Biologische Bundesanstalt
für Land- und Forstwirtschaft

ENTAM
European Network for Testing Agricultural Machines

ENTAM - Test Report

Equipment type: Self-propelled Field Crop Sprayer
Trade mark: Spra Coupe
Model: Spra Coupe 7450 / 7650
(7450 tested)

Manufacturer:
AgChem Europe b.v.
Horsterweg 66 a

Test Report: D - 1764

January 2007

Assessment table

No.	Contents	Assessment
1	Spray tank surface roughness	+
2	Spray tank over volume	+
3	Volume of total residual (here max. allowed 76 l)	++
4	Spray tank contents gauge up to 20% Filling	++
5	Spray tank contents gauge from 20% Filling	++
6	Agitation system	+
7	Width of nozzle bar section	+
8	Boom height adjustment range	+
9	Accuracy of pressure gauge	++
10	Accuracy of flow meter	+++
11	Regulation speed	+
12	Even transverse distribution	++
13	Rinsing water tank	+++
14	Deviation of volume/hectare adjustment device (spray computer) from desired value	++
15	Repeatability of volume/hectare adjustment device (spray computer)	++
16	Pressure drop between manometer and nozzle	++
17	Deviation of single nozzle output from table	+

Fig.1+2 : assessment table and assessment keys of important test results

Note: the assessment keys are listed below. detailed results are in the following test report.

No.	unit	+	++	+++	No.	unit	+	++	+++
1	µm	>70-100	30-70	<30	10	%	4-5	2-4	0-<2
2	%	5-8	>8-12	>12	11	s	> 4.7	2.3 - 4.7	< 2.3
3	of allow.value	>2/3-3/3	1/3-2/3	<1/3	12	CV	>7-9	4-7	<4
4	%	7.5-5.0	5.0-2.5	<2.5	13	dilutable residue *)	10 - 12times	>12 - 14times	>14times
5	%	5.0-4.0	<4.0-2.0	<2.0	14	%	>4-6	2-4	<2
6	%	>10-15	5-10	<5	15	%	>2-3	1-2	<1
7	m	4.5-6	>3-4.5	3 or less	16	%	>7-10	3-7	<3
8	m	1-1.5	>1.5-2.0	>2.0	17	%	>7-10	3-7	<3
9	bar	>0.10-0.20	>0.05-0.10	0.00-0.05	*) At lest 10 times the dilutable residue of spray liquid in the system.				

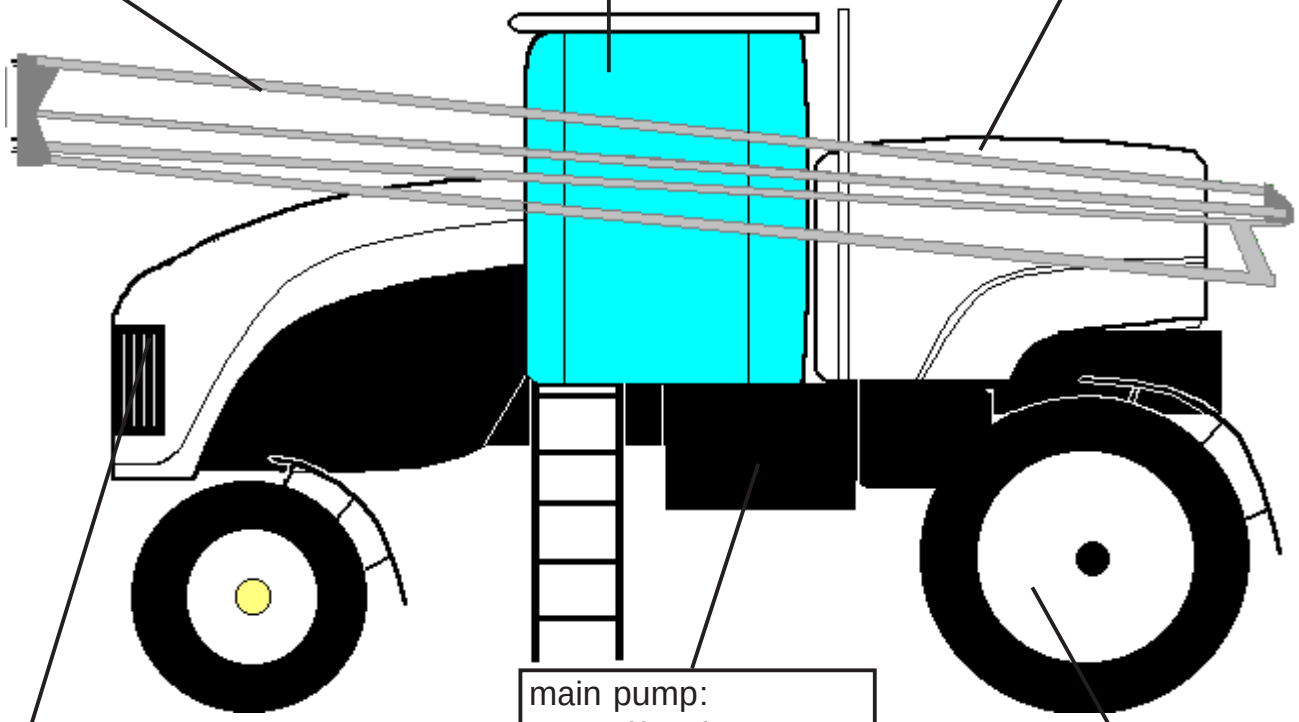
The complete test report can be downloaded at:
www.ENTAM.com or *www.BBA.de*

