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TOP AGRAR TEST

How accurate are the classic maize drills?

VIDEO

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Amazone

Kongskilde

Kuhn

Kverneland

Monosem

Photos: Heil, Höner, Küper

Last season, the maize drills came under scrutiny in a field trial, drilling at 8km/h and 10km/h.

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How accurate are the classic maize drills?

Higher travel speeds, greater accuracies and more electronics – conventional drills have lately seen massive upgrades by their manufacturers. We put five state-of-the-art precision seed drills through their paces in a field comparison

Classic precision drills continue to rate as the most popular machines to bring maize seeds into the soil. They usually have 8 sowing units, mount in the tractor linkage and have a fertiliser tank at the rear. More recently, they also come with truly high-level options. For example, their seed singling and seeder-shut off systems have electric or hydraulic drives for greater operator comfort and they also boast intermediate press wheels that tuck the seeds firmly into the furrow. Yet with respect to ground speed, they still fall behind the speedy models, but they are catching up. This spring we had the opportunity to test the latest models from Amazone, Kongskilde, Kuhn, Kverneland and Monosem in a direct comparison. The coulters on all machines could handle min-tilled land and placed the seed rows at the classic 75cm spacing. The only manufacturer who did not accept our invitation to join the group was Maschio Gaspardo.

Drilling at up to 10km/h: The ploughed and well consolidated sandy field provided consistent conditions for our specific test scheme, which required each machine to drill several plots while travelling at 8km/h and 10km/h. The date was the 20 April 2016. To ensure our 6m drills matched up accurately with the previous work, our Claas Axion 650 was equipped with GPS based autoguidance and RTK correction signal. The GPS equipment also gave us the opportunity of measuring the ground speed without wheel slip.

All combinations were driven by the same operator. Before the flag was raised, all three manufacturers had the opportunity of setting up their drills to handle LG 3216 seeds. The set-up was conducted on another site and then the machines were adjusted for the soil conditions on the test site. The scheme was to plant the seeds exactly 5cm deep and place the granules (150kg of DAP 20/20) in a band 5cm under and 5cm to the side of the seeds.

The germinating conditions were satisfactory although there were a few seedlings that had presumably been damaged by the cold and accounted for what appeared to be gaps later on. Nevertheless, emergence was uniform. When the plants had reached the 3/4-leaf stage, the engineers of the DLG Test Center were called in to measure the accuracy of the actual crop spacing.

How the measurements were taken- Following an approved scheme, one DLG tester pushed a recorder down a row of plants. The equipment records the distance covered down to the millimetre. The recorder runs on two rigidly linked wheels to eliminate any wheel slip. The recorded spacings are used as parameters to determine the accuracy of crop spacing in the field (Table 1).

The so-called 'actual spacing' achieved is expressed in cm and is derived at by averaging all spacings recorded in any one test plot. So-called 'doubles' are spacings that are smaller than 0.5 times the actual spacing result, whereas so-

Table 1: Crop spacing in field

	Ground speed (km/h)	Actual spacing (cm)	Doubles (%)	Nominal spacing (%)	Gaps (%)	Actual spacing (mm)
Amazone ED 6000-2C Super	8	15.1	0.4	90.2	9.4	29.3
	10	14.9	1.3	88.2	10.5	28.2
Kongskilde Aeromat Advance 8	8	15.2	2.4	87.3	10.3	28.4
	10	15.3	2.7	77.5	19.8	33.3
Kuhn Maxima 2 RT	8	15.6	0.5	91.9	7.6	22.9
	10	15.1	0.2	89.4	10.4	24.0
Kverneland Optima HD e-drive II	8	14.7	0.8	88.0	11.2	25.2
	10	14.5	1.1	88.6	10.3	26.9
Monosem Monoshox NG Plus M TFC	8	15.3	0.2	89.0	10.8	25.9
	10	15.3	0.9	85.3	13.8	27.0

Targeted crop spacing: 15.7cm (85,000 K/ha); Actual spacing = average value achieved. Gaps = Percentage spacings 1.5 times larger than actual. The generally high percentage of gaps in our comparison was partly attributed to damaged seedlings.

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Accuracy achieved by the precision drills The lower the crop spacing figure the higher the spacing accuracy.

called 'gaps' are spacings that are larger than 1.5 times the actual spacing value. So gaps could mean that although the grains were put in place, they were just placed too far apart. The tables show the occurrence of doubles and gaps within one plot which are expressed in percent. The remaining percentages reflect those plants that are spaced at the so-called 'nominal spacing'. The higher this value, the greater is the accuracy provided by the drilling technology.

The 'standard deviation' figure defines how many millimetres the average number of plants within a plot are spaced closer or wider apart, hence reflecting the consistency of spacing. A small standard deviation figure means the crop spacing is very consistent. Gaps and doubles are not included in the crop spacing.

Photo: Küper

The DLG Test Center measured for us the crop spacings in the field.

