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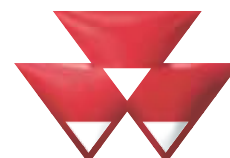
Tractor test: Massey Ferguson 8690 SCR

Big red goes blue



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Tractor test: Massey Ferguson 8690 SCR

Big red goes blue

Massey Ferguson is the first to be racing out of the blocks with the new breed of Stage 3b compliant tractors, so all eyes are eagerly waiting to see how it performs. We got our test hands on the flagship 8690, which uses an SCR system to keep its engine exhaust emissions in check

Massey's 8690 strides into the 300hp plus arena, bristling with technology that allows it to sip its way through the red stuff like nothing we have seen before. In fact, compared with other tractor models in our Powermix test league, it swallowed an impressive 16.6% less fuel per hour, so that over 1,000 hours the 8690 should consume 2,000 litres less fuel than the thirstiest tractor we have tested.

For instance on cultivations it saved 3.3 litres per hectare and 2.8 litres when out baling: even compared to the average fuel used in our Powermix test, the 8690 used 1 litre less per hour. Granted, it's not all money in the bank, as you need to add the cost of the AdBlue, which allows the 8690 to burn fuel more efficiently, mainly courtesy of Selective Catalytic Reduction (SCR).

For further details on SCR, refer back to previous articles in the profi December 2008 and March 2009 issues.

By introducing this Stage 3b technology now, Massey is able to steal a march on the main competition. With SCR fitted, the engine's injection sequence has more in common with motors from the days before emissions legislation. This is thanks to an exhaust treatment that dispatches the nasties and allows fuel injection to start before the piston reaches top dead centre, all of which has a positive effect on fuel consumption.

Purring away under the 8690's bonnet is a six-cylinder, 8.4-litre 84CTA lump from AGCO Sisu Power with common-rail fuel injection and four valves per pot. Massey Ferguson claims a rated output of 250kW/340hp (ISO 14396) and maximum muscle of 272kW. The MF brochure statistics also usefully provide a maximum pto output of 236kW +/-5%.

In the hands of the DLG test centre our steed pumped out 220.1kW at the pto with the motor running at its rated speed of 2,200rpm. And, as it pulled back to its maximum output of 1,850rpm, this figure rose still further – to 244.4kW. Both are respectable results, although the recorded drawbar power was 186.3kW at rated and 207.1kW at maximum speed.

But it is the tractor's fuel consumption that attracts particular praise. On the test bench at rated speed the 8690 managed to sip 227g/kWh, while at maximum pto output this dropped down to the best result we have recorded so far at just 209g/kWh. Moreover, fuel consumption was so good throughout typical performance rates, as well as the Powermix rates, that the big red was the first tractor to receive a 'very good' in the fuel economy department. Even if you compare the 8690's stats to the most efficient Stage 3a tractor we have measured, the Massey is still more efficient – and this statement continues to hold true after the additional cost of the liquid urea has been included.

The AdBlue does require its own 30-litre tank alongside the pair of fuel tanks that hold a total of 590 litres. Depending on how hard the tractor is being worked, AdBlue is consumed at a rate of 0.1 to 4.0% so it usually lasts for about two fills of the diesel tank.

As a general and reasonably accurate rule of thumb, the cost of AdBlue is roughly the same as that of red diesel, but it really depends on the quantity being bought and how it is delivered – for example, in 25-litre cans or 1,000-litre IBC tanks. MF says that because the product is widely used in modern trucks, it is readily available throughout most of Europe.