Technical data of sprayer

- 30m spray boom.
- lateral hydraulic folding.
- 7 mechanical sections.
- 6 spray sections.
- stepless hydraulic boom height adjustment 650 - 2090mm.
- boom pendulum with 9° range.
- slope compensation up to 15°.

- RAVEN SCS 4000 spray computer.

- 2600-l-tank (nominal volume).
- float with rope drive contents indicator.
- 2 rotating nozzles for internal washing.
- tank filling by pump or hydrant.
- 246 l volume of rinsing water tank.



- 6 cylinder-Perkins-Diesel. (127 KW / 175 PS).
- 6-gear power shift transmission.
- activatible front wheel drive.

main pump:
- centrifugal pump; 129 l/min at 7 bar.

filling pump:
- centrifugal pump; 540 l/min

- hydraulic track width adjustment from 1,8 - 2,25 m.
- 1000 mm ground clearance.

Dimensions:

total length:	7660 mm
height:	3500 mm
transportation width:	3000 mm (between outer sides of the boom)
unloaded weight:	7720 kg

Fig.3: Diagram of sprayer

Description of sprayer

The tested Spra Coupe 7450 by AGCO consists of a steel profile frame with a mounted tank and driver's cab. The 6-cylinder Perkins diesel engine with 127 kW (175 PS) is also mounted to the frame and is not used as a supporting structure (modular construction). This contributes to the good torsion of the construction and thus prevents stress peaks in the framework construction. To achieve the relatively large ground clearance of 1 m, there are portal axles with hydraulic wheel drive at the front axle and mechanical axle drive at the rear axle; the front axle wheels can be activated simultaneously with the rear axle if required. In conjunction with the 6-gear power shift transmission, the permissible speed in Germany of 40 km/h can be achieved. The gear is selected by a multifunction-lever with button. The axles' construction allows hydraulic track width adjustment from 1.8 to 2.25 m (when driving slowly), which makes it easy and quick to adjust to different track widths. The wheels are separate and suspended using coil springs. The steering is based on conventional front axle steering.

Fig.4: Right sprayer side. You see the rinsing water tank in front of the rear wheel.

Fig.5: Smooth covered under side. In the front you see the front axle.

The mounted polyethylene spray tank has a nominal volume of 2600 l and an oversize of 140 l. The level of spray liquid can be read on a separate gauge which is linked to a float attached to the gauge with a wire. For cleaning the inside of the sprayer and tank,

rinsing the spray fluid conducting components and diluting spray residues, there is a separate 246 l rinsing tank on the right hand side of the vehicle. The spray and rinsing tanks can both be filled either directly via the filling holes or by the hydraulic pump (with 62 mm camlock connection) on the left hand side of the vehicle. The filling pump is centrifugal with a flow rate of 540 l/min at a engine rotation speed of 1600 min^{-1}. For adjusting the flow of liquid pumped, the motor rotation speed can be varied directly by the buttons at the central controls.