Closely spaced: The differences between the individual machines were just a few millimetres. For example, the difference between the best actual spacing result achieved by the Kuhn Maxima and the poorest result by Kongskilde Aeromat is just about ±10.4mm. This translates into just a tad more than 2cm.

We attributed the relatively large percentage of gaps mainly to the cold weather and so we couldn't really compare the various percentages directly. However, as all machines were operated in identical conditions it is legitimate to use the database to deduce at least a trend. Doing so, we found that drilling at 10km/h, Aeromat produced a notably high number of gaps.

Better than the high-speed machines: A comparison of these results with those achieved by the high-speed maize drills tested four years before this test on the same plot using the same seeds (top agrar 2/2013) reveals the following: travelling at 8km/h, all five classic drills placed the seeds always slightly more accurately than the high-speed models when they were travelling in their fast 12-15km/h range. However, back in 2013 we also found that a greater or smaller accuracy in crop spacing had no significant effect on yield levels.

The traditional drills benefitted from features that were sourced from the fast drills. All test machines have the intermediate press wheel, which is a popular option that presses the seeds firmly into the furrow.

The new seeder drives bring operator comfort – Kongskilde and Kverneland use electric and Amazone hydraulic systems, which allow operators to change the seed rate on the move. But individual rows can also be switched on/off mechanically via spring couplings if the seeders have no electric drives.

Gross weight can be an issue on mounted machines, because it can reach 5t when the fertiliser tank and the seeders are filled to capacity, placing more than 12t on the tractor's rear axle.

Jan-Martin Küper

Table 2: All measurements and prices for the five precision drills[1)]

	Amazone ED 6000-2C Super	Kongskilde Aeromat Advance 8	Kuhn Maxima 2 RT	Kverneland Optima HD e-drive II	Monosem Monoshox NG Plus M TFC
No. of rows	8	8	8	8	8
Row spacing	75cm	75cm	75cm	75cm	75cm
Seed hopper capacity[2)] ...filling height	60 t 106 cm	55 l 132 cm	52 l 114 cm	55 l 133 cm	52 l 116 cm
Cell wheel diameter	256 mm	250 mm	262 mm	245 mm	248 mm
Number of cells	30	24	33	40	30
Cell diameter	4.5/5.0/5.4/5.8 mm	20 mm	5 mm	5 mm	5 mm
Seed drop height	15 cm	47cm	50 cm	58 cm	47cm
Depth control wheels ... Width / diameter	1 next to each coulter 10/36.5 cm	2 next to each coulter 11/ 40 cm	2 next to each coulter 11.5/40 cm	2 next to each coulter 11.5/40 cm	2 next to each coulter 11/ 40 cm
Seed coulter ... Disc diameter	2 V-type discs 35 cm	2 V-type discs 38 cm	2 V-type discs 37 cm	2 V-type discs 38 cm	2 V-type discs 38 cm
Intermediate press wheel ... Width / diameter	Rubber 1.5/30 cm	Stainless steel 2/23 cm	Stainless steel 1.8/22 cm	Stainless steel 2/21 cm	Aluminium/stainless steel 2/29.5 cm
No. of press wheels ... Width / diameter	2, V-type 5.5/38 cm	2, V-type 3/35 cm	2, V-type 5/33 cm	2, V-type 2.5/29.5 cm	2, V-type 5/31 cm
Seeder pressure[3)]	83 – 148 kg	100 – 124 kg[6)]	122 – 162 kg	100 – 210 kg	148 – 240 kg
Fertiliser hopper [2)]	1,100 l	1,200 l	1,350 l	900 l	1,500 l
Height of auger funnel	72 cm	53 cm	55 cm	58 cm	78 cm
Fertiliser coulter ...Diameter	1 disc 40 cm	2 V-type discs 32.5 cm	2 V-type discs 35 cm	2 V-type discs, serrated 35 cm	2 V-type discs 35 cm
No. of spool valves	1 sa + 1 LS	2 da, 2 sa + return	4 da	3 da, 1 sa + return	2 da, 1 sa + return
Kerb weight	3,140 kg	2,740 kg	3,350 kg	2,680 kg	2,990 kg
Implement width in work	6.18 m	5.78 m	5.84 m	5.79 m	5.93 m
Transport width	3.00 m	2.88 m	3.02 m	3.02 m	2.97 m
Storage height	2.97 m	3.18 m	3.22 m	3.13 m	3.50 m
Fan rotation noise [4)]	82 dB(A)	85 dB(A)	79 dB(A)	81 dB(A)	83 dB(A)
Tyres	Two 31 x 15.50-15	Four 7.5 x 15.00 – 15	Two 26 x 12.00-12	Two 26 x 12.00-12	Four 26 x 12.00-12
Price for base specification model[2), 5)] Price for test specification model [2), 5)]	€60,935 €79,600	€52,625 €63,084	€43,877 €61,672	€53,324 €65,048	€44,875 €70,600

1) Measured on the test specification model; results may vary depending on specification; 2) Manufacturer information; 3) Empty seed hopper; 4) Passing by at a 6m distance; 5) List price excl. VAT; 6) Measured with one tensile spring; up to 160kg seeder loading with two springs.