		-20 %	-10 %	0	+10 %	+20 %
Powermix Massey Ferguson 8690 SCR						
Draft work: Average consumption 255g/kWh and 9.59l/ha						
1 Heavy work (100% Load)	Plough	[Bar chart showing performance relative to average]				
	Cultivator	[Bar chart showing performance relative to average]				
2 Medium (60% Load)	Plough	[Bar chart showing performance relative to average]				
	Cultivator	[Bar chart showing performance relative to average]				
Pto work: Average consumption 249g/kWh and 3.62l/ha						
3 Heavy (100% Load)	Power harrow	[Bar chart showing performance relative to average]				
	Mower	[Bar chart showing performance relative to average]				
4 Medium (70% Load)	Power harrow	[Bar chart showing performance relative to average]				
	Mower	[Bar chart showing performance relative to average]				
5 Light (40% Load)	Power harrow	[Bar chart showing performance relative to average]				
	Mower	[Bar chart showing performance relative to average]				
Mixed work: Average consumption 260g/kWh and 3.72l/ha						
6 Manure spreader		[Bar chart showing performance relative to average]				
7 Baler		[Bar chart showing performance relative to average]				
8 Transport ¹⁾		[Bar chart showing performance relative to average]				
Powermix 253g/kWh						



MF's engine sets new Powermix standards.

The Powermix figure is shown at the bottom to the left and is arrived at by averaging the seven individual tests, recorded over 36 different test runs. The table shows average results for the categories draft work, pto work and mixed work, measuring fuel consumption in grams per kilowatt hour and in litres per hectare. The yellow line marks the average of all results obtained from previous Powermix tests. The length of the bars indicates the degree to which tractor performance in this specific type of work was better (green) or fell short of (red) the average result of all Powermix candidates to date. The average Powermix result, obtained from the 45 tractors tested to date, currently stands at 303g/kWh.

¹⁾ The transport cycle is not available yet.

All Powermix results for the Massey Ferguson 8690 are better than the average results. In fact the overall consumption result is 16.6% lower than the average obtained from all previous Powermix tests.

the tractor's power is restricted to 70% until it gets up to temperature, and the same happens if the operator allows his AdBlue tank to run low. A small amount is automatically retained to circulate in the system and keep the injection nozzle cooled. On the tractor there is also an Ad-Blue filter, which needs to be changed either annually or every 3,600 hours.

Like its predecessor, the 8400 range, the new Massey flagship family is equipped with a continuously variable speed transmission and back axle – the same basic hardware as installed within the Fendt 900 Vario models.

To make the most of this transmission, Massey now uses its full Dynamic Tractor Management (DTM), allowing for greater communication between the engine and gearbox so that the engine speed can automatically adjust to the load. As well as being able to choose between its joystick and pedal driving modes, DTM allows the operator to set up a trigger. This enables them to activate DTM automatically when the pto or a spool valve is engaged or disengaged, or the linkage is lowered.

Just like its Fendt cousin the speed range on the MF is manually selected. On the 8690 this is done via a prominent button on the T-shape transmission joystick, although we feel it would be much better if this button was used for the 'cruise' and speed memory.

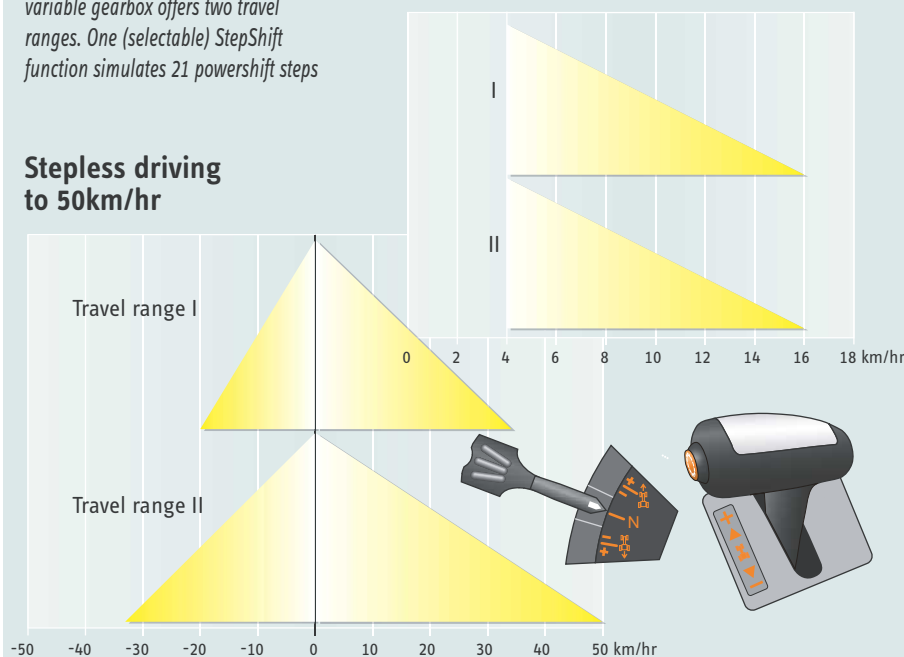
What is different from the Fendt approach, and is something that we really like, is the MF operator can individually set the aggressiveness of direction changes, how quickly the tractor changes between the two cruise speeds and the rate of tractor

