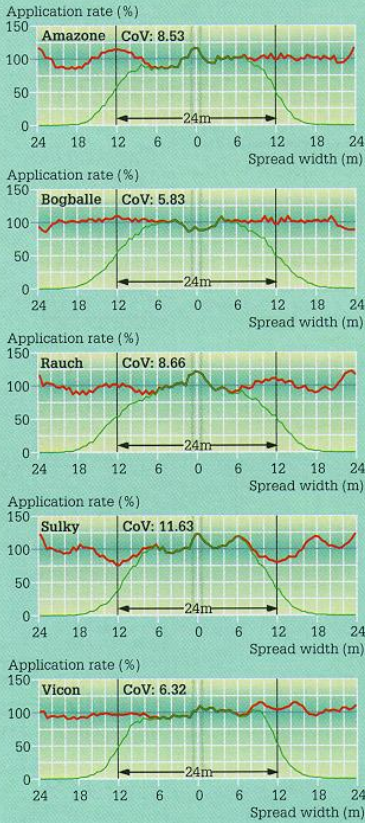
Adjusting the vane position also hiked the performance of Amazone's ZA-M, taking its urea CoV from 12% to a good 9% level.

With a max spread width of 28m it was always a possibility that the Sulky DPX would have issues distributing the urea to 24m – hence the 26% first-off result.

However, to be fair to the French spreader, our second adjustment of the fertiliser 'drop' point saw its CoV plummet down to an excellent 9% recording.

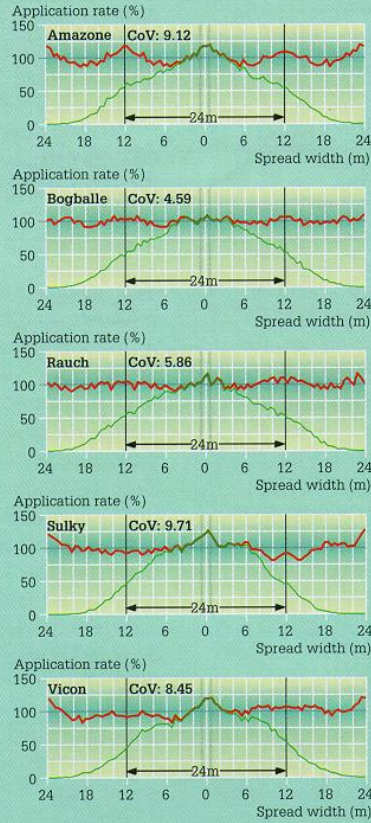
A similar adjustment on the Vicon RS-XL spreader brought down its test figure from 14% to an equally creditable 8%.

Spread pattern – 350kg/ha of muriate of potash



Bogballe/KRM and Rauch/Kuhn again topped out in this part of the profi spreader test, delivering CoVs of less than 9% on their makers' chart settings. Almost as good, Amazone and Sulky notched up 10% and 11%. After adjustment, the Bogballe figure dropped down to less than 6%, the Amazone ZA-M to a CoV of less than 9%. While the Vicon RS-XL spreader model started off with an unacceptable 23% chart setting return, adjustment of the on-disc impact point dragged this test figure down to an excellent 6%. A vast improvement.

Spread pattern – when applying 150kg/ha of urea



Urea is arguably the most difficult fertiliser to spread out to 24m widths. Undeterred, the Bogballe/KRM and Rauch maintained their performance with this product, never exceeding a 10% CoV and then getting down to less than 5% and 6% after operator adjustment from the chart setting. Similarly, the Amazone and Vicon machines got their results down to 9% and 8% respectively after starting out at 12% and 14%. The Sulky, despite having a smaller max spread width, still managed a sub-10% CoV after its fertiliser drop point was altered.

Summary: Spreading all the tested fertilisers to 24m, Bogballe/KRM and Rauch/Kuhn Axera M models gave the best results, with CoVs of 6% to 9% at the first attempt – in other words, off the spreader chart setting. The Amazone ZA-M maxiS came in marginally behind the top pair, with CoVs of 9-12%. When set to their spreading charts the Sulky DPX expert and Vicon RS-XL came off less well with our test fertilisers, though the Sulky did put in a strong 11% performance with the muriate. The Vicon again proved capable of sub-11% readings when adjustments were made. Perhaps one of the more important messages to come out of this test is the need to have comprehensive spreading charts that cover a wide range of fertilisers. It is the charts, after all, that most farm operators rely on. Where feasible, however, it's still best to test and adjust the machine for each fertiliser sample, as this is the practice that invariably achieves the optimum result.

HW



Sulky DPX expert: After adjusting the fertiliser/disc drop point, the DPX came in at under 10% CoV.



Vicon RS-XL: Like the Sulky, the Vicon spreader needed adjusting to achieve its sub-15% CoVs.