The machines are fully operational in base specification and their test specification was comparable.

OPINION

Obstacles on the road to progress

Jan-Martin Küper, top agrar editor

The biggest challenge awaited us on the very first day of our test when five machines had to be adjusted to one tractor. Not a bit of standardisation! Sometimes a new feature is no improvement to what was good in the first place.

Problem no. 1: Hydraulics:Here we would have expected the least problems and yet a trunk full of couplers would not spare us a call on the nearest dealer. With respect to the Power Beyond couplers, not one drill would match the tractor and vice versa. When will we develop a universal multi-coupler that couples all three couplers and that fits every drill and tractor brand?

Problem no. 2: Isobus.The databus worked a peach in our test. Yet, power was in short supply on one machine with electric seeders powered via the Isobus. So we had to route a direct line from the battery. We just hope that the so essential standardisation efforts will keep up with technical progress!

Problem no. 3: Section Control.Setting up the terminals for automatic section control pushed even some product specialists to their limits. There is still a lot of work to do before things get simpler. Quite a few operators will be doomed to fail as they try to program the baud rates and variable sequences.

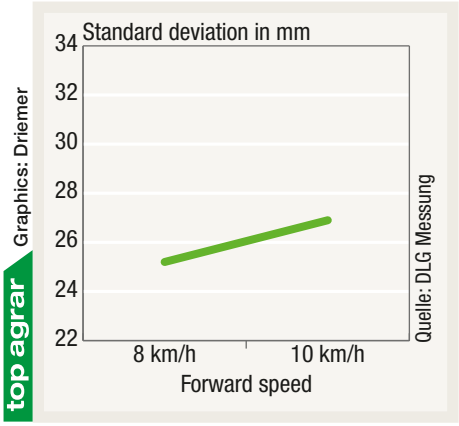
Problem no. 4: Styling.What good is a stylish plastic hopper if its cover does not seal from rain or if the operator has to roll it up manually before each filling? The Kverneland hopper shows the way ahead: Boxy and not very elegant, but ingeniously practical. After all, form still follows function!

We give a detailed description of the three planters and the complete section control test on pages 86-93.

Summary

- The classic maize drills achieved good crop spacing in fine tilth even when travelling at 10km/h.
- Seed placement has become even better. Intermediate press wheels lead to a more rapid emergence.
- New drives are convenient. They adjust the seed rate on the move.
- Individual seeders can be switched on or off no matter what the drive system.

Consistency of spacing



At both speeds Optima, too, placed the seeds within a reasonably accurate range.

Kverneland Optima HD e-drive II

1

Optima had the longest model history among the test machines. Kverneland continued developing the rather inconspicuous precision seed drill to bring it in shape for the requirements of future. And this includes Isobus and electric seeders. Only the fertiliser tank has retained its traditional design, which however needn't be a drawback.

Seed singling & seed hoppers

The seed hoppers offer the highest filling height in the group - and the seed singling system follows suit: to manage the great drop height the seeds fall through a tube that was specifically developed for higher ground speeds and which directs the grain into the furrow in a slight curve to prevent it from rolling. The same tube is used to empty the seeders into a tray. Excellent. Optima was the only machine that had two strippers, of which however only the top one usually needs adjusting. A Plexiglas inspection window allows the operator to check easily whether all cells are filled properly.

Coulters & seed placement

The seed is bedded by a double-disc coulter which has two depth wheels running alongside. The depth is changed by turning a crank that comes with a useful scale. The intermediate press wheel can be set to three different pressures and to one park position. We appreciated the coulter pressure control system which consists of a large notched plate that tensions the springs on the parallel linkage. The firming rollers also offer three pressure steps. Yet changing the angle and the spacing of the rollers takes a tool.

Granule metering & granule coulters

Fertiliser is metered by four mechanical double units. A neat detail here is that each of the eight outlets can be closed individually with a slider. Calibration testing is carried out on one coulter. The tank is split in two compartments with as many as 12 inspection windows. Very useful. Unfortunately though it is a bit short in volume and has no content alarm.

2

3

4

5

1. Although it may look a bit outdated, Optima offers everything a modern maize drill can possibly feature.

2. The placement tools follow close behind each other, which was not an issue in minimal tillage systems.

3. A top and a bottom stripper allow to finetune the singling system. The unit comes with good scales and offers a clear view of the singling discs.

4. 5cm wide closing wheels are an option. The pressure of the intermediate press wheel is adjusted in three steps on a spring.

5. The fertiliser tank was taken over from the Kverneland models. The operator can see the filling hopper through the cut in the middle.

Plus & minus

+ Practical fertiliser tank
+ Low unloaded weight
- Lowest fertiliser storage capacity
- Cell wheel is difficult to remove

Photos: Heil, Küper