For those thinking that buying in bulk is the way to go, here's a couple of words of warning: AdBlue does have a shelf life, which is linked to how well it is stored, and the product freezes at -11°C. When using a tractor in such chilly conditions,

MF 8690 SCR: The Dyna-VT infinitely variable gearbox offers two travel ranges. One (selectable) StepShift function simulates 21 powershift steps

Stepless in the 4-12km/hr range

Stepless driving to 50km/hr





The MF 8690 linkage offers reasonable performance. Links on our test machine were category III. Photos: ST.

deceleration when using the pedal mode. It is possible to set the engine load limit for pto and other operations.

In drive pedal mode the operator can also input the top speed setting for both the low (0-30km/hr) and high (0-50km/hr)

ranges. This setting is done via a dial, but it is difficult to select a lower rate when moving without looking at the controller. To make up for this minor negative, MF duplicates the drive pedal functions on the hand throttle, which is something we found very useful when baling straw and carting maize.

Our prototype model only came with two pto speeds – 540E and 1,000rpm – but we are told there will be an additional 1,000E speed available soon. A handy feature is that the operator can program the external pto control so that a speed memory is activated.

Software on our test 8690 was regularly upgraded during its time with profi, with continual development to the linkage and hydraulic system. Linkage operation is the same as on other MF models, and this 8690 was equipped with a Cat III linkage as no Cat IV implements were available.

FURTHER DETAILS from our field test

This is not a summary of overall assessments but a list of positive and less positive details.

Plus

- + Steering wheel offers good adjustment for all user sizes
- + Effective protection of steps from dirt contamination



+ A photo-voltage element is mounted on the MF cab roof. The system maintains the battery voltage.



+ The column-mounted shuttle control can also adjust the travel speed and operates the accumulated handbrake (which also controls the trailer).



+ Passenger seat is convenient and the ashtray is magnet-mounted to the control panel.

- + Excellent onboard computer
- + Selectable electric socket
- + Ignition key locks bonnet, fuel tank cap and doors

Minus

- CBM quick couplers at the back-end close with difficulty
- Spools are poorly marked



- External control is only for the first spool. The linkage control response was too slow initially, and pto control is on the left mudguard only.

- Brake couplers are in an awkward position for connecting up
- Linkage emergency stop requires some improvement
- Front linkage top link isn't practical



- The cooling box stores only one bottle. It is warmed with the tractor's heating system.



- The 30-litre AdBlue tank mounts on the left of the fuel tank, where it is easy to access. Yet, the toolbox is too small, mounts too low and the lock did not work.



The cab is well laid out and clutter-free. Though different to the 8400 interior, it still has an MF feel.

The DLG test station measured a continuous lift force from the tractor of 8,630daN, which is a sound result. Not quite so impressive, however, are the maximum oil flow at 193.2 litres per minute via three spools and hydraulic output at 56.3kW; both figures are average for a tractor in this power category.