Fig. 6: Filling pump with Kamlock - connection.

There is a centrifugal pump with a flow rate of 129 l/min at 7 bar for applying the spray liquid. The functions (spraying, agitating, filling, cleaning the inside, cleaning the outside) are selected using a 5-way-valve at the central controls. The flow of liquid from the agitator can be adjusted continuously using a hand valve or switched on and off by an electric on-off valve (operated from the cab).
For spray operation, the liquid is fed through a central pressure filter and a flow meter before landing in the spray boom section valves. For de-aerating the centrifugal pump which is not self-priming, there is a ½“ vent connection which is shut off manually after de-aerating.The spray boom is a framework construction made of aluminium profiles which is folded at the side of the vehicle.

Fig.7: Central controls at the left hand side with buttons (orange) for adjusting the engine revoultions.

For easy accessibility to the driver's cab when the steps are lowered, the left folded boom section is swivelled outwards about 30cm. The height of the spray boom can be adjusted continuously and hydraulically using a lifting mechanism parallel motion, within a height range of 650 mm to 2090 mm. The lifting mechanism compensates for the pendulum movement of the boom within a range of 9 °. Also, it is possible to lift the boom halves separately up to 12°. The integrated slope compensation device compensates for slopes of up to 20° gradient. The mechanical construction of the boom consists of 7 segments of which the exterior, 2.4m in length, are equipped with a device for avoiding obstacles to the front, back and above. The spray system is divided into 6 spraying sections with 10 nozzles each and a nozzle spacing of 50 cm. Each of the sections has its own in-line filter, also situated in the boom. The spray liquid can be removed (without a suction filter) from a small sump in the bottom of the tank.

Fig. 8: Moveble boomrest for easier entry of the cabin.

Alternatively, the induction bowl with an integrated container rinsing device, on the left hand side of the vehicle, can be used for filling the tank with plant protection products via the tank opening. For induction and for cleaning the inside of the induction bowl there is a rotating cleaning nozzle.The container rinsing device also consists of a rotating rinsing nozzle which is

Fig. 9: Left sprayer side with induction hopper in working position (in the centre) and tube for outer surface cleaning.

activated by placing a container over the top and pushing it downwards (dead man's device). The induction bowl is tightly sealed with a screw lid.

The speed-dependent adjustment of spray application is managed by a spray computer, model RAVEN SCS 4000 and influences the speed of the centrifugal pump.
A multifunctional knob on the right arm of the driver's seat contains the switches for activating the section valves, central controls, hydraulic functions lifting/lowering of the boom and the boom extensions (variable geometry), and the gears. A console to the right of the driver's seat contains the switches for folding the boom (inner and outer segments with separate switches), agitator switch, slope compensation, boom locking and drive and chassis adjustment for track width, all-wheel drive and motor speed (electronic hand throttle). Application parameters are entered into the RAVEN computer by control keys and arrow keys. The LCD display which shows the set values is sufficient in size and the backlight enables gut legibility even in bad light conditions. During operation, the display shows the values for the application rate in l/ha, spray pressure in kPa (corresponds with 1/100 bar), driving speed in km/h, operational mode (manual/automatic) and section valves (on/off). In addition, an extra field shows tank contents, current flow rate, total area, total volume, partial area and average capacity per hour in ha/h.

Result table

tested assembly			result (measured)	
spray tank	over volume		5,4%	* min. 5 %
	contents gauge	graduation marks	100	* max. 100 l
		deviation	-3.80% 3.60%	* max. 7.5 % up to 520 l filling * max. 5 % between 520 and 2600 l
	surface roughness		0.08mm	* max 0.1 mm
rinsing tank	volume		246 l corresponding to 10.7times the dilutable volume	* min. 10times the dilutable volume
	rinsing and dilution possible?		yes	
can rinsing equipment	rinsing efficiency		< 0.001%	* max. 0.01 % of can contents
manometer	graduation marks		0.01	* max. 0.2 bar
	deviation		0,08 bar	* max. 0.2 bar
agitation system	deviation from even concentration		-10.54%	*max. 15 %
residual in l		dilutable	22.89	* max. 73 l
		non delutable		
spray boom	height adjustment range from - to		500 mm - 1940 mm	
	nozzle ground contact protection		yes	
	pressure loss between manometer and nozzle at 5 bar pressure		6,8%	* max. 10 %
	nozzle dripping after switch off		0 ml	* max. 2 ml
	single nozzle flow rate			
	type of nozzle: Lechler ID 120 04 POM			
	pressure (bar)	flow rate (l/min)	max. deviation from table in % *(max. 10 %)	max. deviation from mean in % *(max. 5 %)
	5.0	1.929	-7,5%	-4,5%
	transverse distribution			
	type of nozzle: Lechler ID 120 04 POM			
	pressure (bar)	distance (cm)	coefficient of variation (%) *(max. 9 %)	
	3.0	50	6.29	
	5.0	50	4.25	
	6.5	50	4.04	

volume/hectare adjustment device		
displayed (l/min)	real (l/min)	deviation in % from real *(max. 5 %)
18.0	18.0	0.00
36.0	35.7	0.83
54.0	53.7	0.50
73.0	72.1	1.25
90.0	90.0	0.00

Fig.10: Result table, part 1

Result table

volume/hectare adjustment device			
repeatability of adjustment			
	adjusted flow rate in l/ha	deviation from adjusted value % *(max. 6 %)	CV *(< 3 %)
	210	-2.18	0.68
	300	-1.48	0.76
	390	-2.23	1.26
	procedure	regulation time (s) with deviation > 10 % to adjusted value	
	switching on / off	3.5	* max. 7 s
	switching of single sections	1.7	* max. 7 s
	change of driving speed by changing gears		
	1.5 m/s to 2.0 m/s	3.2	* max. 7 s
	2.0 m/s to 2.5 m/s	3.8	* max. 7 s
	2.5 m/s to 2.0 m/s	4.8	* max. 7 s
	2.0 m/s to 1.5 m/s	5	* max. 7 s

Fig.11: Result table, part 2

Safety Tests

The sprayer is equipped with safety pictograms (stickers) and operating instructions in the native language, which include further safety information. The sprayer carries a CE-mark and a vehicle identification plate.

The CE-mark shows that a product fulfils the requirements defined for the respective EC directives and that the supplier has carried out the appropriate procedures to achieve conformity. The CE-mark is placed on the equipment by the manufacturer. The manufacturer confirms by doing so that the sprayer was designed and built in accordance with harmonised EC Directive 98/37/EEC and that standard EN 907 has been complied with.

Explanation on testing:

Testing takes place according to the Technical Instructions for ENTAM-Tests of field crop sprayers. This procedure was developed by the competent testing authorities of the European countries participating in ENTAM and is based on the CEN standard EN 12761 „Agricultural and forestry machinery – Plant protection equipment for the application of plant protection products and liquid fertilisers“. This test is only a technical performance test which takes place without an accompanying field test. The test results apply only to the tested appurtenances of the sprayer. Statements on the behaviour of the sprayer with different appurtenances cannot be derived from these results.

Responsibility and recognition

Performing competent authority:
Federal Biological Research Centre for Agriculture and Forestry (BBA) (Germany)
Application Techniques Division; Messeweg 11-12; D-38104 Braunschweig

This test is recognized by the ENTAM members:

HIAE Hungarian Institute of Agricultural Engineering (Hungary)	D-13/2007
NAGREF National Agricultural Research Foundation (Greece)	LE/90/01/ZZ
ENAMA Ente Nazionale per la Meccanizzazione Agricola (Italy)	ENTAM „Rapporto di prova prestazionale“ 01/2007
CMA Generalitat de Catalunya Centre de Mecanització Agrària (CMA) (Spain)	EPH003/07
HBLuFA FRANCISCO JOSEPHINUM WIESELBURG (Austria)	BLT-Prot.-Nr. 032/07
PIMR - Przemyslowy Instytut Maszyn Rolniczych Industrial Institute of Agricultural Engineering (Poland)	PIMR - 3/ENTAM/07