As on other Massey Ferguson Dyna-VT models, the hydraulic and transmission oil is kept separate. Our tractor had a total of nine spool valves – six on the rear and three up front – but in standard guise the 8690 would come with four rear and



The armrest with Datatronic CCD looks after a large number of functions. Certain elements of the ergonomics within the cabin could do with improving, but overall the accommodation still notches a '++' in our test sheet (p18).

two front spools when a front linkage is specified. As you might imagine there are various control systems for operating all of the spool valves, but some of the operations are not consistent. For example, for those activated by the cross controller it is necessary to pull the lever past a notch to



The tractor's dashboard is packed with useful information, even though some of it is duplicated.

engage the timer function but not when you press it forward.

The test tractor also came equipped with a hydraulic top link, which is becoming more popular in this power segment. It can be operated by the buttons on either of the rear mudguards, however this does mean that the first spool is tied up by the top link. Switching attention to the chassis we find that a slim waist has allowed for a tight turning circle. Shod

on 620/75 R30 and 710/85 R38 rubber with a track width of 194/206cm, our test 8690 model managed a reasonably compact 13.90m turn – which is tighter than its competitors. In addition, this all-new frame has enabled MF to move up from 2.05m diameter rear tyres, which were the limit on the 8480, to 2.15m tall boots resulting in a bigger footprint for the increased power.

Up to 2,000kg of extra ballast can also be added to the rear wheels. Our steed was wearing 1,000kg of back wheel ballast so it tipped the scales at 11,700kg. With a GVWR of 18,000kg, this limited payload to 6,300kg, which is on a par with the other tractors in this park.

One rather clever feature that has been developed for the 8600 is the SpeedSteer function. It allows the operator to set the number of steering wheel turns from lock to lock from 0.75 to four. It is a system that works well but, to prevent accidents, the feature cannot be used at speeds over 14km/hr; we reckon this limit could be a little higher.

SpeedSteer can also be incorporated into the field headland management system: clever, as highly responsive steering is not

Massey Ferguson 8690: Lift power and lift requirement



Massey Ferguson 8690: The red curve shows the recorded lift capacity (90% of maximum lift) as continuous lift power on the link ends. The yellow curve displays lift capacity with lift arms shortened – more than 2,770daN extra lift capacity, 17cm smaller lift range. Our MF test candidate boasted excellent lift forces.



The MF 8690's integral front linkage is entirely new, and the operator can make the package double-acting by simply pressing on a button.

ideal when ploughing. Tractors capable of a 50km/hr top speed also benefit from the firm's front axle suspension system as standard, although in our view this is not the most cossetting of packages on the high-hp market – or at least it wasn't on our tested example.

Stepping up into the new four-post cab, 8400 operators will quickly welcome the 28% of extra space but should recognise the unchanged dash. The new CCD information display enables the operator to alter more of the functions and also edit headland sequences – just as he can on MF's Datatronic 3 terminal.

The indicator stalk remains on the right-hand side of the steering column, but is now self-cancelling. The 8690 also gets hydraulic cab suspension rather than the pneumatic system, and our test unit came with Optiride Plus, which not only determines the current position but responds to forward speed and pitching, too. On top of that, the hydraulics can be used to raise the cab up 17cm to improve access to the rear axle; as a fringe benefit, this makes cleaning easier.

Summary: The MF 8600 range is the first in a new generation of catalyst-equipped machines that will be rolling out of tractor factories over the next few years. This technology means the 8690 is Stage 3b-ready, an emission standard that does not come into force until 2011, and perhaps

most impressive of all, when compared to its current Stage 3a competitors the 8690 stands unrivalled in the economy stakes. These fuel savings comfortably cover the cost of using 0.1% to 4% of AdBlue.

The stepless DynaVT transmission, with its two travel ranges, is an excellent box that bristles with electronic wizardry. At the rear, the linkage is strong and the hydraulic system achieved an average result for this power bracket. Although the tractor is running on large rubber to direct all that power to the ground, it's surprisingly manoeuvrable. Indeed our only real area of criticism was that our test tractor's suspension failed to deliver the level of ride comfort we were expecting. We reckon some tweaks are required here, although it could have just been an issue with our particular test model.

Depending on price, there's no doubt that the MF 8690 merits serious consideration in this hp bracket – if for no other reason than its sector-leading fuel consumption. List price of the 50km/hr AdBlue-equipped 8690 is £156,070.

MN, HW

THINKRED THINKLEADERSHIP

Save 16%* on your fuel bills. Invest in an MF 8600!

*16% fuel saving achieved by MF 8690 SCR in Powermix DLG test, compared to the average for all tractors in the same hp class (Profi magazine)

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MF 8690 SCR

Technical data

Engine: 250kW/340hp (ISO) at 2,200rpm; max of 272kW/370hp (ISO); watercooled six-cylinder (Stage 3b) Sisu 84CTA engine with common-rail, four valves per cylinder, turbocharger and inter-cooling; 8,400cm³ capacity; two fuel tanks with 360 + 230 litres; SCR catalyst with separate 30-litre AdBlue tank

Transmission: Infinitely variable 'DynaVT' with 'DTM' management, ML260 from AGCO, power-shuttle, automatic shifting; 50km/hr at 1,900rpm (40km/hr option at 1,600rpm)

Brakes: Wet disc brakes at rear, hydraulic engagement; parking brake is integrated in shuttle control; air brake is standard

Electrics: 12V, two batteries; two x 120amp alternators; 3.6kW/4.9hp starter motor

Linkage: Cat III/IV, ELC with draft link control, shock absorption and slip control. Front linkage and pto are optional

Hydraulics: Swash plate pump with 175 litres/min output, 200 bar, four double-acting spool valves are standard (max nine); available oil for external use by towed and mounted implements is 65 litres

Pto: 540/1,000 or 540E/1,000; 1 3/8in or 1 3/4in, six or 21 splines, electrohydraulic control

Axles and running gear: Dana front axle with 'QuadLink' suspension is standard, AGCO HA 260 rear axle, 620/75 R30 and 710/85 R38 test tyres

Service and maintenance: 21 litres engine oil (400-hour intervals); 85 litres transmission oil (2,000 hours), 110 litres hydraulic oil (1,200 hours), 34-litre cooling system

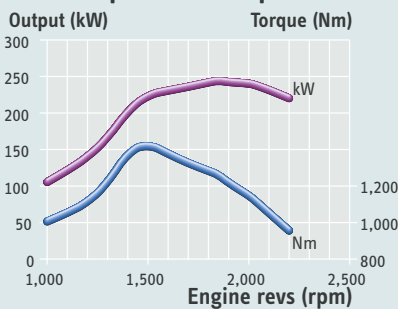
Price: 50km/hr base specification model lists at £156,070 (excl. VAT); front linkage (includes belly weight and two spools) £4,361 - front pto hikes it to £7,530; SpeedSteer steering and Datatronic CCD £3,715 plus AutoGuide with TopDoc £11,562



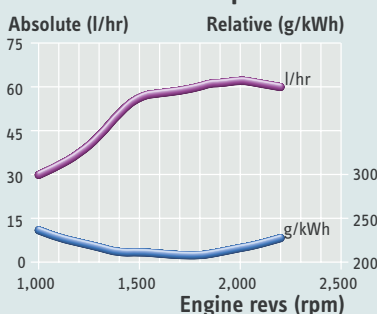
Results from the test station

Pto output:	
Max (1,850rpm)	244.4kW
at rated speed	220.1kW
Fuel consumption:	
Specific at max draft output	209g/kWh
Specific at rated speed	227g/kWh
Maximum at rated speed	61.2/59.9l/hr
Torque:	
Max	1,432Nm (1,500rpm)
Torque rise	49.9%
Engine speed drop	31.8%
Start-off torque	105%
Transmission:	
No. of gears in 4-12km/hr range	Stepless
Rear lift power: (90% max oil pressure, corr.)	
Bottom	8,630daN
Middle	10,280daN
Top	11,030daN
Lift height under load	81.1cm (23.0-104.1cm)
Hydraulic output:	
Operating pressure	220 bar
Max flow	193.2l/min
Max output	56.3kW (177.1l/min, 191 bar)
Drawbar power:	
Max (1,850rpm)	207.1kW (248g/kWh)
At rated speed	186.3kW (268g/kWh)
Noise level: (Under load at driver's ear)	
Cab closed/open	Not measured
Braking:	
Max mean deceleration	Not measured
Pedal force	Not measured
Turning circle:	
4WD disengaged/engaged	13.20m/13.90m
Test weight:	
Front axle	4,820kg
Rear axle	6,880kg
Unladen weight (incl. 1t wheel weights)	11,700kg
GVWR	18,000kg
Payload	6,300kg
Power-weight ratio	46kg/kW
Wheelbase	310cm
Track width front	194cm
Track width rear	206cm
Ground clearance	37.3cm

Output and Torque



Fuel Consumption



Fuel economy at typical performance

Working areas	Output	Speed	g/kWh	l/hr
Standard speed pto 540rpm	100%	2,030	217	61.9
Economy speed pto 540Erpm	100%	1,600	210	57.8
Standard speed pto 1,000rpm	100%	2,030	217	61.9
Economy pto 1,000Erpm	100%	-	-	-
Engine in top speed range	80%	Max	231	48.6
High output	80%	90%	218	46.0
Transport work	40%	90%	247	26.0
Low output, 1/2 speed	40%	60%	227	24.0
High output, 1/2 speed	60%	60%	217	34.2

The test results

Engine: ++	
Performance characteristics	2.1
Fuel economy	1.0
Pto output/drawbar power	1.5

Best fuel consumption rates. And even though AdBlue consumption needs to be added, it is still an excellent result. First-class lugging power.

Transmission: ++	
Gearbox ratios/functions	1.0
Shifting	1.6
Clutch/throttle	1.8
Pto	2.5

Excellent CVT transmission with 'DTM' management, 50km/hr available at reduced engine speed. Two travel ranges require manual engagement; only two pto speeds available.

Chassis: +	
Steering	1.5
Four-wheel drive and diff lock	1.8
Hand/foot brake	1.5
Front axle/cab suspension	2.5
Weight and payload	1.5

Manoeuvrable for this power bracket, convenient 'SpeedSteer' option. Effective front axle suspension and hydraulic cab suspension (option). Nevertheless, driver comfort was disappointing on our tractor. Payload and ballasting are good.

Linkage/hydraulics: +	
Lift power and lift height	1.0
Operation	2.1
Hydraulic output	2.9
Spool valves	3.0
Hydraulic couplers	1.2

Rear lift capacities are very good; hydraulic output is a good average. Downgraded due to defects on pre-production machine.

Cab: ++	
Space and comfort	1.2
Visibility	1.3
Heating/ventilation	1.6
Noise level	Not measured
Electrical system	2.1
Build quality	2.0
Maintenance	2.3

Very good space and visibility, versatile cab suspension system. Setting the suspension system did not have a significant effect.

Ability:	--	-	0	+	++
Basic standards					●
Average standards					●
High standards					●
Field work					●
Grassland work					●
Transport work					●
Loader work					●

Price: Low High
£114,000 to £121,000 ●

Typical farmer buying price after discount excl VAT for base specification MF 8690 (50km/hr)

Grading system:	0 average
++ very good	-- poor
+ good	- below average

The individual marks are extracts from our assessments and do not necessarily result in a mathematically conclusive overall mark